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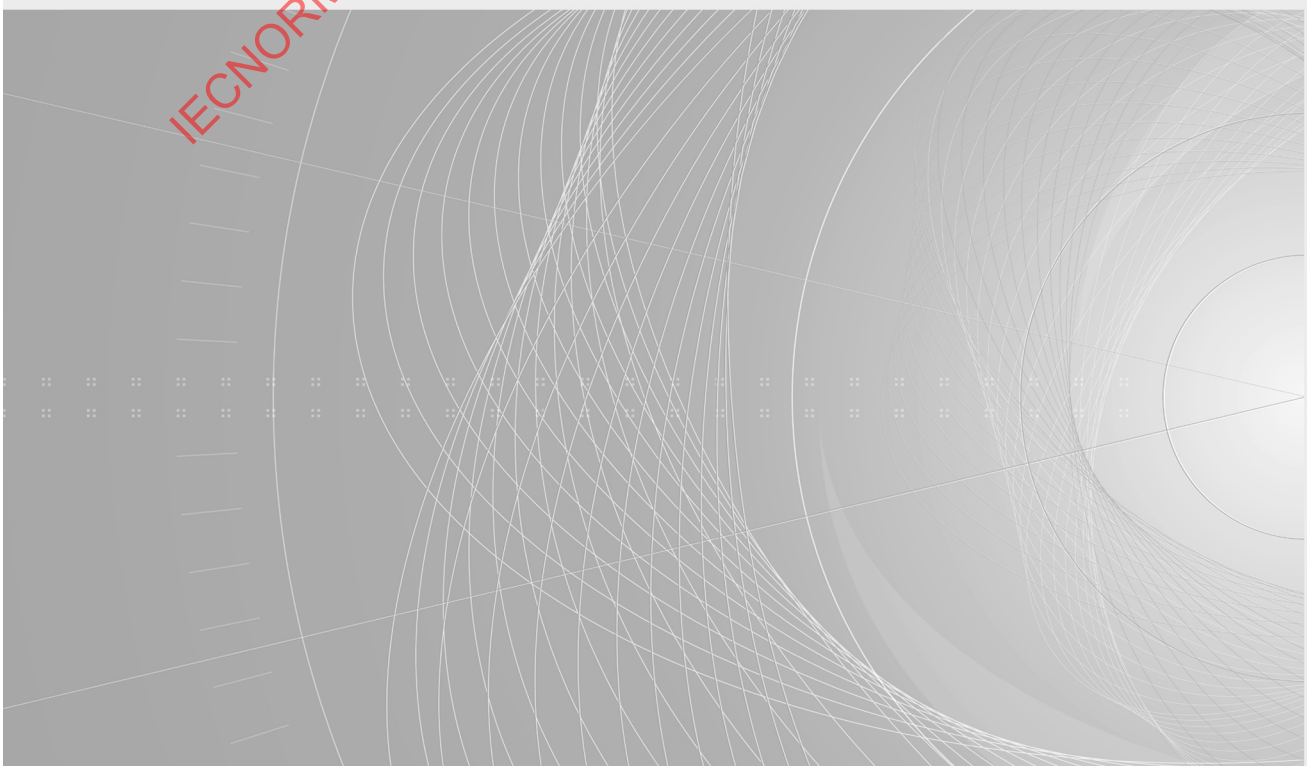
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Application integration at electric utilities – System interfaces for distribution management – Part 3: Interface for network operations

Intégration d'applications pour les services électriques – Interfaces système pour la gestion de la distribution – Partie 3: Interface pour l'exploitation du réseau



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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APPLICATION INTEGRATION AT ELECTRIC UTILITIES – SYSTEM INTERFACES FOR DISTRIBUTION MANAGEMENT –

Part 3: Interface for network operations

FOREWORD

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International standard IEC 61968-3 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This third edition cancels and replaces the second edition published in 2017. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) major rework of Switch Order related profiles and Outage related profiles;
b) documented profiles in more detail as a result of the analysis of end-to-end use cases;
c) separated Measurement and Control profile into two profiles: PSRMeasurements and PSRControls;
d) replaced Temporary Network Change profile with SwitchingEvents profile;

e) added MeasurementAction, ControlAction, GenericAction and VerificationAction to SwitchingPlans profile. Added examples;

f) added SwitchingActions profile to support the coordination of SwitchingPlan execution between control room and the field crew;

g) added ClampAction to SwitchingPlan, SwitchingAction and SwitchingEvent profiles, to allow clamps to be placed and removed independently of jumpers;

h) separated OutagesAndFaults profile into UnplannedOutages, PlannedOutages, EquipmentFaults, LineFaults;

i) added list of energized and de-energized UsagePoints to the UnplannedOutages profile;

j) added PlannedOutages profile;

k) added PlannedOutageNotifications profile;

l) added SwitchingPlanRequest profile to replace OutageSchedules profile;

m) expanded TroubleOrders profile to include UnplannedOutages and TroubleTickets and to allow crews to be scheduled to individual tasks within the TroubleOrder;

n) expanded use cases and sequence diagrams;

o) sequence diagrams updated to use IEC 61968-100 message patterns;

p) use cases in IEC 62559-2 use case template;

q) added example XML for profiles;

r) replaced xsd in Annex with tables to document the profiles in a serialisation-independent form;

s) clarified FLISR use case to include interactions between DSO and TSO per review comments from Edition 2.

t) removed OperationalTags since it is now part of the TagAction in the SwitchingEvents payload

The text of this International Standard is based on the following documents:

Draft	Report on voting
57/2343/FDIS	57/2364/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The language used for the development of this International Standard is English.

In this standard, the following print types are used:

– **tokens: in arial black type**

A list of all parts of the IEC 61968 series, under the general title: *Application integration at electric utilities – System interfaces for distribution management* can be found on the IEC website.

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The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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INTRODUCTION

The purpose of this part of IEC 61968 is to define a standard for the integration of network operations systems with each other and other systems and business functions within the scope of IEC 61968. The specific details of the communication protocols those systems employ are outside the scope of this part of IEC 61968. Instead, this part of IEC 61968 will recognize and model the general capabilities that can be potentially provided by network operations systems. In this way, this part of IEC 61968 will not be impacted by the specification, development and/or deployment of next generation network operations systems, either through the use of standards or proprietary means.

The IEC 61968 series of standards is intended to facilitate inter-application integration as opposed to intra-application integration. Intra-application integration is aimed at programs in the same application system, usually communicating with each other using middleware that is embedded in their underlying runtime environment, and tends to be optimised for close, real-time, synchronous connections and interactive request/reply or conversation communication models. Therefore, these inter-application interface standards are relevant to loosely coupled applications with more heterogeneity in languages, operating systems, protocols and management tools. This series of standards is intended to support applications that need to exchange data every few seconds, minutes, or hours rather than waiting for a nightly batch run. This series of standards, which are intended to be implemented with middleware services that exchange messages among applications, will complement, not replace utility data warehouses, database gateways, and operational stores.

As used in IEC 61968, a distribution management system (DMS) consists of various distributed application components for the utility to manage electrical distribution networks. These capabilities include monitoring and control of equipment for power delivery, management processes to ensure system reliability, voltage management, demand-side management, outage management, work management, automated mapping and facilities management. Standard interfaces are defined for each class of applications identified in the interface reference model (IRM), which is described in IEC 61968-1.

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APPLICATION INTEGRATION AT ELECTRIC UTILITIES – SYSTEM INTERFACES FOR DISTRIBUTION MANAGEMENT –

Part 3: Interface for network operations

1 Scope

Per the IEC 61968 Interface Reference Model, the Network Operations function defined in this part of IEC 61968 provides utilities with the means to supervise main substation topology (breaker and switch state), feeder topology and control equipment status through SCADA, AMI and other data sources. It also provides the means for handling network connectivity and loading conditions. Finally, it makes it possible for utilities to locate customer telephone complaints and coordinate activities of field crews with respect to planned and unplanned outages.

IEC 61968-3 specifies the information content of a set of message payloads that can be used to support many of the business functions related to network operations. Typical uses of the message payloads defined in IEC 61968-3 include data acquisition by external systems, fault isolation, fault restoration, trouble management and coordination of the real-time state of the network.

The scope diagram shown in Figure 1 illustrates the possibility of implementing IEC 61968-3 functionality as either a single integrated advanced distribution management system or as a set of separate functions – OMS, DMS and SCADA. Utilities may choose to buy these systems from different vendors and integrate them using the IEC 61968-3 messages. Alternatively, a single vendor could provide two or all of these components as a single integrated system. In the case of more than one system being provided by the same vendor, the vendor may choose to use either extensions of the IEC 61968 messages or a proprietary integration mechanism to provide enhanced functionality over and above what is required/supported by the IEC 61968-3 specification. While this is a possible implementation, Subclause 4.3 defines the scope in terms of business functions that are implemented in common vendor offerings.

Annexes in this document detail integration scenarios or use cases, which are informative examples showing typical ways of using the message payloads defined in this document as well as message payloads to be defined in other parts of the IEC 61968 series.

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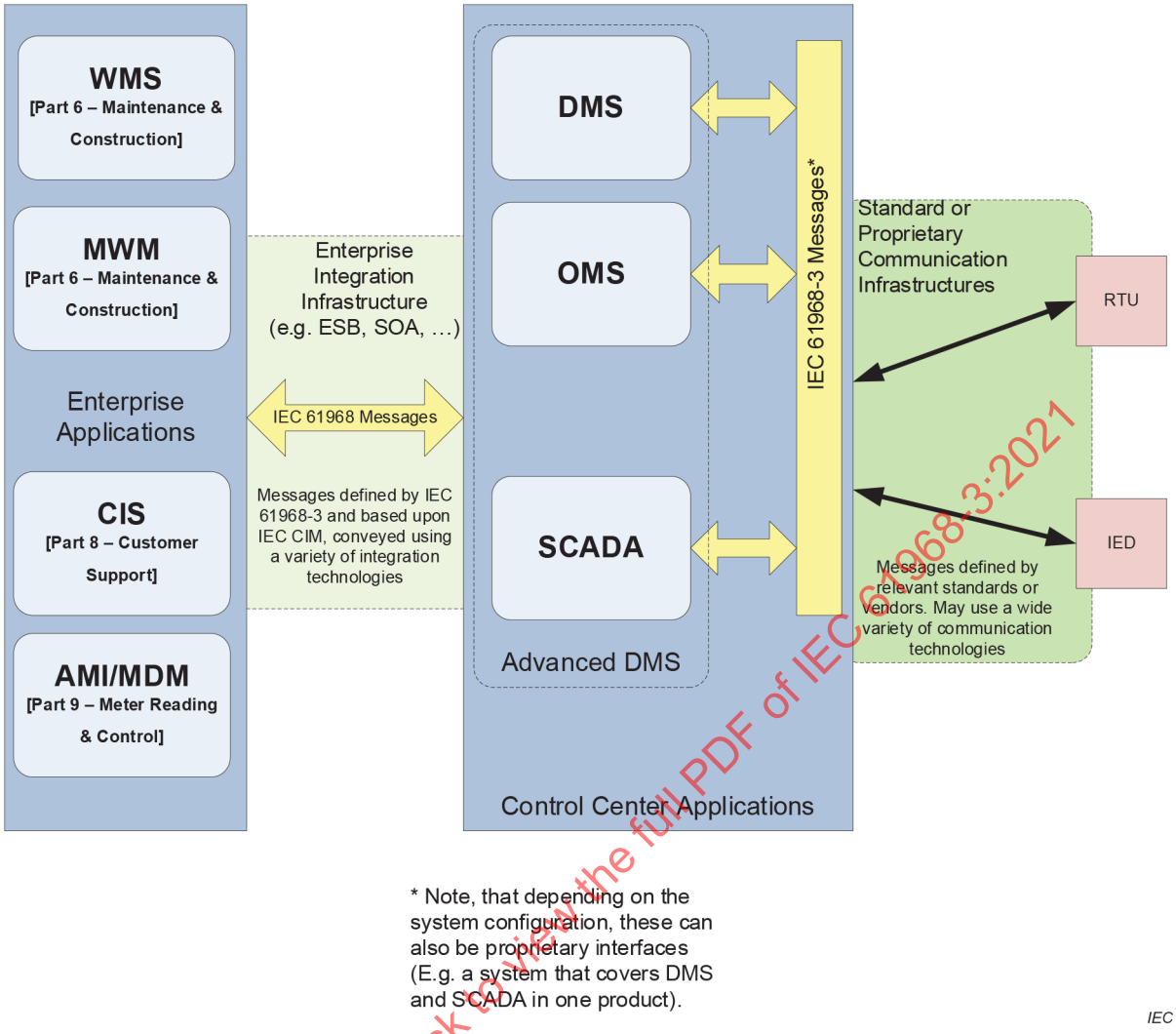


Figure 1 – IEC 61968-3 Scope

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2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61968-1, *Application integration at electric utilities – System interfaces for distribution management – Part 1: Interface architecture and general recommendations*

IEC TS 61968-2, *Application integration at electric utilities – System interfaces for distribution management – Part 2: Glossary*

IEC 61968-100, *Application integration at electric utilities – System interfaces for distribution management – Part 100: Implementation profiles*

IEC 61970-301, *Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.2 Abbreviated terms

For the purposes of this document, the abbreviations given in IEC 61968-2 as well as the following apply.

NOTE Refer to IEC 60050, *International Electrotechnical Vocabulary*, for general glossary definitions.

FLISR Fault Location, Isolation and Service Restoration

WMS Work Management System

4 Reference and information models

4.1 General approach to network operations

Traditionally there have been two types of systems to manage distribution operations: Distribution Management Systems (DMS) and Outage Management Systems (OMS). Often a DMS has been delivered as an extension to a SCADA system, but some DMS can be delivered as a standalone set of distribution applications with no SCADA.

Outage Management Systems are used extensively in many parts of the world (typically with large service territories and a large amount of primary overhead conductor) to manage their distribution systems. Such distribution systems are typically configured radially and cover large distances. For this reason it has been historically expensive to monitor the status of the distribution system, particularly outside of the substation. In more dense populations the cost of telemetry and automation is lower, and can be justified on a cost per customer basis.

Thus often the only way that a distribution utility knows that there is a problem with the system is when a customer calls to report an outage. The utility then collects a set of outage calls, and from the pattern of calls received, determines the likely location and cause of the outage. A crew is then sent to the location of the outage to investigate further and affect repairs.

Distribution management systems have their roots in transmission SCADA systems. As automation has moved downwards and into distribution substations, there has been an increasing need to provide functionality for distribution applications. Distribution management systems originated as either extensions to the existing transmission SCADA, by adding additional points to cover the feeder breakers, or by adding a standalone distribution SCADA system. Both types of system usually have RTUs, communication front-ends, alarm systems and displays.

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What characterizes these systems as distribution management systems is the addition of functions such as the ability to add temporary devices, such as line cuts and jumper lines. Such temporary devices are uncommon in transmission systems, but are very common in distribution systems. Since many distribution systems are operated in a radial configuration, it is often necessary to operate feeder tie switches to reconfigure feeders, either to restore outages or to adjust to different loading situations. This dictates a need for the ability to dynamically color lines according to which direction they are being energized from and also for the ability to color lines according to whether they are energized or not. In addition, in certain parts of the world, such systems can be unbalanced, meaning that each electrical phase is operated independently. Another characteristic of a distribution system is that change is the norm. New residential construction and routine maintenance means that the distribution network model changes frequently. It is not uncommon for 10 000 or even 100 000 changes to occur to a distribution system in a single week.

The thing that both the DMS and OMS have in common is the need for an as operated near real-time network model. Thus this part of IEC 61968 includes the ability to exchange distribution network models between two such systems and to keep them synchronized. Increasingly, vendors are beginning to realize that this integration is non-trivial to implement and maintain, are therefore offering integrated DMS/OMS, and even integrated DMS/OMS/SCADA systems in order to provide reduced total cost of ownership and consistent views of the real-time distribution network. The term ADMS (Advanced Distribution Management System) has been coined to describe such systems.

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4.2 Reference model

Figure 2 serves as a reference model and provides examples of the logical components and data flows related to this document. Clause 3 provides references to terms that are defined by the CIM.

The diagram in Figure 2 describes the flows between the components in the reference model. The label for each flow is the name of an IEC 61968 message profile.

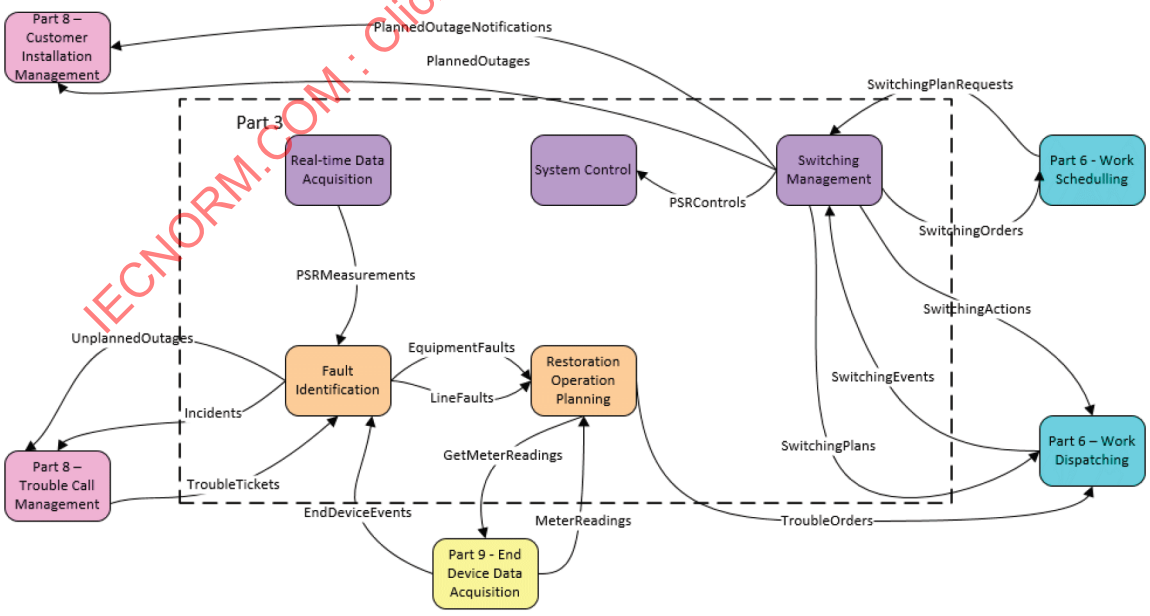


Figure 2 – IEC 61968-3 Reference model

The reference architecture reflects four main logical components (potentially realized as systems or subsystems) related to network operations:

IEC 61968-9, *Application integration at electric utilities – System interfaces for distribution management – Part 9: Interfaces for meter reading and control*

IEC 61968-8, *Application integration at electric utilities – System interfaces for distribution management – Part 8: Interfaces for customer operations*

IEC 61968-6, *Application integration at electric utilities – System interfaces for distribution management – Part 6: Interfaces for maintenance and construction*

IEC 61968-5, *Application integration at electric utilities – System interfaces for distribution management – Part 5: Distributed energy optimization*

4.3 Interface reference model

It is not the intention of this document to define the applications and systems that vendors should produce. It is expected that a concrete (physical) application will provide the functionality of one or more abstract (logical) components as listed in this document. These abstract components are grouped by the business functions of the Interface reference model.

In this document, the term abstract component is used to refer to that portion of a software system that supports one or more of the interfaces defined in this part of IEC 61968 and IEC 61968-6, IEC 61968-8 and IEC 61968-9. It does not necessarily mean that compliant software is delivered either as separate modules or as a single system.

IEC 61968-1 describes the interface reference model, while IEC 61968-3 through IEC 61968-9 define the details of the information exchanged for specific types of abstract component.

4.4 Network operations business functions and sub-business functions

It should be noted that the message payloads defined in this document, IEC 61968-3, *Application integration at electric utilities – System interfaces for distribution management – Part 3: Interfaces for Network Operations*, may be sent or received by any type of component within a distribution management system (DMS) or outage management system (OMS).

Table 1 shows these business functions and typical sub-business functions that are expected to be producers of information for these message payloads. This is not intended to be an exhaustive list of business functions and sub-business functions, rather they are examples. Typical consumers of the information include, but are not restricted to, the other business functions as listed in IEC 61968-1.

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Table 1 – Business functions and sub-business functions

Business functions	Sub-business functions
Real-time Operation (RTO) The Real-Time Operation (RTO) business function includes the execution of the planned action in regard to changing the network operational state. In addition, it monitors the current state of the network to ensure that the power grid is operating in a secure and balanced state. Predefined and activated remedial action will be executed when the pre-condition is met. That a system is secure and balanced state means that there is balance between supply and demand and that the system can handle pre-defined unanticipated loss of system equipment without violating operational requirements in regard to voltage, frequency, and operational stability limits. Real-Time Data Acquistion (RTDA)	The Real-Time Data Acquisition business function includes the collection and validation of measurements and observations that are used to determent the present state of the system that is under the entities' control. This could include acquisition of measurements and observations that are outside the entity's responsibility, but where the equipment that is defined as relevant to determine the state of the responsible system. The measurements and observations could include: • traditional SCADA points and analogues; • manually collected and entered data; • phasor data; • data generated by other systems, such as: – generating plants; – IEC 61850 systems; – lower or higher-level operations' activities. The common denominator for this data is that it is sampled data treated as raw input, as opposed to a setting or instruction or request received from some other system. In other words, the source of the data is completely ignorant of the acquisition and use of the data. It is not a coordinated integration of peer intelligence.
	Switching Management (SM) The Switching Management business function includes all activity involved in supervising execution of switching orders and outage restoration. • Execution of switching steps can involve remote operations of devices via SCADA and/or modifying settings on system controls. • Execution incorporates critical safety procedures. • Wherever there is concern about the impact of switching on the grid, analytical evaluation of the security of the state that switching will establish is usual. The types of analysis are similar to real-time state evaluation except that power flow or optimal power flow replaces state estimation.
	System Control (SC) The System Control business function includes any activity (other than Switching Management) which issues instructions to field controls in order to change the state of the grid. These controls may be closed loop or man-in-the-loop. Controls can be divided into active and reactive domains and generally use either raw measurements or the evaluated state as the input to control logic, which then develops a proposed change. Such control logic can be quite complex, even involving analyses based on algorithms such as optimal power flow. Control functions also may include follow-up logic to confirm that an issued control was in fact executed in the field and/or to assess whether the impact of the control was as predicted. Controls are important to model in analytical simulations, and a key distinguishing characteristic is whether the control can be represented by standard block diagram components or whether one has to incorporate the control software in order to simulate. Active controls include: • AGC, LFC; • active reserve management; • controllable load management; • remedial action scheme settings; • security constrained dispatch. Reactive controls include: • reactive reserve management; • Volt-VAr optimization; • DER settings; • FLISR.

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Business functions	Sub-business functions
Fault Management (FM) The Fault Management (FM) business function receives notifications regarding faults in the electrical network and analyses those notifications in order to estimate the location of the fault. Fault Management tracks the fault through the stages of actual location, minimizing the area impacted by the fault, restoring service to all impacted parts of the network and coordinating permanent repairs. Fault Management ensures that fault durations and restoration times are correctly captured for regulatory reporting purposes.	Fault Identification (FI) The Fault Identification (FI) business function uses a variety of inputs in order to identify where the real fault has occurred. It will also identify the cause of the fault, where known.
	Restoration Operation Planning (ROP) The Restoration Operation Planning (ROP) business function create a plan for handling unplanned or forced outage to recover to an acceptable operation state. It also includes a plan to restore the network to its pre-fault condition after repairs have been made

The use case sequence diagrams presented in this document assume a simplified interpretation of the business functions listed in Table 1. This allows for easier mapping of business functions to systems familiar to the parties implementing the standard.

4.5 Static information model

4.5.1 General

The information model relevant to network operations consists of classes that provide a template for the attributes for each message payload.

The classes are defined in detail in IEC 61968-11, Common Information Model (CIM) Extensions for Distribution or in IEC 61970-301, Energy Management System Application Program Interfaces – Common Information Model Core.

4.5.2 Classes for network operations

Table 2 lists classes used within message types. Usually all the attributes of these classes are defined within a message type. The descriptions provided describe usage within IEC 61968-3.

Classes that are used to specify the network model are defined in IEC 61970.

Classes described as type "Asset" are defined in the IEC 61968/Assets package of the CIM.

Classes described as type "Work" are defined in the IEC 61968/Work package of the CIM.

Classes described as type "Customer" are defined in the IEC 61968/Customers package of the CIM.

Classes described as type "Metering" are defined in the IEC 61968/Metering package of the CIM.

Classes described as type "Profile" are contextual profiles defined for IEC 61968-3 that describe message definitions defined using CIM objects.

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Table 2 – Classes for network operations

Class	Type	Description
AreaKind	Class	Enumeration for the type of area defined; e.g., county, state, parish, zipcode, etc.
ClearanceAction	Class	Action on clearance document as a switching step.
ClearanceActionKind	Class	Type of clearance action.
ClearanceDocument	Class	Safety document used to authorise work on conducting equipment in the field. Tagged equipment is not allowed to be operated.
ControlAction	Class	Control executed as a switching step.
CutAction	Class	Action on cut as a switching step.
EnergySourceAction	Class	Action on energy source as a switching step.
ERTConfidenceKind	Class	The estimated time of restoration can have a confidence factor applied such as high or low confidence that the ERT will be accomplished. This confidence factor may be updated as needed during the outage period – just as the actual ERT can be updated.
EstimatedRestorationTime	Class	The Estimated Restoration Time for a single outage
FieldSafetySupervisor	Class	Crew member on work site responsible for all local safety measures for the work crew doing maintenance, construction and repair in a substation or on a power line/cable.
GenericAction	Class	An arbitrary switching step.
GroundAction	Class	Action on ground as a switching step.
Incident	Class	Description of a problem in the field that may be reported in a trouble ticket or come from another source. It may have to do with an outage.
JumperAction	Class	Action on jumper as a switching step.
MeasurementAction	Class	Measurement taken as a switching step.
OperationalTag	Class	Operational tag placed on a power system resource or asset in the context of switching plan execution or other work in the field.
OperationsSafetySupervisor	Class	Operator with responsibility that the work in high voltage installation is executed in a safe manner and according to safety regulation.
Outage	Class	Document describing details of an active or planned outage in a part of the electrical network. A non-planned outage may be created upon: – a breaker trip, – a fault indicator status change, – a meter event indicating customer outage, – a reception of one or more customer trouble calls, or – an operator command, reflecting information obtained from the field crew. Outage restoration may be performed using a switching plan which complements the outage information with detailed switching activities, including the relationship to the crew and work. A planned outage may be created upon: – a request for service, maintenance or construction work in the field, or – an operator-defined outage for what-if/contingency network analysis.
OutageArea	Class	This defines the area covered by the Outage.

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Class	Type	Description
OutageCauseKind	Class	This enumeration describes the primary cause of the outage – planned, unplanned, etc.
OutageOrder	Class	Transmits an outage plan to a crew in order for the planned outage to be executed.
OutagePlan	Class	Document containing the definition of planned outages of equipment and/or usage points. It will reference switching plans that are used to execute the planned outage.
OutageStatusKind	Class	This defines if the outage have been predicted or confirmed
PlannedOutage	Class	An outage that is created by the utility that will impact a customer. These may be created to implement a switching plan or energize a new line or device. The customer may or may not be notified in advance.
PlannedOutageNotification	Class	Notifies customers about a planned outage that they will be impacted by.
PSREvent	Class	Event recording the change in operational status of a power system resource; may be for an event that has already occurred or for a planned activity.
PSREventKind	Class	Kind of power system resource event.
SafetyDocument	Class	Document restricting or authorising works on electrical equipment (for example a permit to work, sanction for test, limitation of access, or certificate of isolation), defined based upon organisational practices.
ServicePointOutageSummary	Class	Summary counts of service points affected by an outage. These counts are sometimes referred to as total and critical customer count.
SwitchAction	Class	Action on switch as a switching step.
SwitchActionKind	Class	Kind of action on switch.
SwitchingAction	Class	Atomic switching action.
SwitchingEvent	Class	Event indicating the completion (success or fail) of any switching action (jumper action, cut action, tag action, etc). The switching action may or may not be a consequential event in response to a request to complete the action.
SwitchingOrder	Class	Transmits a switching plan to a crew in order for the plan to be executed.
SwitchingPlan	Class	A sequence of grouped or atomic steps intended to: – de-energise equipment or part of the network for safe work, and/or – bring back in service previously de-energised equipment or part of the network.
SwitchingPlanRequest	Class	A document used to request that a switching plan be created for a particular purpose.
SwitchingStep	Class	Atomic switching step; can be part of a switching step group, or part of a switching plan.
SwitchingStepGroup	Class	A logical step, grouping atomic switching steps that are important to distinguish when they may change topology (e.g. placing a jumper between two cuts).
TagAction	Class	Action on operation tag as a switching step.
TagActionKind	Class	Kind of action on tag.
TempEquipActionKind	Class	Kind of action on temporary equipment (such as cut, jumper, ground, energy source).
TroubleOrder	Class	Trouble order sends an incident to a crew to initiate a response to an unplanned outage.

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Class	Type	Description
UnplannedOutage	Class	Document describing the consequence of an unplanned outage in a part of the electrical network. For the purposes of this model, an unplanned outage refers to a state where energy is not delivered; such as, customers out of service, a street light is not served, etc. A unplanned outage may be created upon: – impacts the SAIDI calculation – a breaker trip, – a fault indicator status change, – a meter event indicating customer outage, – a reception of one or more customer trouble calls, or – an operator command, reflecting information obtained from the field crew. Outage restoration may be performed using a switching plan which complements the outage information with detailed switching activities, including the relationship to the crew and work.
VerificationAction	Class	Verification of a switch position or other condition as a switching step

4.5.3 Classes related to network operations

Table 3 lists classes that are commonly associated with network operations classes. Their attributes, or a subset of their attributes, are used in the messages defined in this document. The detailed attributes of those classes are defined in IEC 61968-11.

Table 3 – Classes related to network operations

Related Class	Reference	Description
AccountNotification	Customer	Notifications for move-in, move-out, delinquencies, etc.
Agreement	Common	Formal agreement between two parties defining the terms and conditions for a set of services. The specifics of the services are, in turn, defined via one or more service agreements.
Approver	Common	Person who accepted/signed or rejected the document.
Asset	Asset	Tangible resource of the utility, including power system equipment, various end devices, cabinets, buildings, etc. For electrical network equipment, the role of the asset is defined through PowerSystemResource and its subAssetes, defined mainly in the Wires model (refer to IEC 61970-301 and model package IEC61970::Wires). Asset description places emphasis on the physical characteristics of the equipment fulfilling that role.
AssetContainer	Asset	Asset that is aggregation of other assets such as conductors, transformers, switchgear, land, fences, buildings, equipment, vehicles, etc.
AssetFunction	Asset	Function performed by an asset.
AssetInfo	Asset	Set of attributes of an asset, representing typical datasheet information of a physical device that can be instantiated and shared in different data exchange contexts: – as attributes of an asset instance (installed or in stock) – as attributes of an asset model (product by a manufacturer) – as attributes of a type asset (generic type of an asset as used in designs/extension planning).
AssetKind	Asset	Kinds of assets or asset components.
Author	Common	Person who created document or activity record.
BaseWork	Class	Common representation for work and work tasks.

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Related Class	Reference	Description
ConfigurationEvent	Common	Used to report details on creation, change or deletion of an entity or its configuration.
CoordinateSystem	Common	Coordinate reference system.
Crew	Common	Group of people with specific skills, tools, and vehicles.
CrewMember	Common	Member of a crew.
CrewStatusKind	Common	Defines the current status of the Crew – assigned, arrived, etc.
CrewType	Common	Custom description of the type of crew. This may be used to determine the type of work the crew can be assigned to. Examples include repair, tree trimming, switching, etc.
Customer	Customer	Organisation receiving services from service supplier.
CustomerAccount	Customer	Assignment of a group of products and services purchased by the customer through a customer agreement, used as a mechanism for customer billing and payment. It contains common information from the various types of customer agreements to create billings (invoices) for a customer and receive payment.
CustomerAgreement	Customer	Agreement between the customer and the service supplier to pay for service at a specific service location. It records certain billing information about the type of service provided at the service location and is used during charge creation to determine the type of service.
CustomerKind	Customer	Kind of customer.
CustomerNotification	Customer	Conditions for notifying the customer about the changes in the status of their service (e.g., outage restore, estimated restoration time, tariff or service level change, etc.)
Document	Common	Parent class for different groupings of information collected and managed as a part of a business process. It will frequently contain references to other objects, such as assets, people and power system resources.
DocumentPersonRole	Common	Person role with respect to documents.
Editor	Common	Person who modified the document.
ElectronicAddress	Common	Electronic address information.
FieldDispatchHistory	Common	The history of field dispatch statuses for this work.
FieldDispatchStep	Common	Details of the step in the field dispatch history.
Hazard	Common	An object or a condition that is a danger for causing loss or perils to an asset and/or people.
Issuer	Common	Person who issued the document and is responsible for its content.
Location	Common	The place, scene, or point of something where someone or something has been, is, and/or will be at a given moment in time. It can be defined with one or more postition points (coordinates) in a given coordinate system.
NotificationTriggerKind	Customer	Kind of trigger to notify customer.
OperationPersonRole	Common	Person role in the context of utility operations.
Operator	Common	Control room operator.
Organisation	Common	Organisation that might have roles as utility, contractor, supplier, manufacturer, customer, etc.
Ownership	Common	Ownership of e.g. asset.
Person	Common	General purpose information for name and other information to contact people.

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Related Class	Reference	Description
PositionPoint	Common	Set of spatial coordinates that determine a point, defined in the coordinate system specified in 'Location.CoordinateSystem'. Use a single position point instance to desribe a point-oriented location. Use a sequence of position points to describe a line-oriented object (physical location of non-point oriented objects like cables or lines), or area of an object (like a substation or a geographical zone – in this case, have first and last position point with the same values).
Priority	Common	Priority definition.
ServiceCategory	Customer	Category of service provided to the customer.
ServiceKind	Customer	Kind of service.
ServiceLocation	Customer	A real estate location, commonly referred to as premises.
Status	Common	Current status information relevant to an entity.
StreetAddress	Common	General purpose street and postal address information.
StreetDetail	Common	Street details, in the context of address.
TelephoneNumber	Common	Telephone number.
TownDetail	Common	Town details, in the context of address.
TroubleCallKind	Customer	Describes the type of Trouble, based on customer input.
TroubleReportingKind	Customer	Kind of trouble reporting.
TroubleTicket	Customer	Customer call to report a problem with their service.
Work	Work	Document used to request, initiate, track and record work.
WorkActivityRecord	Work	Records information about the status of work or work task at a point in time.
WorkAsset	Work	Asset used to perform work.
WorkKind	Work	Kinds of work.
WorkLocation	Work	Information about a particular location for various forms of work.
WorkStatusKind	Work	Kind of status, specific to work.
WorkTask	Work	A task within a set of work.
WorkTaskKind	Work	Kinds of work tasks.

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5 Network operations message payloads

5.1 General

The purpose of Clause 5 is to describe the message payloads related to IEC 61968-3. It is important to note that some of these message payloads may also be used by other parts of IEC 61968. The general approach to the realization of message structures and XML schemas for IEC 61968 message payloads is described in IEC 61968-100.

Although they may be represented in sequence diagrams for context and completeness, this document does not describe message formats that are defined by other parts of IEC 61968. The message payload structures defined by this part of IEC 61968 are described in Clause 5.

Message structures are diagrammed within Clause 5. Note that these diagrams are examples and not intended to be exhaustive. The notation convention shows required elements with a solid outline, and optional elements with dashed outlines.

It is also important to note that the use cases and sequence diagrams provided in Annex A are informative in nature, and are intended to provide examples of usage for the normative message payload definitions. There is no intent by this document to standardize specific business processes.

The following are some general conventions in the message definitions provided in this document:

– Objects are identified by one of the following:
  - **mRID** inherited from **IdentifiedObject**
  - one or more **Name.name** instances. Transacting systems may use one or both of the attributes to uniquely identify the objects being exchanged.
  - a combination of **mRID** and one or more **Name.name** instances
– Several CIM classes have an attribute called **type** to provide a string description of an instance of the class. Some CIM classes (such as **Asset**) also have an enumerated attribute called "**kind**". This provides for better interoperability. Messages in this document that incorporate such classes include both the "**type**" and "**kind**" attributes. Where an appropriate value is not available for "**kind**", the transacting systems may use the value "**other**" for "**kind**" in order to indicate that the string description in the "**type**" attribute should be used.
– The majority of attributes in the message payloads are optional. It is up to the transacting system to implement the logic for any required fields.

5.2 Summary of IEC 61968-3 message profiles

Table 4 shows a summary of all of the messages defined in this document and their purpose.

Table 4 – Summary of IEC 61968-3 message profiles

Profile Name	Purpose
PSRMeasurements	Contains accumulator, analog, discrete and string values from SCADA. Time stamps and quality codes are also included. If applicable, includes a reference to the **PowerSystemResource** that the measurement is associated with.
PSRControls	Request to SCADA to change a value in the field. The change can be an accumulator reset, analog control, command, raise/lower command or a setpoint. If applicable, includes a reference to the **PowerSystemResource** that is associated with the control request.
SwitchingPlanRequests	A **SwitchingPlanRequest** is used to convey a request from work management (or other business function) to network operations that switching needs to be performed (e.g. part of the network needs to be isolated) in order for maintenance or construction work to be performed. The payload includes the type of work to be performed and when it should start. The typical outcome of a **SwitchingPlanRequest** is the creation of a **SwitchingPlan**.
SwitchingPlans	**SwitchingPlans** message payloads are designed to communicate a set of **SwitchingActions** that form a sequence of operations to manage a complete operational task. **SwitchingPlans** may also be created in order to perform emergency switching.
SwitchingOrders	**SwitchingOrders** message payloads are designed to communicate requests for scheduling the execution of a **SwitchingPlan** for emergency or planned switching.
SwitchingActions	**SwitchingActions** are used to coordinate the manual execution of steps within **SwitchingPlans** between the control room and field crews. Automated step execution is coordinated with **PSRControls** messages.
SwitchingEvents	**SwitchingEvents** are used to communicate temporary network changes as a result of the execution of a step in a **SwitchingPlan** that was initiated via a **SwitchingAction. SwitchingEvents** are also used to communicate temporary network changes between enterprise systems. Results of **PSRControls** are coordinated with **PSRMeasurements** messages.

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Profile Name	Purpose
PlannedOutageNotifications	**PlannedOutageNotifications** are used to notify customers that they will be impacted by a **PlannedOutage**, prior to the execution of a **SwitchingPlan**. The payload includes scheduled start and end date/time and a list of customers who will be impacted.
PlannedOutages	**PlannedOutages** message payloads are designed to communicate the creation and status changes of **PlannedOutages** once one or more customers become de-energized as a result of planned switching actions. The payload includes: a list of customers affected and the actual start/end time.
UnplannedOutages	**UnplannedOutages** message payloads are designed to communicate the creation and status changes of **UnplannedOutages** once one or more customers become de-energized. This could be as a result of faults, such as short circuit faults and downed lines, switching errors or other causes.
TroubleOrders	**TroubleOrders** message payloads are designed to communicate work requests to field crews to perform work in response to an **Incident**, or an **UnplannedOutage**, and to track the status of the work.
Incidents	**Incidents** message payloads are designed to communicate a problem in the field. Typically, but not always, an **Incident** is associated with an **UnplannedOutage**.
EquipmentFaults	**EquipmentFaults** message payloads, are designed to communicate the detailed fault information as part of **UnplannedOutages** messages. An **EquipmentFault** is a fault applied at the terminal, external to the equipment. This class is not used to specify faults internal to the equipment.
LineFaults	**LineFaults** messages are designed to communicate the detailed fault information as part of **UnplannedOutages** messages. **LineFaults** define all types of faults that occur on AC or DC line segments.

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5.3 Config Profiles

5.3.1 General

Config profiles are used to share a subset of the model so as to avoid sharing the entire model and to avoid sending configuration data at run-time. It is envisioned that config messages are exchanged between systems only when required.

For example, a Customer Information System may send **CustomerConfig**, **UsagePointConfig**, and **OperationsDataLinkageConfig** messages to an Outage Management System. By receiving these messages and instantiating the customer information, the usage point information, the association between customers and usage points, and information in its database, the OMS can produce customer contact lists for an outage.

All messages rely on unique identifiers (**mRIDs**) for all objects that are part of the common network model, in this case the common distribution network model which is defined as part of CIM. In order to publish those unique identifiers, the respective system needs either to import that network model or load the necessary identifiers as part of the system's configuration step.

Two mechanisms are supported for message transfer between systems, one is a 'push' model and the other is a 'pull' model. The mechanism selected depends upon the capabilities of the systems involved in the message exchange and the timeliness of the data exchanged. An example of a push message exchange is shown in Figure 3. In this example, a new customer is created in the CIS and the information is sent to OMS.

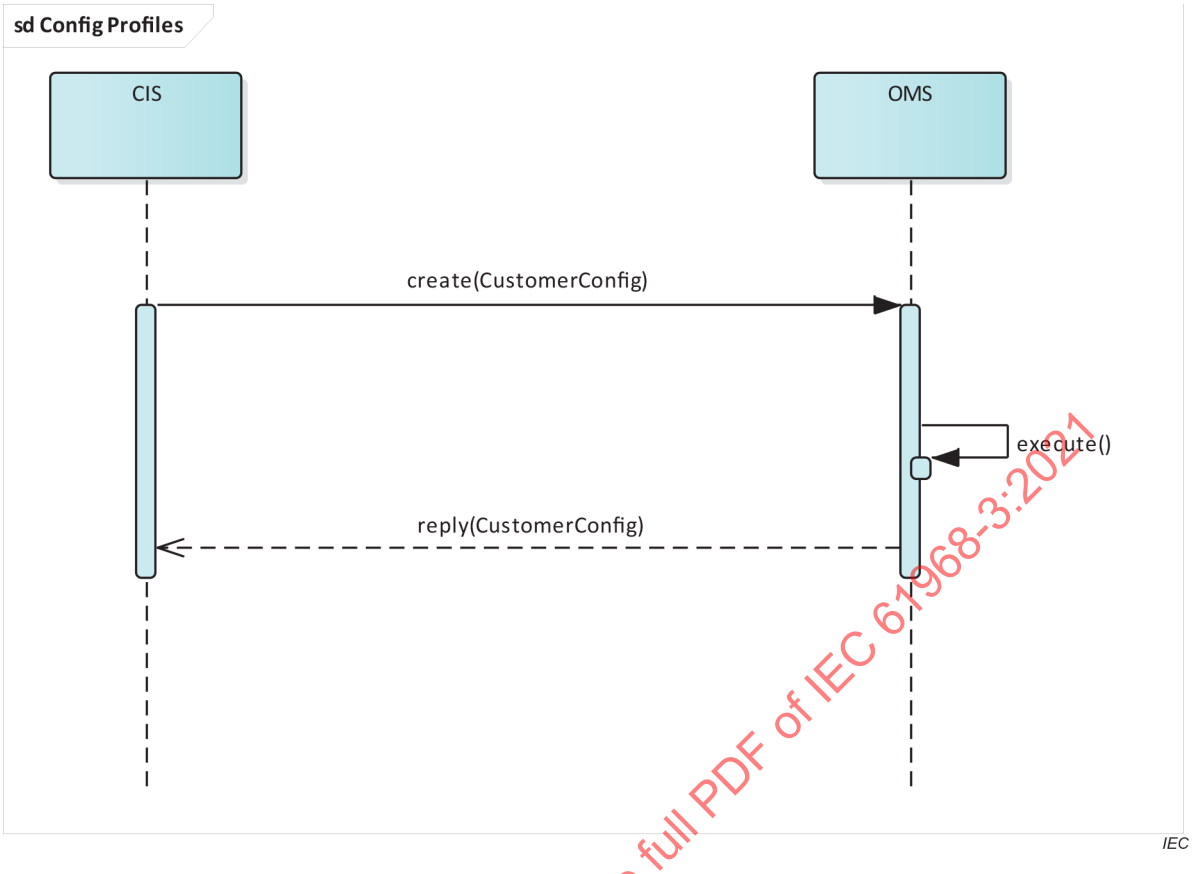


Figure 3 – Example of a Push Message Exchange

An example of a pull message exchange is shown in Figure 4.

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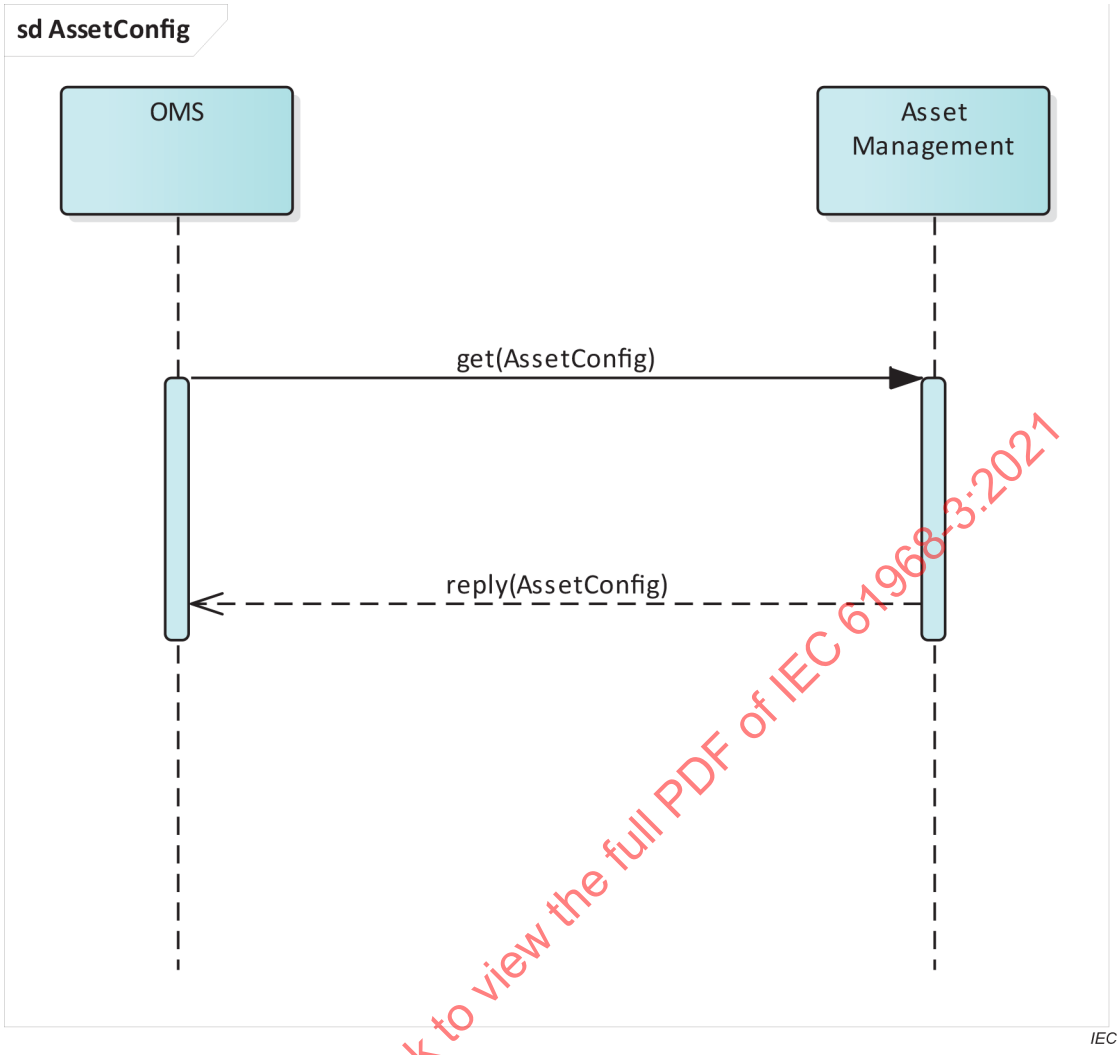


Figure 4 – Example of a Pull Message Exchange

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5.3.2 Message payloads

There are multiple Config messages, including:

- **AssetConfig** – see 5.3.3
- **CustomerAgreementConfig** – see D.1
- **CustomerConfig** – see D.2
- **FaultCauseTypeConfig** – see 5.3.4
- **LocationConfig** – see 5.3.5
- **MeterConfig** – see D.3
- **PowerSystemResourceConfig** – see 5.3.6
- **UsagePointConfig** – see D.4
- **UsagePointLocationConfig** – see D.5

The above config messages are associated using the **OperationsDataLinkageConfig** message, to allow relationships between the various config messages to be defined.

5.3.3 **AssetConfig** payload

The **AssetConfig** payload shown in Figure 5 and Figure 6 defines zero, one or many **Asset**s. Important attributes for the purposes of this document are the **mRID** and **Names** since this allows the mapping between the **mRID**, **Names** and the objects themselves in the messages so that the the entire object instance does not need to be sent in the message.

The attributes of the **AssetConfig** profile are described in Table 5.

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Table 5 – AssetConfig Profile

AssetConfig				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
AssetConfig	Asset	[1..*]		
Profile Attributes for Asset				
mRID	String	[0..1]	GUID	mRID of the Asset
description	String	[0..1]		Free-form text field that describes the **Asset**
Names	Name	[0..*]	See B.56	Human-readable names for the Asset.
baselineCondition	String	[0..1]		Condition of asset at last baseline. Examples include new, rebuilt, overhaul required, other. Refer to inspection data for information on the most current condition of the asset.
baselineLossOfLife	PerCent	[0..1]		Percentage of initial life expectancy that has been lost as of the last life expectancy baseline. Represents (initial life expectancy – current life expectancy) / initial life expectancy.
critical	Boolean	[0..1]		True if asset is considered critical for some reason (for example, a pole with critical attachments).
inUseState	inUseStateKind	[0..1]	See C.9	Indication of whether asset is currently deployed (in use), ready to be put into use or not available for use.
kind	AssetKind	[0..1]	See C.1	Kind of asset. Used in description of asset components in asset instance templates.
lifecycleState	AssetLifecycleStateKind	[0..1]	See C.2	Current lifecycle state of asset.
lotNumber	String	[0..1]		Lot number for this asset. Even for the same model and version number, many assets are manufactured in lots.
position	String	[0..1]		Position of asset or asset component. May often be in relation to other assets or components.
purchasePrice	Money	[0..1]		Purchase price of asset.
retiredReason	RetiredReasonKind	[0..1]	See C.16	Reason asset retired.
serialNumber	String	[0..1]		Serial number of this asset.

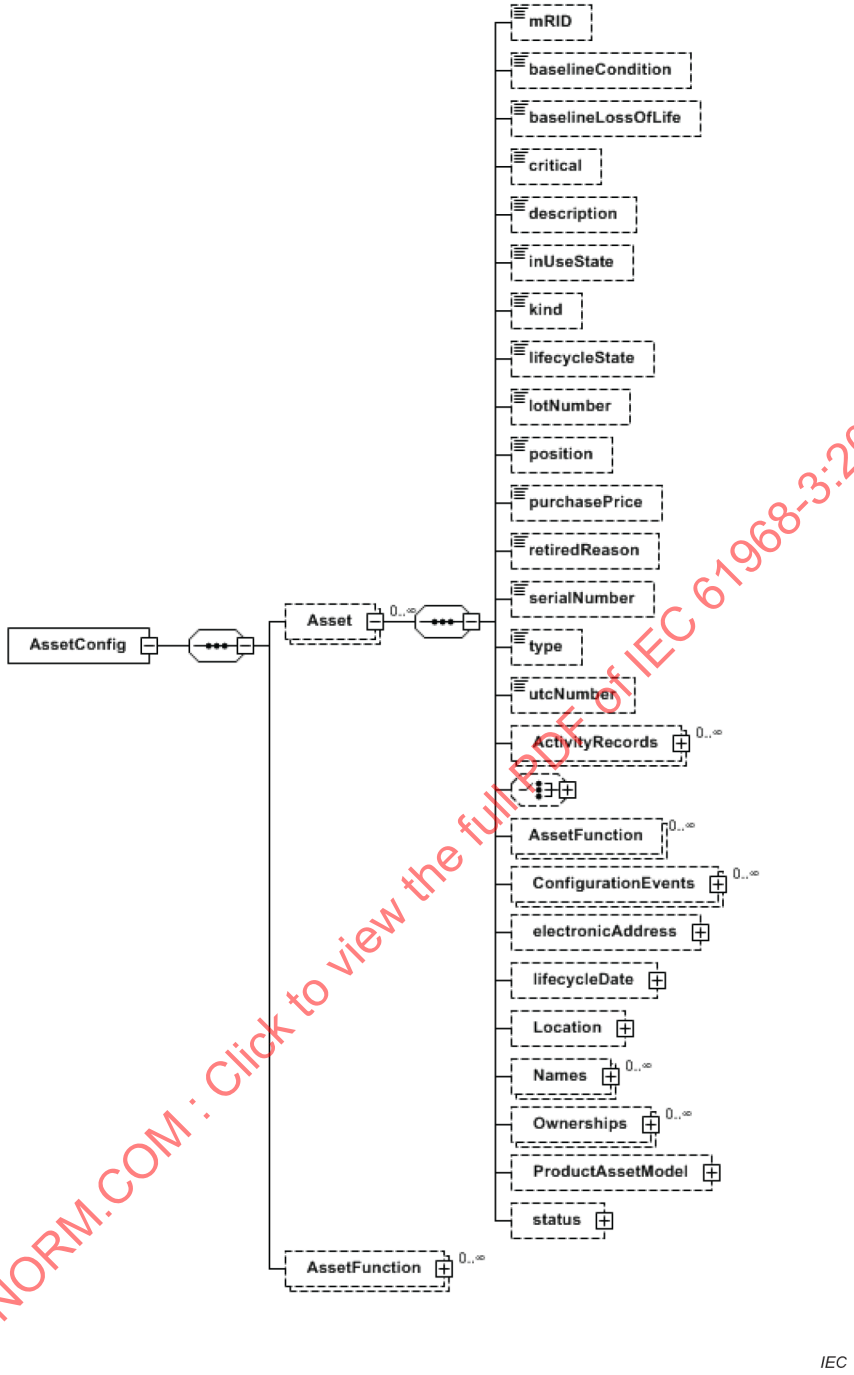
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AssetConfig				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
type	String	[0..1]		Utility-specific classification of Asset and its subtypes, according to their corporate standards, practices, and existing IT systems (e.g., for management of assets, maintenance, work, outage, customers, etc.).
utcNumber	String	[0..1]		Uniquely tracked commodity (UTC) number.
ActivityRecords	ActivityRecord	[0..*]	See B.5	
AssetContainer	Choice of: Cabinet DuctBank Pole Structure Tower UndergroundStructure	[0..1]	For Cabinet, see B.14 For DuctBank, see B.30 For Pole, see B.66 For Structure, see B.84 For Tower, see B.91 For UndergroundStructure, see B.96	
AssetFunction	AssetFunction	[0..*]	Reference to AssetFunction in this payload	Contains the mRID or Names.name of the referenced AssetFunction
ConfigurationEvents	ConfigurationEvent	[0..*]	See B.19	All configuration events created for this asset.
electronicAddress	ElectronicAddress	[0..1]	See B.32	Electronic address of this asset, such as a MAC address.
lifecycleDate	LifeCycleDate	[0..1]	See B.50	Lifecycle dates for this asset.
Location	Location	[0..1]	See B.52	Location of this asset
Ownerships	Ownership	[0..1]	See B.64	All ownerships of this asset.
ProductAssetModel	ProductAssetModel	[0..1]	See B.70	The model of this asset.
status	Status	[0..1]	See B.79	Status of this asset.

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AssetConfig				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
Profile attributes for AssetFunction				
mRID	String	[0..1]	GUID	mRID of the AssetFunction
description	String	[0..1]		Free-form text field that describes the **AssetFunction**
Names	Name	[0..*]	See B.56	Human-readable names for the AssetFunction.
configID	String	[0..1]		Configuration specified for this function.
firmwareID	String	[0..1]		Firmware version.
hardwareID	String	[0..1]		Hardware version.
password	String	[0..1]		Password needed to access this function.
programID	String	[0..1]		Name of program.

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Figure 5 – AssetConfig payload (1)

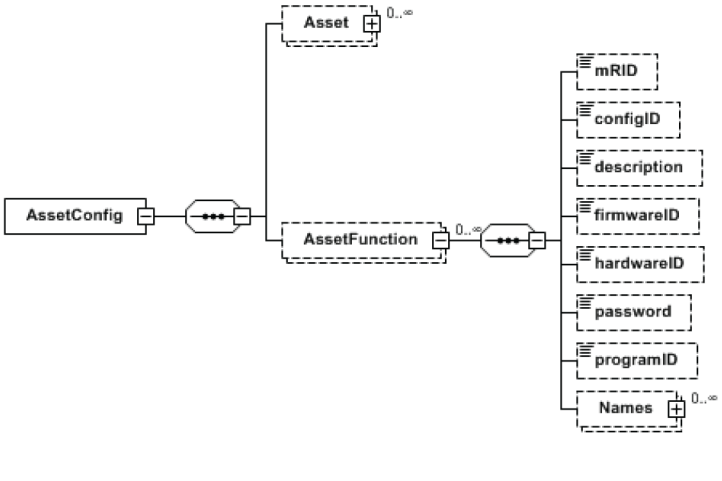


Figure 6 – AssetConfig payload (2)

5.3.4 FaultCauseTypeConfig payload

The **FaultCauseTypeConfig** payload shown in Figure 7 defines zero, one or many **FaultCauseType**s. Important attributes for the purposes of this document are the **mRID** and **Names** since this allows the mapping **between** the **mRID**, **Names** and the objects themselves in the messages so that the the entire object instance does not need to be sent in the message.

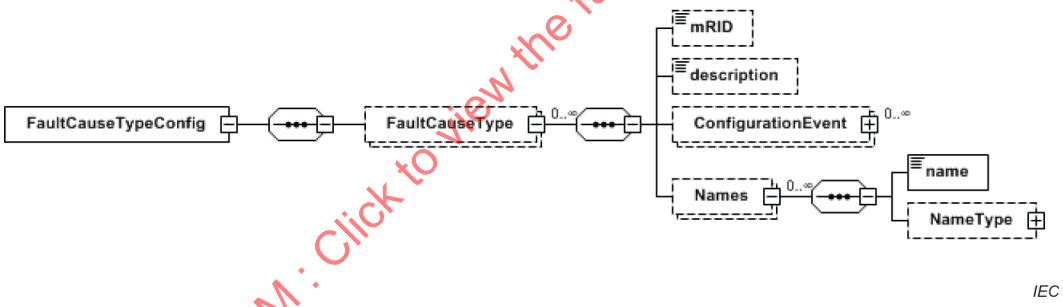


Figure 7 – FaultCauseTypeConfig payload

5.3.5 LocationConfig payload

The **LocationConfig** payload shown in Figure 8 defines zero, one or many **Location**s. Important attributes for the purposes of this document are the **mRID** and **Names** since this allows the mapping **between** the **mRID**, **Names** and the objects themselves in the messages so that the the entire object instance does not need to be sent in the message.

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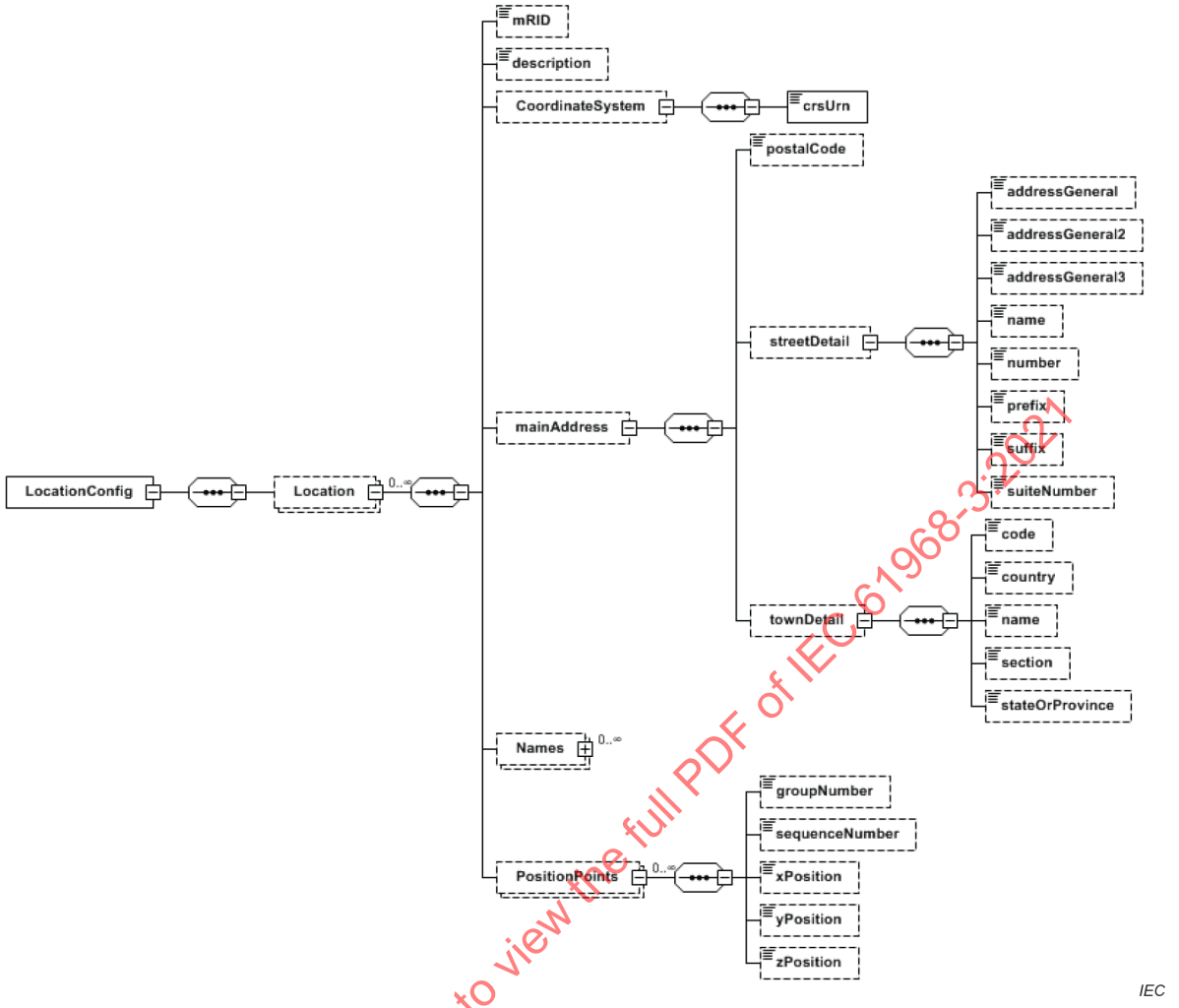


Figure 8 – LocationConfig payload

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5.3.6 PowerSystemResourceConfig payload

The **PowerSystemResourceConfig** payload shown in Figure 9 defines zero, one or many **PowerSystemResource**s. Important attributes for the purposes of this document are the **mRID** and **Names** since this allows the mapping **between** the **mRID**, **Names** and the objects themselves in the messages so that the the entire object instance does not need to be sent in the message.

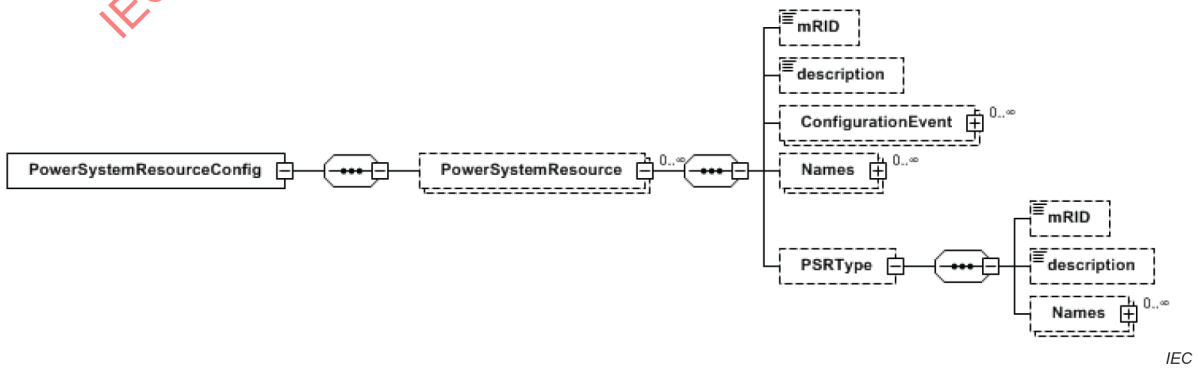


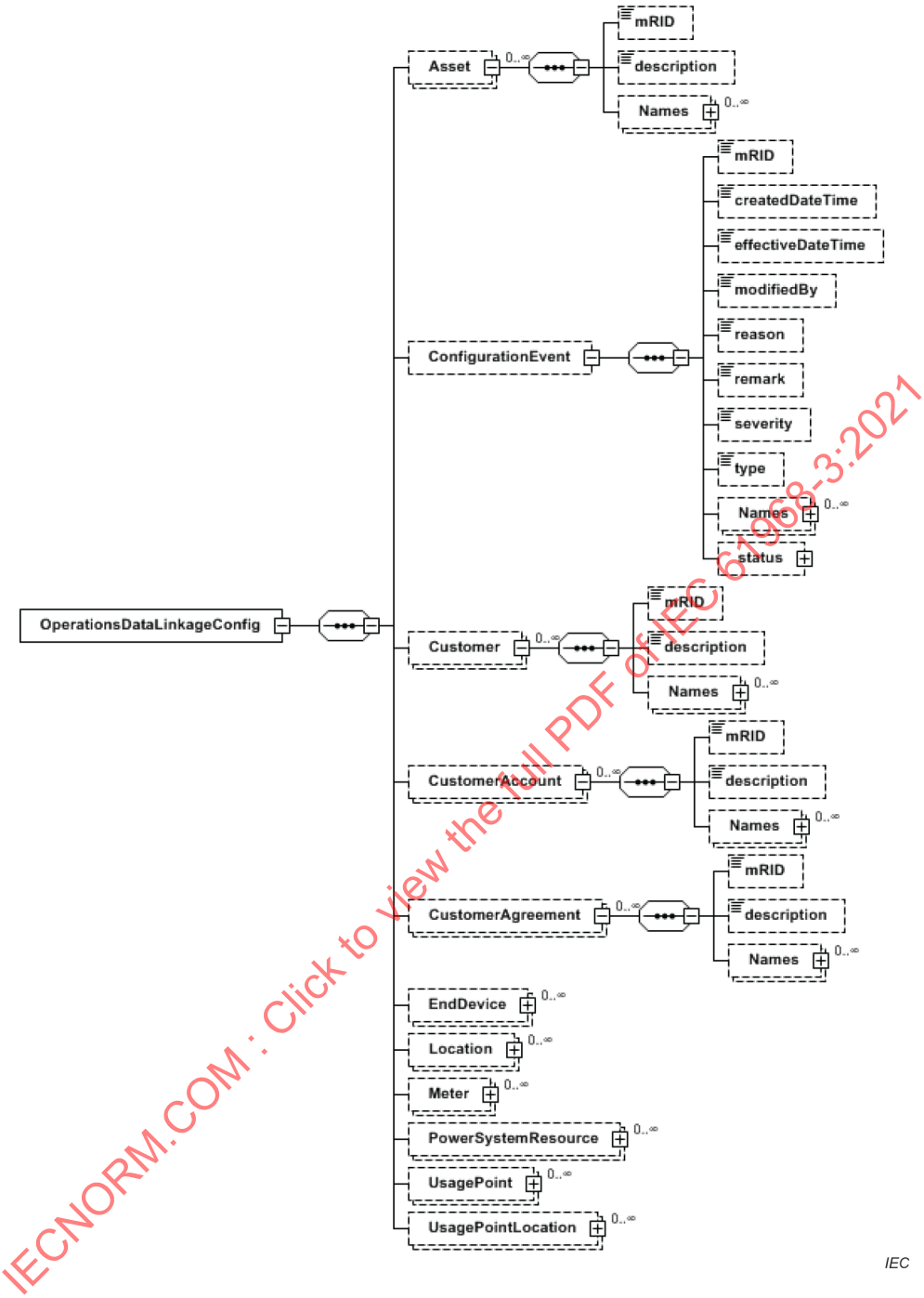
Figure 9 – PowerSystemResourceConfig payload

5.3.7 **OperationsDataLinkageConfig** payload

The **OperationsDataLinkageConfig** payload shown in Figure 10 and Figure 11 defines zero, one or many **OperationsDataLinkage**s. This message links the various objects used in config messages together. In particular it optionally links one or more of the following together:

- Asset
- ConfigurationEvent
- Customer
- CustomerAccount
- CustomerAgreement
- EndDevice
- Location
- Meter
- PowerSystemResourceConfig
- UsagePoint
- UsagePointLocation

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Figure 10 – OperationsDataLinkageConfig payload (1)

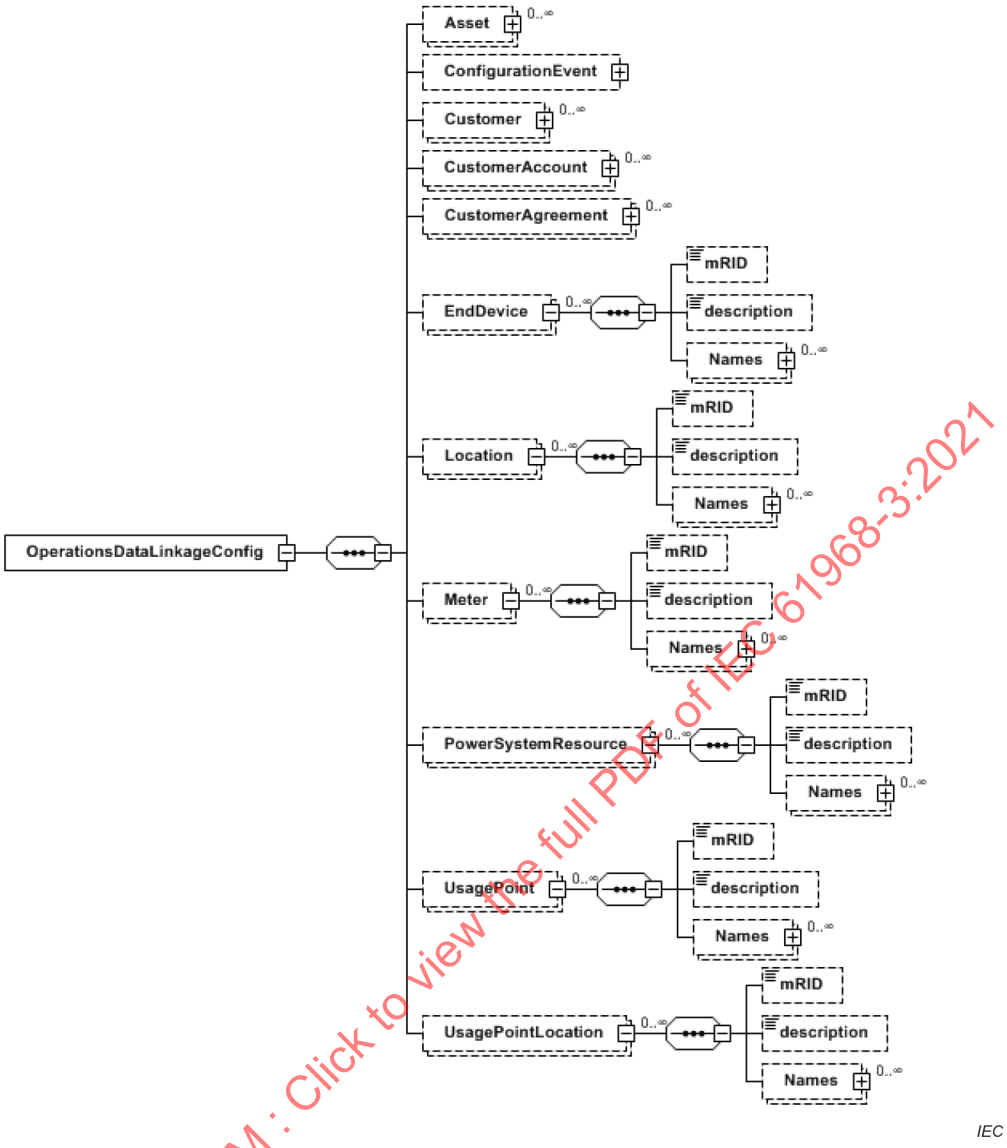


Figure 11 – OperationsDataLinkageConfig payload (2)

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Possible use cases for this message include:

- Linking a customer to a meter
- Linking a customer to a power system resource, such as a load (energyConsumer).
- Linking a customer to their customer agreement, to determine participation in a demand response program

5.3.8 Example – linking a Customer to a PowerSystemResource

A common requirement for outage management and distribution management systems is to associate customers with the network. This can be done by associating a **Customer** with an **EnergyConsumer**. In this case, an **OperationsDataLinkageConfig** message could be sent from the system of record (e.g. CIS or GIS) and would contain the **Customer mRID** or **name** and the **PowerSystemResource mRID** or **name**.

In this example, it is not mandatory that a **CustomerConfig** message or a **PowerSystemResourceConfig** message to have been received, as long as the **mRID** or **name** of the **Customer** and **PowerSystemResource** are known to the receiving system. However, sample **CustomerConfig** and **PowerSystemResourceConfig** XML is included.

CustomerConfig sample XML. This defines information for one customer:

```
<?xml version="1.0" encoding="UTF-8"?>
<m:CustomerConfig xmlns:m="http://iec.ch/TC57/2019/CustomerConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/CustomerConfig# CustomerConfig.xsd ">
  <m:Customer>
    <m:mRID>fd393766-f408-4ef8-8d83-d9f17fddf931</m:mRID>
    <m:kind>commercialIndustrial</m:kind>
    <m:locale>m:en</m:locale>
    <m:Names>
      <m:name>Michael B Higgins</m:name>
        <m:NameType>
          <m:name>Customer Name</m:name>
        </m:NameType>
    </m:Names>
    <m:Names>
        <m:name>02100045112314</m:name>
        <m:NameType>
          <m:name>Account Number</m:name>
        </m:NameType>
    </m:Names>
    <m:Organisation>
      <m:electronicAddress>
        <m:email1>michaelbhiggins31427@gmail.com</m:email1>
      </m:electronicAddress>
      <m:Names>
        <m:name>02100045112314</m:name>
        <m:NameType>
          <m:name>Account Number</m:name>
        </m:NameType>
      </m:Names>
      <m:phone1>
        <m:areaCode>919</m:areaCode>
        <m:cityCode>555</m:cityCode>
        <m:localNumber>1212</m:localNumber>
      </m:phone1>
      <m:postalAddress>
        <m:postalCode>27606</m:postalCode>
        <m:streetDetail>
          <m:addressGeneral>Main Campus Drive</m:addressGeneral>
          <m:number>901</m:number>
        </m:streetDetail>
        <m:townDetail>
          <m:name>Raleigh</m:name>
          <m:stateOrProvince>NC</m:stateOrProvince>
        </m:townDetail>
      </m:postalAddress>
      <m:streetAddress>
        <m:postalCode>27606</m:postalCode>
        <m:streetDetail>
          <m:addressGeneral>Main Campus Drive</m:addressGeneral>
          <m:number>901</m:number>
        </m:streetDetail>
        <m:townDetail>
          <m:name>Raleigh</m:name>
          <m:stateOrProvince>NC</m:stateOrProvince>
        </m:townDetail>
      </m:streetAddress>
    </m:Organisation>
  </m:Customer>
</m:CustomerConfig>
```

PowerSystemResourceConfig sample XML. This defines a pad mount transformer that the above customer will be associated with:

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PowerSystemResourceConfig xmlns:m="http://iec.ch/TC57/2019/PowerSystemResourceConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PowerSystemResourceConfig#
PowerSystemResourceConfig.xsd ">
  <m:PowerSystemResource>
    <m:mRID>ffb7f838-1eef-4297-83b4-59a2e431551d</m:mRID>
  </m:PowerSystemResource>
</m:PowerSystemResourceConfig>
```

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OperationsDataLinkage sample XML. This links the customer with the pad mount transformer:

```
<?xml version="1.0" encoding="UTF-8"?>
<m:OperationsDataLinkageConfig xmlns:m="http://iec.ch/TC57/2017/OperationsDataLinkageConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2017/OperationsDataLinkageConfig#
OperationsDataLinkageConfig.xsd ">
  <m:Customer>
    <m:mRID>fd393766-f408-4ef8-8d83-d9f17fddf931</m:mRID>
  </m:Customer>
  <m:PowerSystemResource>
    <m:mRID> ffb7f838-1eef-4297-83b4-59a2e431551d </m:mRID>
  </m:PowerSystemResource>
</m:OperationsDataLinkageConfig>
```

5.4 PSRMeasurements payload

5.4.1 General

Network state is monitored by SCADA or other network monitoring devices/systems and communicated to other systems that need to consider the current network state for further processing and analysis, e.g. an OMS system (for the Fault Management function) or a DMS (for the Network Operations and Monitoring function).

A Measurement in this document is analogous to a MeterReading in IEC 61969-9. In IEC 61968-9, a MeterReading is indeed used to convey a current value of digital (e.g., switch position) or analog (e.g., voltage) information. However, an EndDeviceEvent is used to convey a change in state (e.g., the change from a closed to an open position of a switch). So, for example, if a system receives a MeterReading indicating a switch is open at a particular time, the system must rely on its own prior knowledge of the switch position to determine whether the open state represents a change in state (from closed to open) at that particular time or simply a confirmation that the switch is still open at that particular time. Conversely, if a system receives an EndDeviceEvent indicating a switch opened at a particular time, the system need not have prior knowledge of the state of the switch to understand that the switch had been closed up until that time.

Many legacy measurement systems, such as SCADA, make no similar distinction between states and events. This is because such systems have been designed to receive data from field devices either by periodic polling or by exception. Thus in general, events are not available. This is also true for measurements that are calculated within the SCADA system or by an application such as state estimator or power flow. Thus it is assumed that any business function receiving PSRMeasurements has the capability of determining whether a value has changed since the last time a value was received. In some cases, the receiving function may be looking for a change that exceeds a certain threshold before taking action.

Figure 12 is sequence diagram showing how **PSRMeasurements** are used to communicate values between different actors. It is also possible for an actor to request the current value of a measurement, using the GetPSRMeasurements profile defined in 5.4.7. The sequence diagram is shown in Figure 13.

PSRMeasurements message payloads are designed to communicate network state information such as the current switch status, the state of a fault relay, the current tap position of a transformer or the current value of a voltage measurement. Messages may contain accumulator, analog, discrete and string values from SCADA or other measurement systems. Time stamps and quality codes are also included. The message also includes the phase(s) associated with the measurement, defined by **phases** (of type **PhaseCode**). If no phases are specified, then three phases are assumed. For unganged (single phase) measurements, one **PSRMeasurement** per phase is required. Each **PSRMeasurement** includes a reference to the power system resource that the measurement is associated with.

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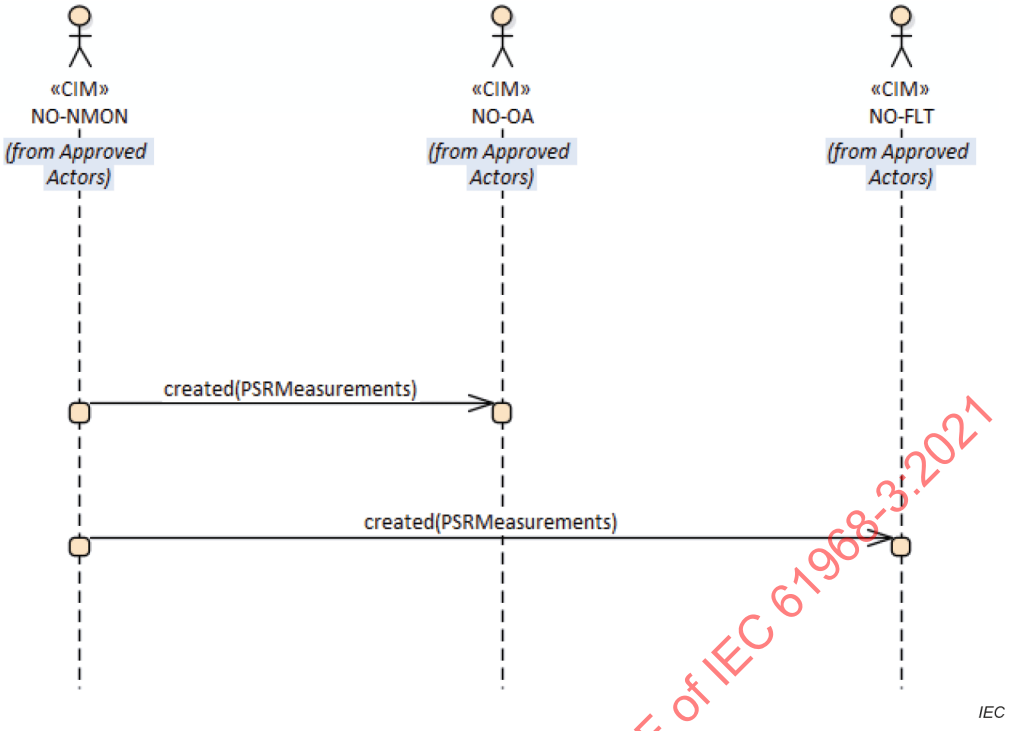


Figure 12 – PSRMeasurements sequence diagram

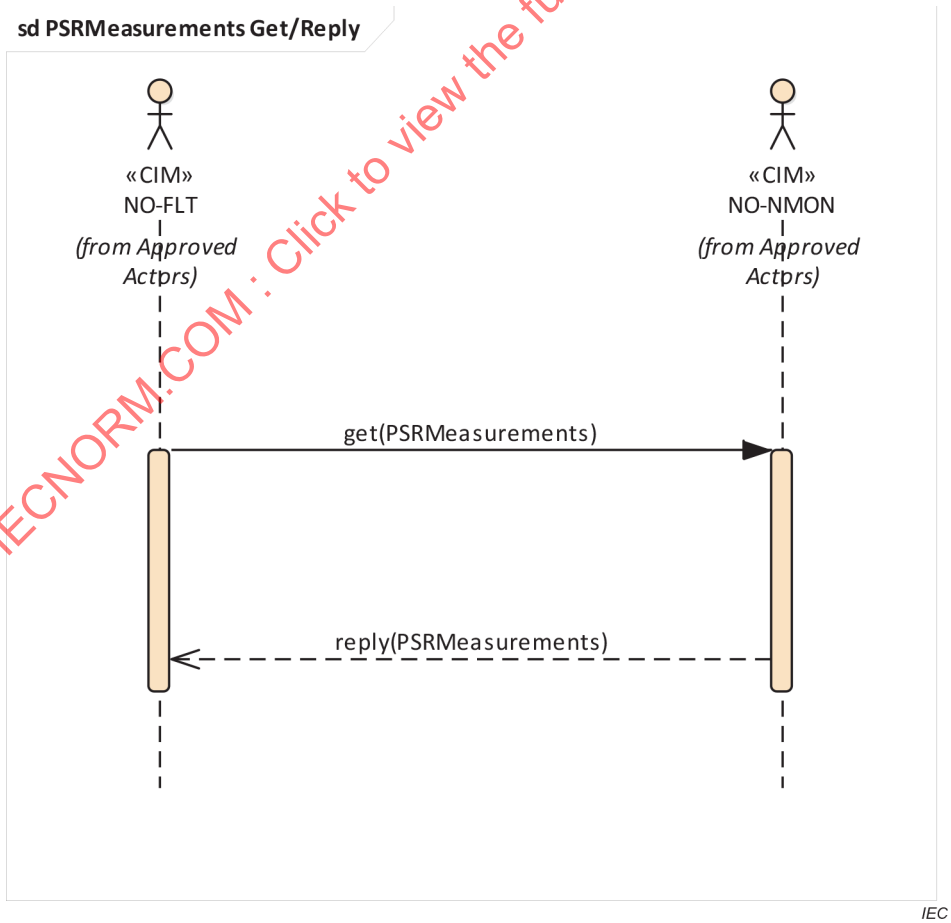


Figure 13 – Get/Reply Message Pattern for PSRMeasurements

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5.4.2 Message Payload

PSRMeasurement value objects are the following

- **Accumulator** value
- **Analog** value (for example active and reactive power)
- **Discrete** value (for example status of a breaker)
- **StringMeasurement** value

The attributes of the **PSRMeasurements** profile are described in Table 6.

Table 6 – PSRMeasurements Profile

PSRMeasurements				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
PSRMeasurements	Accumulator	[0..*]	See B.2	Choice depending on the type of measurement
PSRMeasurements	Analog	[0..*]	See B.6	Choice depending on the type of measurement
PSRMeasurements	Discrete	[0..*]	See B.28	Choice depending on the type of measurement
PSRMeasurements	StringMeasurement	[0..*]	See B.82	Choice depending on the type of measurement

5.4.3 PSRMeasurements Payload – Accumulator

Figure 14 shows the message payload for **PSRMeasurements Accumulator**. **Accumulator** represents an accumulated (counted) Measurement, e.g. an energy value.

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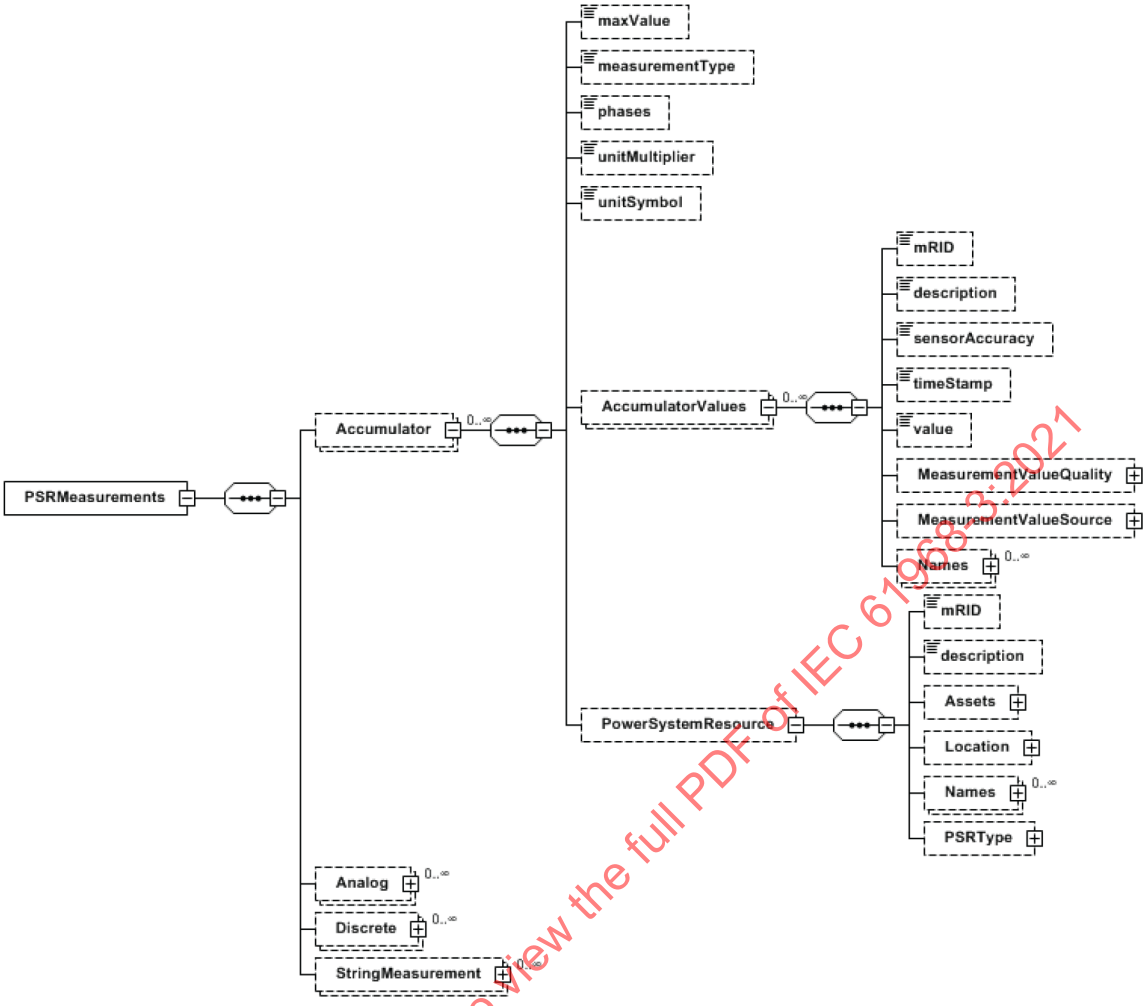


Figure 14 – PSRMeasurements payload – Accumulator

5.4.4 PSRMeasurements Payload – Analog

5.4.4.1 General

Figure 15 shows the message payload for **PSRMeasurements Analog**. **Analog** represents an analog Measurement, i.e. one that has continuous floating point values.

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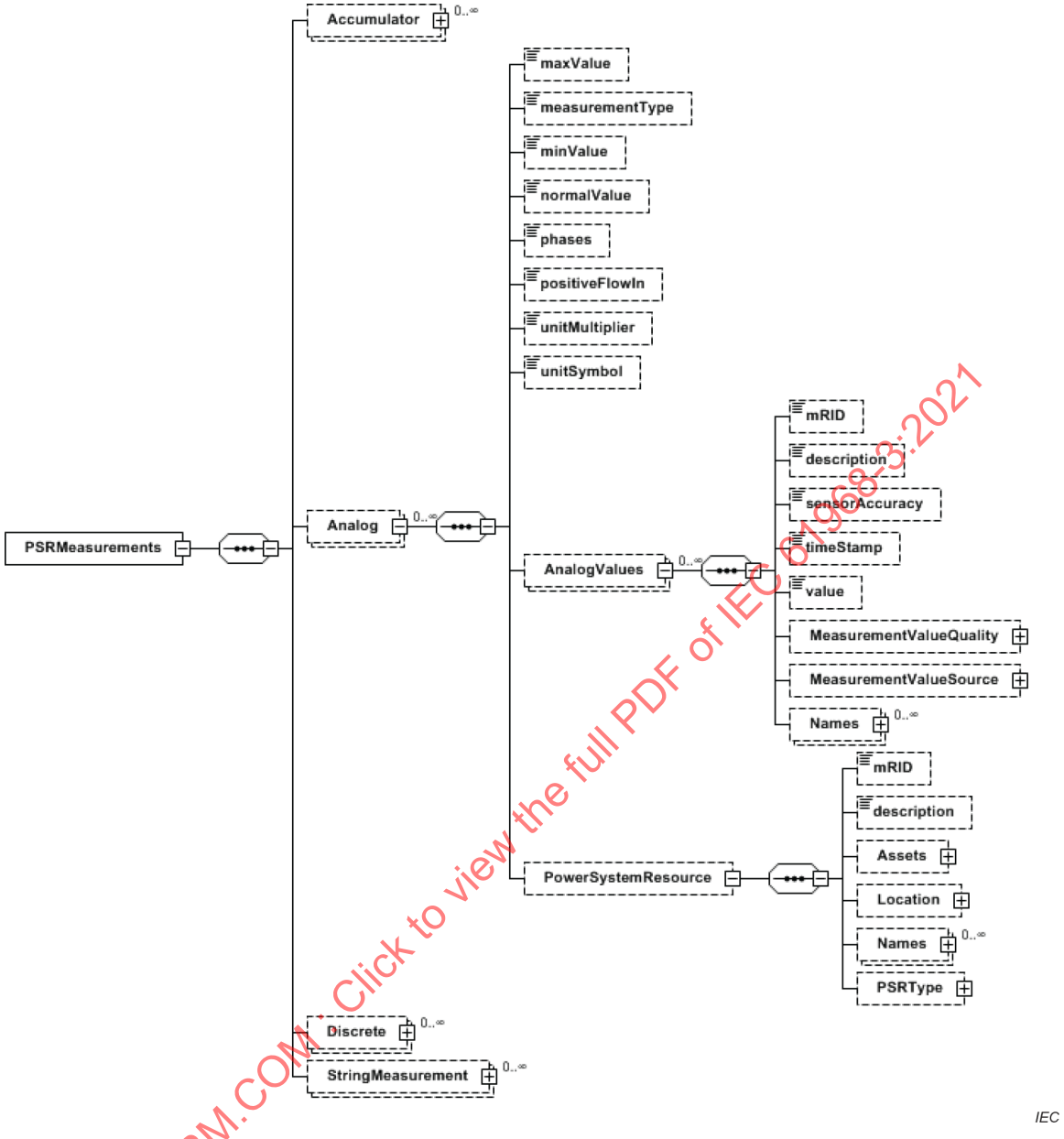


Figure 15 – PSRMeasurements payload – Analog

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5.4.4.2 Example XML for Analog Measurement

The example below shows a B-phase Amps measurement that is associated with a line recloser.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRMeasurements xmlns:m="http://iec.ch/TC57/2019/PSRMeasurements#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2017/PSRMeasurements# PSRMeasurements.xsd ">
  <m:Analog>
    <m:measurementType>Line Flow</m:measurementType>
    <m:phases>B</m:phases>
    <m:positiveFlowIn>true</m:positiveFlowIn>
    <m:unitMultiplier>none</m:unitMultiplier>
    <m:unitSymbol>A</m:unitSymbol>
    <m:AnalogValues>
      <m:mRID>4d9ae2fa-37c0-42b0-90ca-0cefc141d5e8</m:mRID>
      <m:timeStamp>2019-03-08T12:03:01-06:00</m:timeStamp>
      <m:value>210.14</m:value>
      <m:MeasurementValueQuality>
        <m:badReference>false</m:badReference>
        <m:estimatorReplaced>false</m:estimatorReplaced>
```

```
        <m:failure>false</m:failure>
        <m:oldData>false</m:oldData>
        <m:operatorBlocked>false</m:operatorBlocked>
        <m:oscillatory>false</m:oscillatory>
        <m:outOfRange>false</m:outOfRange>
        <m:overFlow>false</m:overFlow>
        <m:source>SCADA</m:source>
        <m:suspect>false</m:suspect>
        <m:test>true</m:test>
        <m:validity>GOOD</m:validity>
      </m:MeasurementValueQuality>
      <m:Names>
        <m:name> Recloser D102 Phase B Amps </m:name>
      </m:Names>
    </m:AnalogValues>
    <m:PowerSystemResource>
      <m:mRID>4d9ae2fa-37c0-42b0-90ca-0cefc141d5e8</m:mRID>
      <m:description>m:description</m:description>
      <m:Names>
        <m:name> Recloser D102</m:name>
      </m:Names>
      <m:PSRType>
        <m:mRID>75240e31-89b4-40c0-a1eb-27629e726110</m:mRID>
        <m:description> Recloser Unganged 23kV </m:description>
        <m:Names>
          <m:name> Recl Ug 23kV </m:name>
        </m:Names>
      </m:PSRType>
    </m:PowerSystemResource>
  </m:Analog>
</m:PSRMeasurements>
```

5.4.5 **PSRMeasurements** Payload – **Discrete**

5.4.5.1 General

Figure 16 shows the message payload for **PSRMeasurements Discrete**. **Discrete** represents a discrete Measurement, i.e. a Measurement representing discrete values, e.g. a Breaker position.

The valid values for **DiscreteValue.value** are dependent upon the **measurementType** as shown in Table 7.

Table 7 – Valid values for DiscreteValue.value

measurementType	Valid values
Single Point Status	False or open (0), true or closed (1)
Double Point Status	Invalid or transient (0), false or closed (1), true or open (2), invalid (3).
Integer Status	Integer

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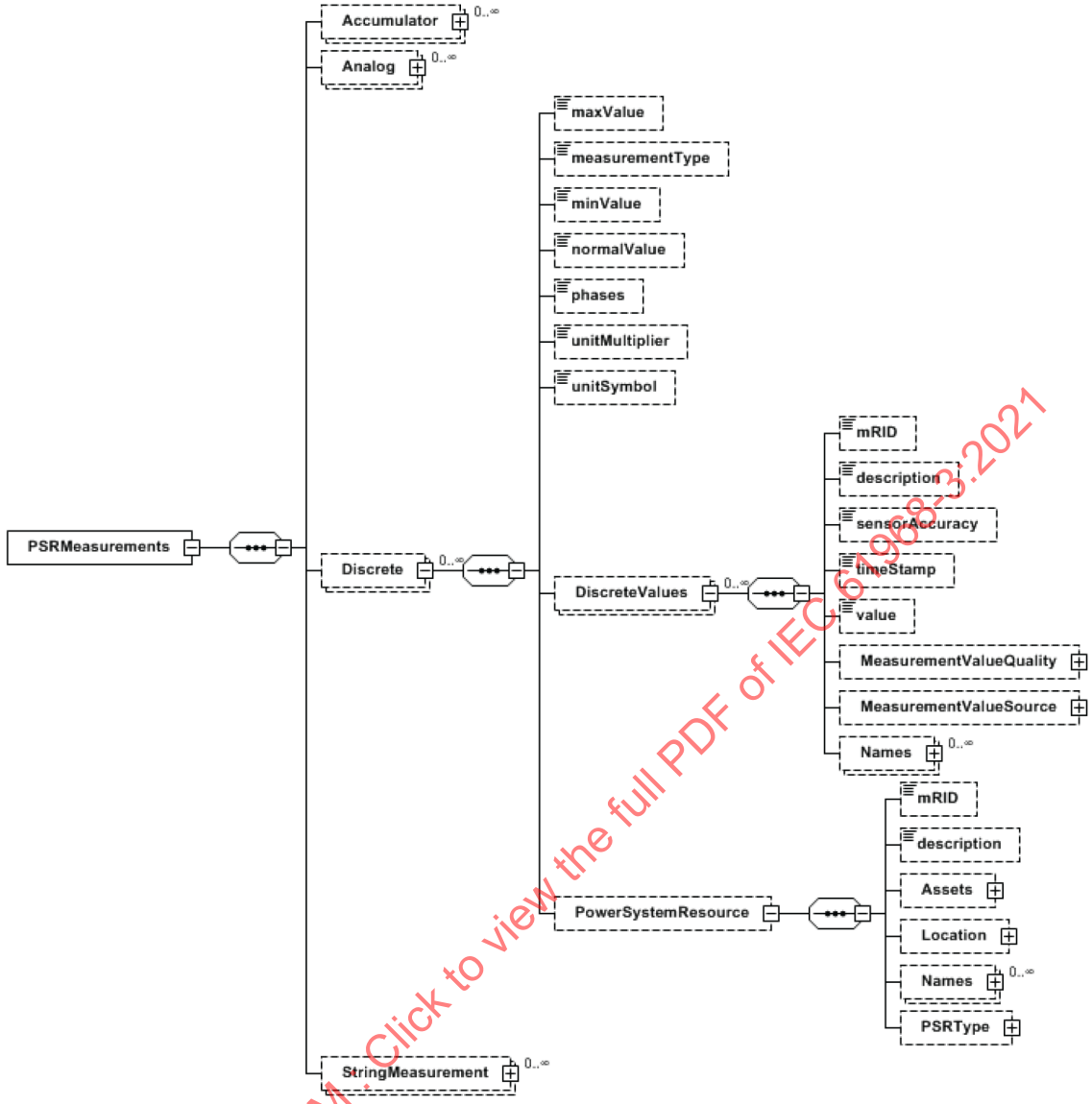


Figure 16 – PSRMeasurements payload – Discrete

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5.4.5.2 Example XML for Discrete Measurement

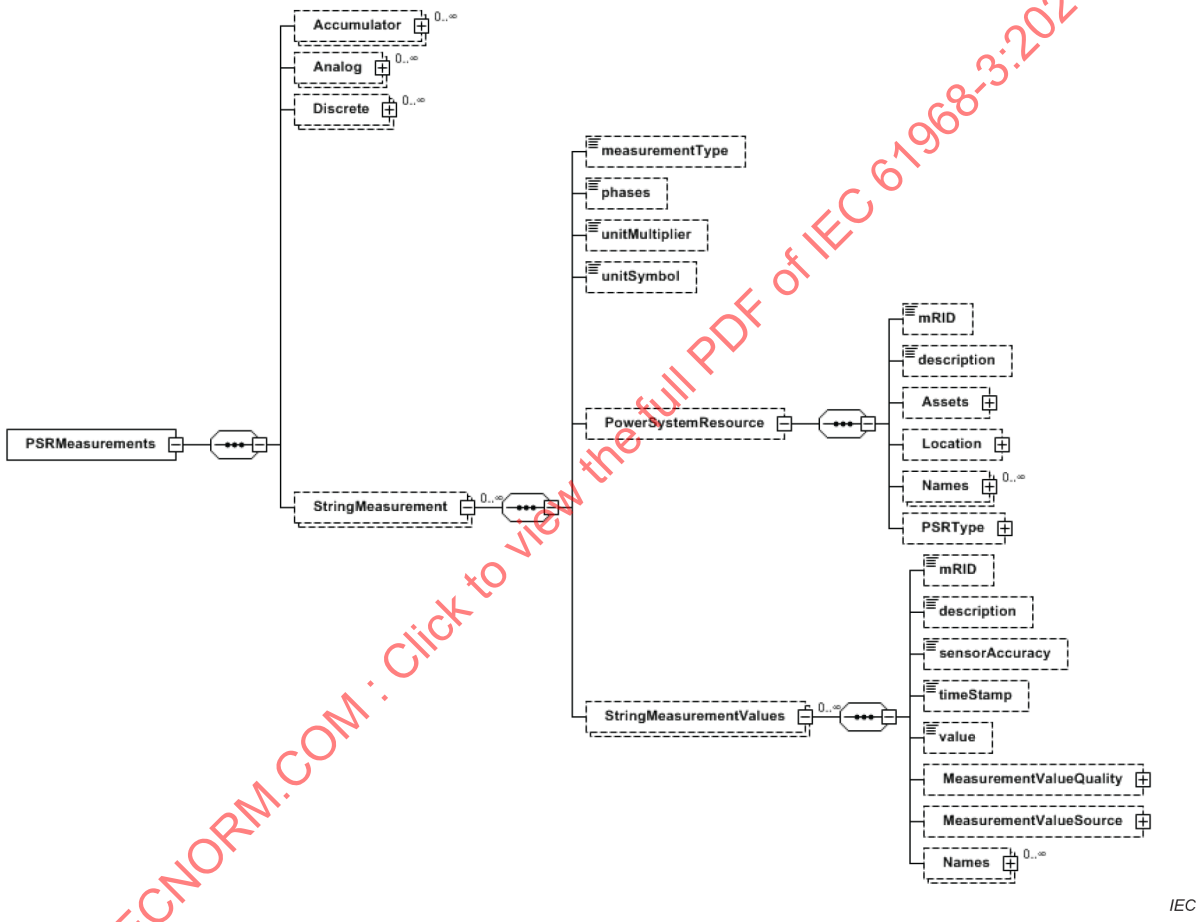
Below is example XML for an unganged recloser status for Phase A.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRMeasurements xmlns:m="http://iec.ch/TC57/2019/PSRMeasurements#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2017/PSRMeasurements# PSRMeasurements.xsd ">
<m:Discrete>
    <m:measurementType> Unganged Recloser Status </m:measurementType>
    <m:normalValue>1</m:normalValue>
    <m:phases>A</m:phases>
    <m:DiscreteValues>
      <m:description> Lizard Lick Feeder-324 Recloser 4267 Phase A Status </m:description>
      <m:timeStamp>2019-04-10T12:12:12</m:timeStamp>
      <m:value>1</m:value>
      <m:MeasurementValueQuality>
        <m:estimatorReplaced>false</m:estimatorReplaced>
        <m:validity>GOOD</m:validity>
      </m:MeasurementValueQuality>
      <m:MeasurementValueSource>
        <m:Names>
          <m:name>SCADA</m:name>
        </m:Names>
```

```
      </m:MeasurementValueSource>
      <m:Names>
        <m:name> Lizard Lick-324 R-4267 A Status </m:name>
      </m:Names>
    </m:DiscreteValues>
    <m:PowerSystemResource>
      <m:mRID>7c584905-8c89-4810-98f5-f73d47521cbf </m:mRID>
    </m:PowerSystemResource>
  </m:Discrete>
</m:PSRMeasurements>
```

5.4.6 **PSRMeasurements** Payload – **StringMeasurement**

Figure 17 shows the message payload for **PSRMeasurements** **StringMeasurement**. **StringMeasurement** represents a measurement with values of type string.



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Figure 17 – PSRMeasurements payload – StringMeasurement

5.4.7 **GetPSRMeasurements** payload

The **GetPSRMeasurements** profile is used to request one or more **Measurement**s. The payload is shown graphically in Figure 18.

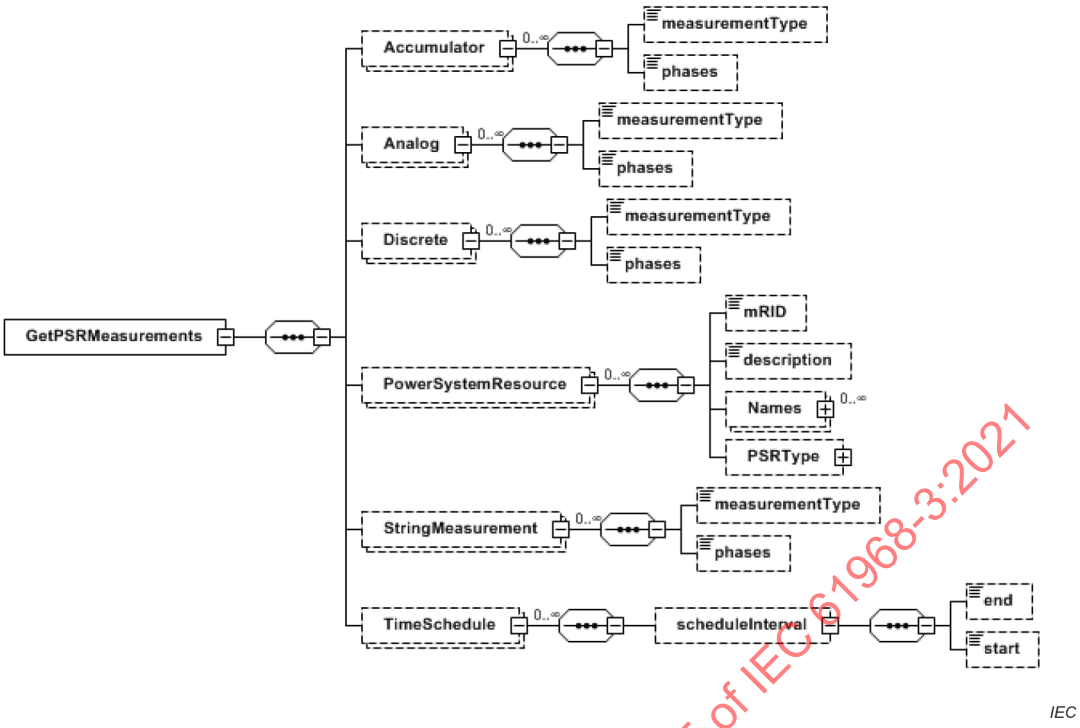


Figure 18 – GetPSRMeasurements payload

The attributes of the **getPSRMeasurements** profile are described in Table 8.

Table 8 – getPSRMeasurements Profile

PSRMeasurements				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
Accumulator	Accumulator	[0..*]	See B.2	measurementType and phases of the requested measurements.
Analog	Analog	[0..*]	See B.6	measurementType and phases of the requested measurements.
Discrete	Discrete	[0..*]	See B.28	measurementType and phases of the requested measurements.
PowerSystemResource	PowerSystemResource	[0..*]	See B.68	The PowerSystemResources for which the measurements are requested.
StringMeasurement	StringMeasurement	[0..*]	See B.82	measurementType and phases of the requested measurements.
TimeSchedule	TimeSchedule	[0..*]	See B.91	Time range of the requested measurements. If no time range is specified, the request is for the latest measurements only.

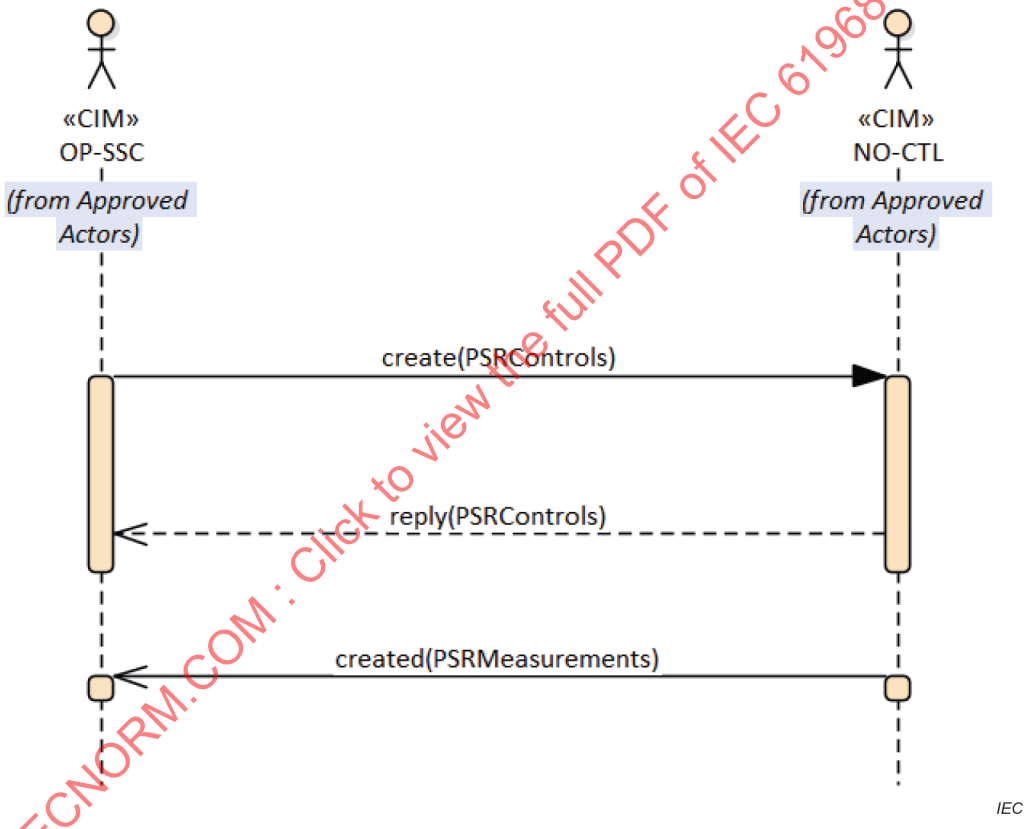
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5.5 **PSRControls** payload

5.5.1 General

PSRControls message payloads are designed to communicate requests to change the network state. The change can be an accumulator reset, analog control, command, raise/lower command or a setpoint. Examples include a request to open or close a switch, control the position of a transformer tap or set a new set point for a local controller. Each **PSRControl** includes a reference to the **PowerSystemResource** that is associated with the control request.

Controls are typically sent from a DMS system to a SCADA system. Figure 19 is a sequence diagram that shows how an actor can request a control to be performed. The diagram also shows a reply that confirms that the control request has been received. It also shows that when the value changes as a result of the control being sent, a **PSRMeasurements** is sent to the requester.



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Figure 19 – PSRControls sequence diagram

5.5.2 **PSRControls** Message Payload

This message payload can be used for exchanging control data including 0 to many control objects.

Control objects are the following:

- **AccumulatorReset**
- **AnalogControl**
- **Command** (for example open or close a switch)
- **RaiseLowerCommand** (for example raise or lower a transformers tap position)
- **SetPoint** (for example setpoint for local voltage control)

The attributes of the **PSRControls** profile are described in Table 9.

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Table 9 – PSRControls Profile

PSRControls				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
PSRControls	AccumulatorReset	[0..*]	Choice depending on the type of control.	This command resets the counter value to zero.
PSRControls	AnalogControl	[0..*]	Choice depending on the type of control.	An analog control used for supervisory control.
PSRControls	Command	[0..*]	Choice depending on the type of control.	A Command is a discrete control used for supervisory control.
PSRControls	RaiseLowerCommand	[0..*]	Choice depending on the type of control.	An analog control that increase or decrease a set point value with pulses. Unless otherwise specified, one pulse moves the set point by one.
PSRControls	SetPoint	[0..*]	Choice depending on the type of control.	An analog control that issues a set point value.
Profile Attributes for AccumulatorReset				
controlType	String	[0..1]		Specifies the type of Control, e.g. BreakerOn/Off, GeneratorVoltageSetPoint, TieLineFlow etc. The ControlType.name shall be unique among all specified types and describe the type.
operationInProgress	Boolean	[0..1]		Indicates that a client is currently sending control commands that has not completed.
phases	PhaseCode	[0..1]	See C.12	Specifies the phases to be controlled. If no phases are specified, all available phases are assumed. E.g. for a three phase control, three phases are assumed to be controlled..
timeStamp	DateTime	[0..1]		The last time a control output was sent.
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	

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PSRControls				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
Profile Attributes for AnalogControl				
controlType	String	[0..1]		Specifies the type of Control, e.g. BreakerOn/Off, GeneratorVoltageSetPoint, TieLineFlow etc. The ControlType.name shall be unique among all specified types and describe the type.
maxValue	Float	[0..1]		Normal value range maximum for any of the Control.value. Used for scaling, e.g. in bar graphs.
minValue	Float	[0..1]		Normal value range minimum for any of the Control.value. Used for scaling, e.g. in bar graphs.
operationInProgress	Boolean	[0..1]		Indicates that a client is currently sending control commands that has not completed.
phases	PhaseCode	[0..1]	See C.12	Specifies the phases to be controlled. If no phases are specified, all available phases are assumed. E.g. for a three phase control, three phases are assumed to be controlled..
timeStamp	DateTime	[0..1]		The last time a control output was sent.
unitMultiplier	UnitMultiplier	[0..1]		The unit multiplier of the measured quantity.
unitSymbol	UnitSymbol	[0..1]		The unit of measure of the measured quantity.
AnalogValue	AnalogValue	[0..*]	See B.7	
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	
Profile Attributes for Command				
controlType	String	[0..1]		
normalValue	Integer	[0..1]		Normal value for Control.value e.g. used for percentage scaling.
operationInProgress	Boolean	[0..1]		Indicates that a client is currently sending control commands that has not completed.
phases	PhaseCode	[0..1]	See C.12	Specifies the phases to be controlled. If no phases are specified, all available phases are assumed. E.g. for a three phase control, three phases are assumed to be controlled.
timeStamp	DateTime	[0..1]		The last time a control output was sent.
unitMultiplier	UnitMultiplier	[0..1]		The unit multiplier of the controlled quantity.
unitSymbol	UnitSymbol	[0..1]		The unit of measure of the controlled quantity.
DiscreteValue	DiscreteValue	[0..*]	See B.29	

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PSRControls				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	
Profile Attributes for RaiseLowerCommand				
controlType	String	[0..1]		Values of either 'Raise' or 'Lower'
maxValue	Float	[0..1]		Normal value range maximum for any of the Control.value. Used for scaling, e.g. in bar graphs.
minValue	Float	[0..1]		Normal value range minimum for any of the Control.value. Used for scaling, e.g. in bar graphs.
operationInProgress	Boolean	[0..1]		Indicates that a client is currently sending control commands that has not completed.
phases	PhaseCode	[0..1]	See C.12	Specifies the phases to be controlled. If no phases are specified, all available phases are assumed. E.g. for a three phase control, three phases are assumed to be controlled..
timeStamp	DateTime	[0..1]		The last time a control output was sent.
unitMultiplier	UnitMultiplier	[0..1]		The unit multiplier of the measured quantity.
unitSymbol	UnitSymbol	[0..1]		The unit of measure of the measured quantity.
AnalogValue	AnalogValue	[0..*]	See B.7	AnalogValue.value is used to specify the number of pulses. If not specified, a value of 1 is assumed.
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	

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PSRControls				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
Profile Attributes for SetPoint				
controlType	String	[0..1]		Specifies the type of Control, e.g. BreakerOn/Off, GeneratorVoltageSetPoint, TieLineFlow etc. The ControlType.name shall be unique among all specified types and describe the type.
maxValue	Float	[0..1]		Normal value range maximum for any of the Control.value. Used for scaling, e.g. in bar graphs.
minValue	Float	[0..1]		Normal value range minimum for any of the Control.value. Used for scaling, e.g. in bar graphs.
normalValue	Float	[0..1]		Normal value for Control.value e.g. used for percentage scaling.
operationInProgress	Boolean	[0..1]		Indicates that a client is currently sending control commands that has not completed.
phases	PhaseCode	[0..1]	See C.12	Specifies the phases to be controlled. If no phases are specified, all available phases are assumed. E.g. for a three phase control, three phases are assumed to be controlled.
timeStamp	DateTime	[0..1]		The last time a control output was sent.
unitMultiplier	UnitMultiplier	[0..1]		The unit multiplier of the measured quantity.
unitSymbol	UnitSymbol	[0..1]		The unit of measure of the measured quantity.
AnalogValue	AnalogValue	[0..*]	See B.7	AnalogValue.value is used to specify the desired analog value that the controlled device should be set to. For example, for a voltage regulator, the desired voltage should be specified.
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	

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5.5.3 PSRControls payload – AccumulatorReset

5.5.3.1 General

Figure 20 shows the **AccumulatorReset** control message payload. This command resets the counter value to zero.

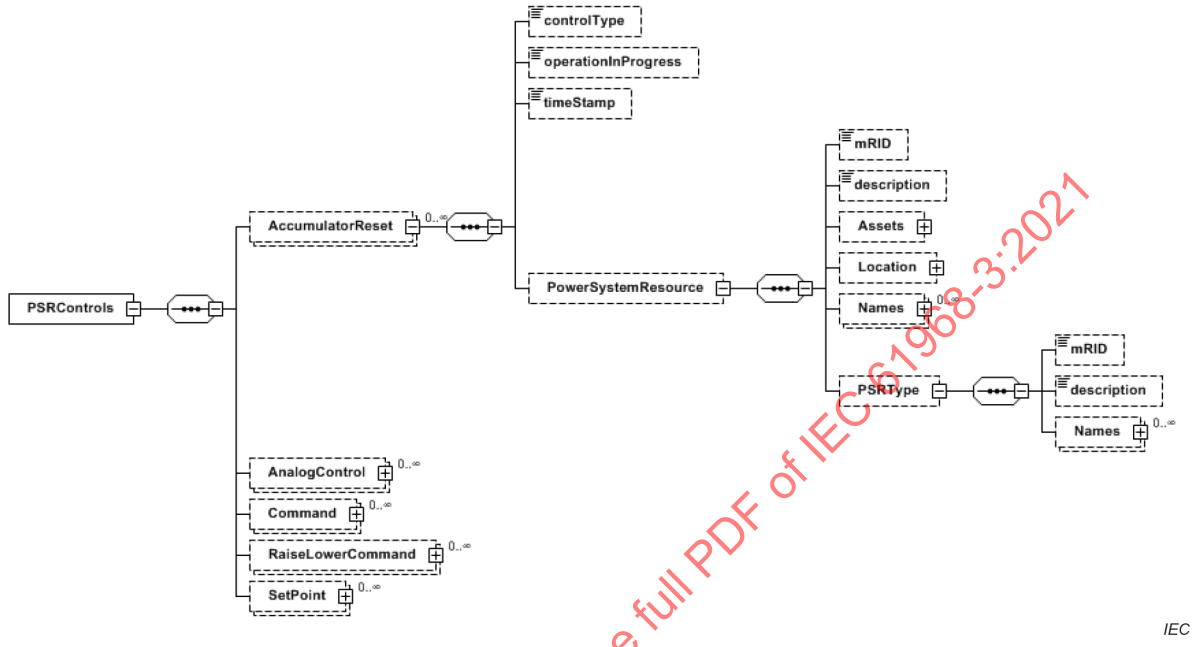


Figure 20 – PSRControls payload – AccumulatorReset

5.5.3.2 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRControls xmlns:m="http://iec.ch/TC57/2019/PSRControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PSRControls# PSRControls.xsd ">
  <m:AccumulatorReset>
    <m:controlType>Accumulator Reset</m:controlType>
    <m:phases>ABC</m:phases>
    <m:timeStamp>2019-06-03T09:00:00</m:timeStamp>
    <m:PowerSystemResource>
      <m:mRID>d738d450-a5ec-472b-bc74-11aaf22af7fd</m:mRID>
    </m:PowerSystemResource>
  </m:AccumulatorReset>
</m:PSRControls>
```

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5.5.4 PSRControls payload – AnalogControl

5.5.4.1 General

Figure 21 shows the **AnalogControl** control message payload. This command is an analog control used for supervisory control.

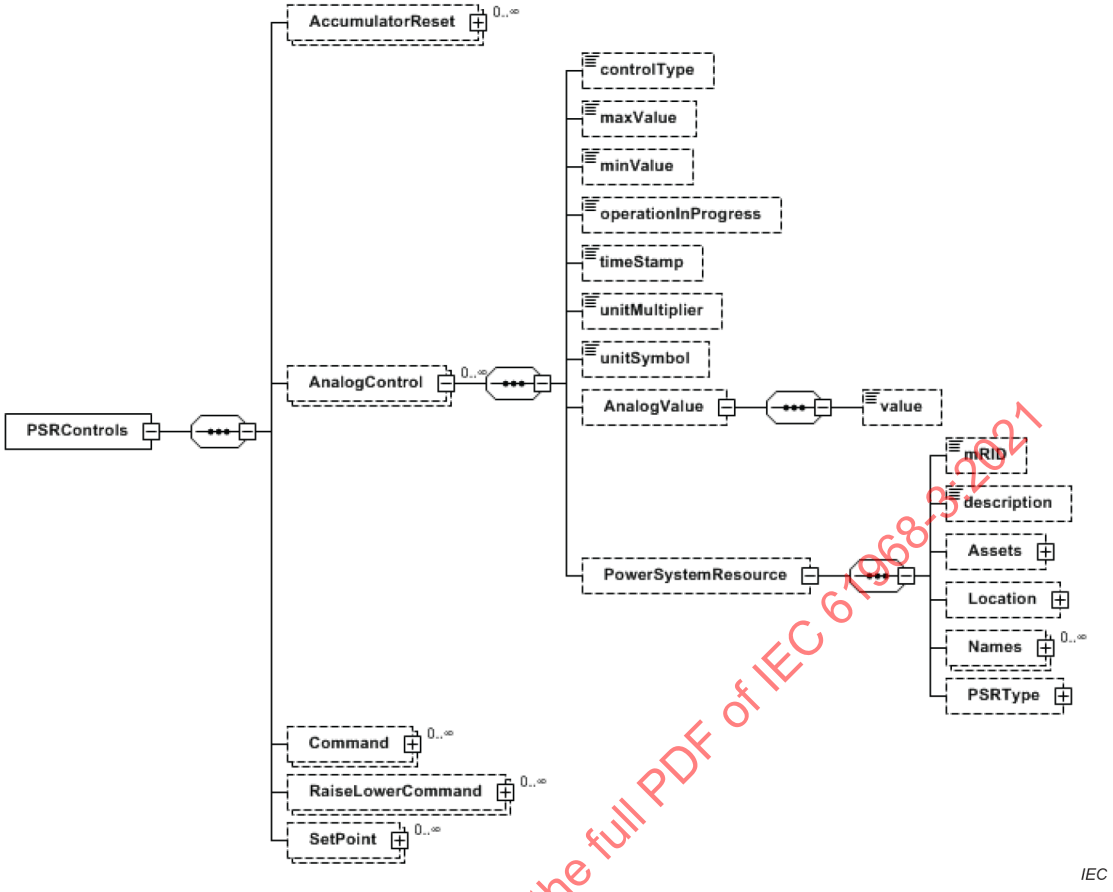


Figure 21 – PSRControls payload – AnalogControl

5.5.4.2 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRControls xmlns:m="http://iec.ch/TC57/2019/PSRControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PSRControls# PSRControls.xsd ">
  <m:AnalogControl>
    <m:controlType>Analog Output</m:controlType>
    <m:timeStamp>2019-06-03T09:47:00</m:timeStamp>
    <m:AnalogValue>
      <m:value>0.0</m:value>
    </m:AnalogValue>
    <m:PowerSystemResource>
      <m:mRID>6093b77b-0e82-4a9c-9a8d-aa79bd926972</m:mRID>
    </m:PowerSystemResource>
  </m:AnalogControl>
</m:PSRControls>
```

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5.5.5 PSRControls payload – Command

5.5.5.1 General

Figure 22 shows the **Command** control message payload. Command is a discrete control used for supervisory control.

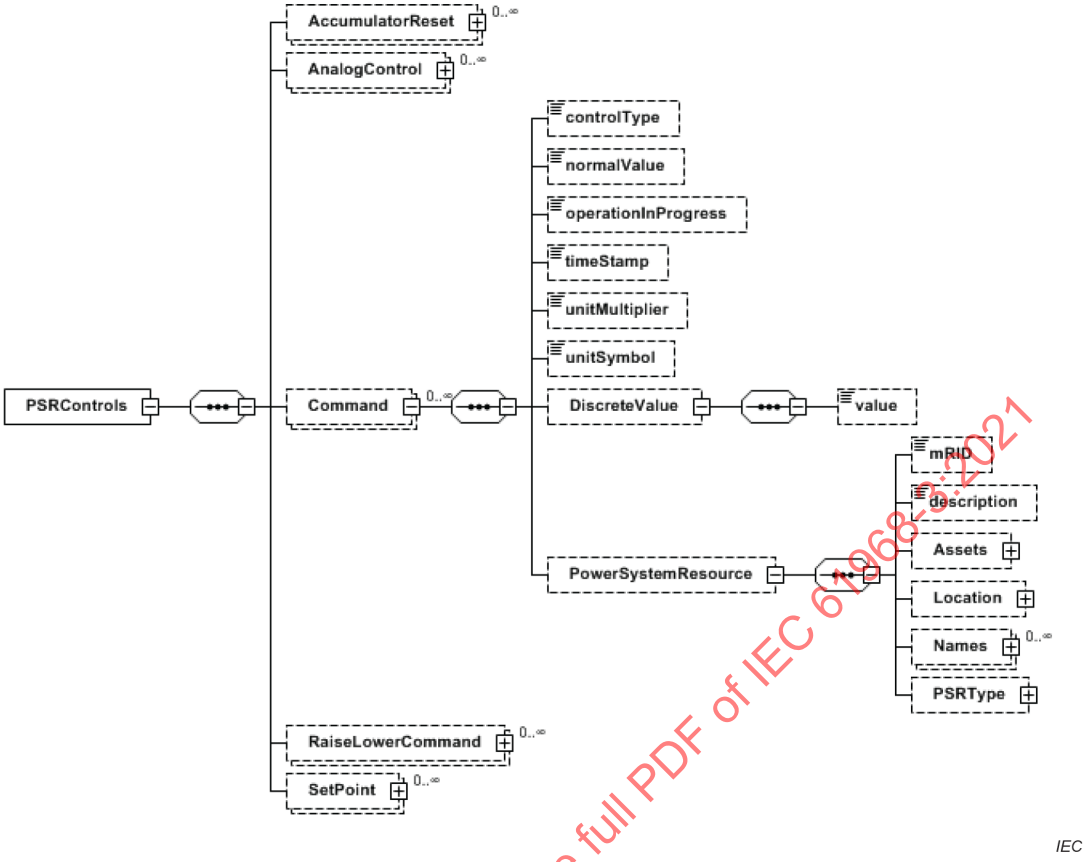


Figure 22 – PSRControls payload – Command

5.5.5.2 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRControls xmlns:m="http://iec.ch/TC57/2019/PSRControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PSRControls# PSRControls.xsd ">
  <m:Command>
    <m:controlType>Breaker Open/Close</m:controlType>
    <m:phases>A</m:phases>
    <m:timeStamp>2019-06-03T09:54:00</m:timeStamp>
    <m:DiscreteValue>
      <m:value>01</m:value>
    </m:DiscreteValue>
    <m:PowerSystemResource>
      <m:mRID>0fe7a6fe-9270-4f33-8f7e-04a00965b4e4</m:mRID>
      <m:Assets>
        <m:description>Wicker 12kV Substation Feeder 02 Breaker</m:description>
        <m:Names>
          <m:name>Wick F-02 CB</m:name>
        </m:Names>
      </m:Assets>
      <m:Names>
        <m:name>Wick F-02 CB</m:name>
      </m:Names>
      <m:PSRType>
        <m:Names>
          <m:name>12kV Circuit Breaker</m:name>
        </m:Names>
      </m:PSRType>
    </m:PowerSystemResource>
  </m:Command>
</m:PSRControls>
```

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5.5.6 PSRControls payload – RaiseLowerCommand

5.5.6.1 General

Figure 23 shows the **RaiseLowerCommand** control message payload. An analog control that increase or decrease a set point value with pulses.

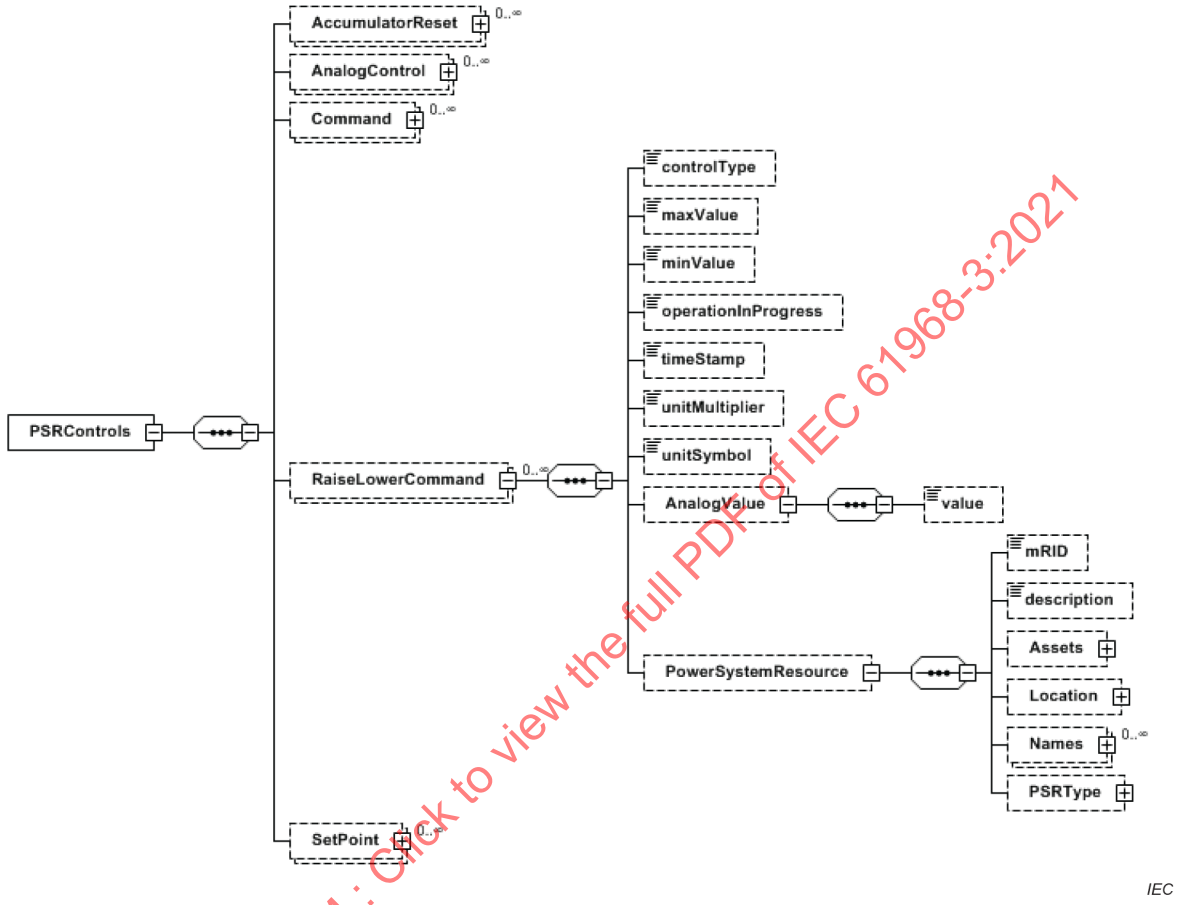


Figure 23 – PSRControls payload RaiseLowerCommand

5.5.6.2 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRControls xmlns:m="http://iec.ch/TC57/2019/PSRControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PSRControls# PSRControls.xsd ">
  <m:RaiseLowerCommand>
    <m:controlType>Load Tap Changer Control</m:controlType>
    <m:maxValue>16</m:maxValue>
    <m:minValue>-16</m:minValue>
    <m:phases>ABC</m:phases>
    <m:timeStamp>2019-06-03T10:00:00</m:timeStamp>
    <m:AnalogValue>
      <m:value>8.0</m:value>
    </m:AnalogValue>
    <m:PowerSystemResource>
      <m:mRID>b50d893b-b44e-4895-8924-658c862ee75f</m:mRID>
      <m:Assets>
        <m:Names>
          <m:name>Wick 12kV Substation Transformer Bank 01 LTC</m:name>
        </m:Names>
      </m:Assets>
      <m:Names>
        <m:name> Wick 12kV Substation Transformer Bank 01 LTC </m:name>
      </m:Names>
      <m:PSRType>
        <m:Names>
```

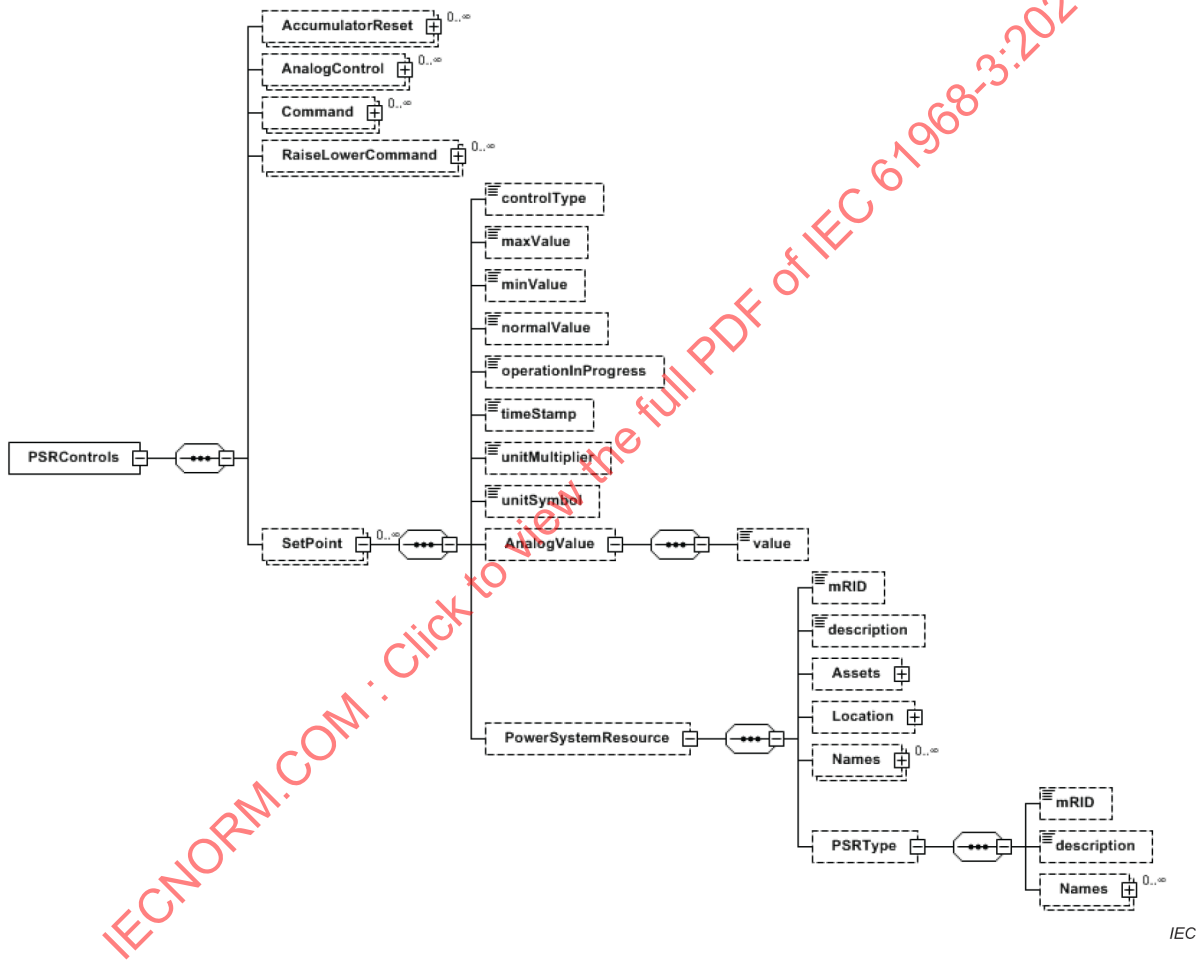
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```
          <m:name>Load Tap Changer</m:name>
        </m:Names>
      </m:PSRType>
    </m:PowerSystemResource>
  </m:RaiseLowerCommand>
</m:PSRControls>
```

5.5.7 PSRControls payload – SetPoint

5.5.7.1 General

Figure 24 shows the **SetPoint** control message payload. A **SetPoint** is an analog control that issues a target value that a controller must set a controlled variable to.



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Figure 24 – PSRControls payload SetPoint

5.5.7.2 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRControls xmlns:m="http://iec.ch/TC57/2019/PSRControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PSRControls# PSRControls.xsd ">
  <m:SetPoint>
    <m:controlType>Single Phase Voltage Setpoint, Per Unit</m:controlType>
    <m:maxValue>1.05</m:maxValue>
    <m:minValue>0.95</m:minValue>
    <m:normalValue>1.0</m:normalValue>
    <m:phases>B</m:phases>
    <m:timeStamp>2019-06-03T10:05:00</m:timeStamp>
    <m:unitMultiplier>none</m:unitMultiplier>
    <m:AnalogValue>
      <m:value>1.02</m:value>
    </m:AnalogValue>
    <m:PowerSystemResource>
      <m:mRID>13dd1b33-71fe-48e7-859c-887edf017399</m:mRID>
      <m:Assets>
        <m:description>Wick 12kV F02 VREG-1029</m:description>
        <m:Names>
          <m:name>VREG-1029</m:name>
        </m:Names>
      </m:Assets>
      <m:Names>
        <m:name>Wick 12-F02 VREG-1029</m:name>
      </m:Names>
      <m:PSRType>
        <m:Names>
          <m:name>Voltage regulator PU tap</m:name>
        </m:Names>
      </m:PSRType>
    </m:PowerSystemResource>
  </m:SetPoint>
</m:PSRControls>
```

5.6 **SwitchingPlanRequests** payload

5.6.1 General

Figure 25 is a sequence diagram that is an example of the interaction between work management and switch order scheduling.

In this example, the sequence starts with a **SwitchingPlanRequest**, which is used to convey a request from work management (or other business function) to network operations that switching needs to be performed. This could be a request to isolate part of the network in order for maintenance or construction work to be performed. The payload includes the type of work to be performed and when it should start. The typical outcome of a **SwitchingPlanRequest** is the creation of a **SwitchingPlan**. A **SwitchingPlan** is a sequence of pre-defined steps that typically perform operations to change the state of the network, such as a sequence of switch open and close operations.

Switch Action Scheduling (OP-SSC) acknowledges receipt of the request with a reply message. The **SwitchingPlan** is then developed by creating steps, either manually or automatically.

During its development, the **SwitchingPlan** goes through various review and approval processes within the Switch Action Scheduling function. Upon completion of the development of an approved **SwitchingPlan**, Switch Action Scheduling makes a request to Work Scheduling and Dispatching (MC-SCHD) to create a **SwitchingOrder** using the **SwitchingOrders** message. The **SwitchingPlan** is not yet communicated outside of the Switch Action Scheduling function. An example of this communication is described in Subclause 5.10.

The **SwitchingOrder** is scheduled within Work Scheduling and Dispatching. Once it has been scheduled, Work Scheduling and Dispatching replies with a **SwitchingOrders** message, to indicate that the **SwitchingOrder** has been scheduled.

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Finally, if the switching will result in customer outages, Customer Service is notified of the planned outage via a **PlannedOutageNotification** message.

Please note that the actual scheduling and coordination of SwitchingPlanRequests (Predictive Operational Condition Planning as defined in IEC 61968-1) is not included in the scope of this document.

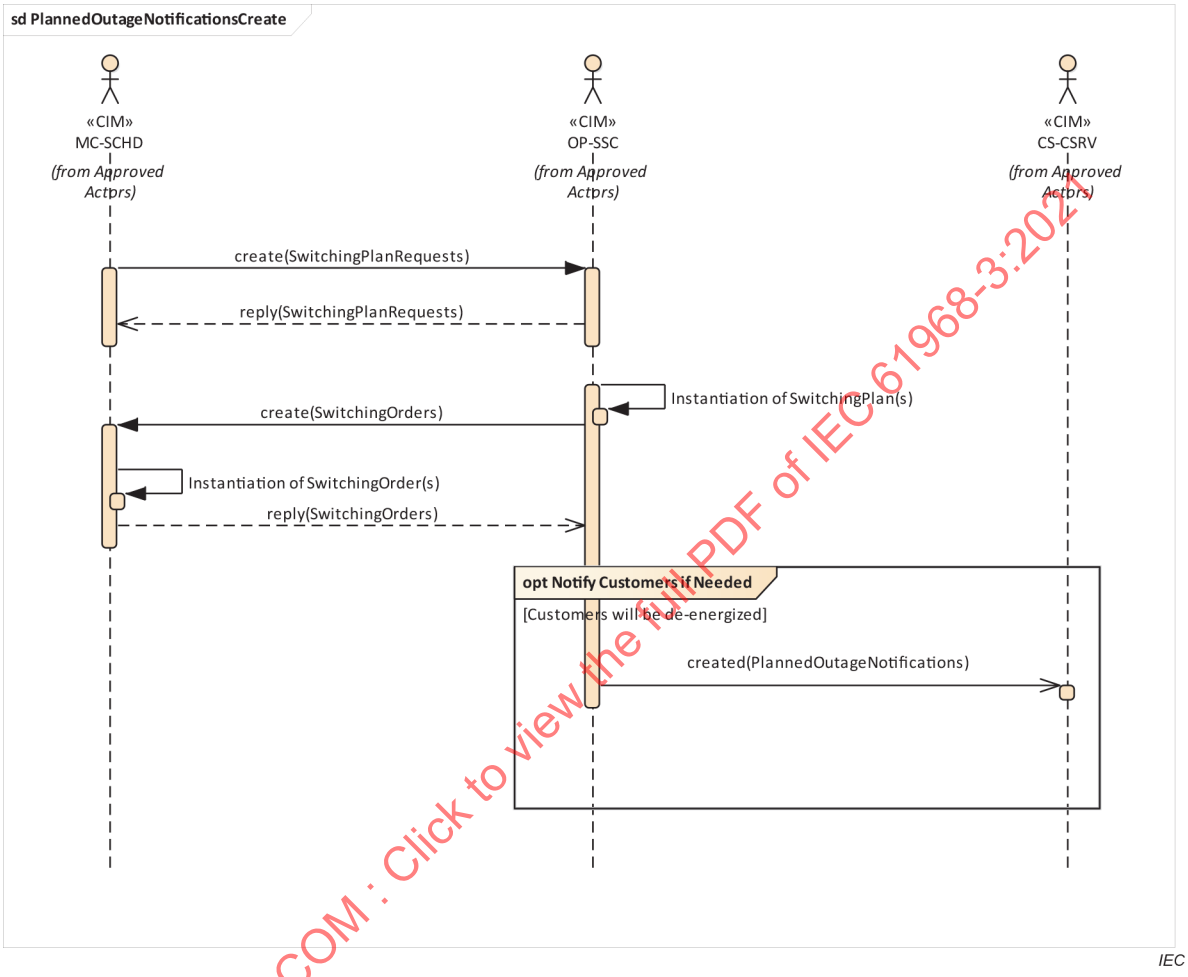


Figure 25 – SwitchingPlanRequests Sequence Diagram

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5.6.2 Message Payload

The attributes of the **SwitchingPlanRequests** profile are described in Table 10 and shown graphically in Figure 26 and Figure 27.

Table 10 – SwitchingPlanRequests Profile

SwitchingPlanRequests				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
SwitchingPlanRequests	SwitchingPlanRequest	[1..*]		
Profile Attributes				
mRID	String	[0..1]	GUID	
description	String	[0..1]		Free-form text field that describes the **SwitchingPlanRequest**
Names	Name	[0..*]	See B.56	Can be used to provide additional information such as internal request number.
comment	String	[0..1]		Requester comments
createdDateTime	DateTime	[0..1]		DateTime that the SwitchingPlanRequest was initially created.
equipmentToBeIsolated	String	[0..1]		List of equipment to be isolated, free-form text
groundingPoints	String	[0..1]		List of potential grounding points, free-form text
isolationArea	String	[0..1]		The location of the area to be isolated, free-form text
isolationPoints	String	[0..1]		List of potential isolation points, free-form text
lastModifiedDateTime	DateTime	[0..1]		DateTime that the SwitchingPlanRequest was last changed.
purpose	String	[0..1]		The purpose of the switching request
revisionNumber	String	[0..1]		Revision number of switching request. Used to track changes.
subject	String	[0..1]		Free-form text
switchingRequestDetails	String	[0..1]		Free-form text
title	String	[0..1]		Free-form text
type	String	[0..1]		Type of switching request
Author	Author	[0..1]	See B.13	Author of the SwitchingPlanRequest
docStatus	Status	[0..1]	See B.79	docStatus.value is used to specify the overall status of the SwitchingPlanRequest document, such as draft, in review, approved, cancelled, etc.
forwardSwitchingDateTimeInterval	DateTimeInterval	[0..1]		Forward switching start and end date – time and date when the switching starts and ends to take the equipment out of service
outageDateTimeInterval	DateTimeInterval	[0..1]		Outage start and end date – time and date when customers are scheduled to be de-energized and then energized.
RequestingOrganization	Organisation	[0..1]	See B.62	The name and contact information of the organisation making the switching request
reverseSwitchingDateTimeInterval	DateTimeInterval	[0..1]		Reverse switching start and end date – time and date when the switching starts and ends to put the equipment back in service

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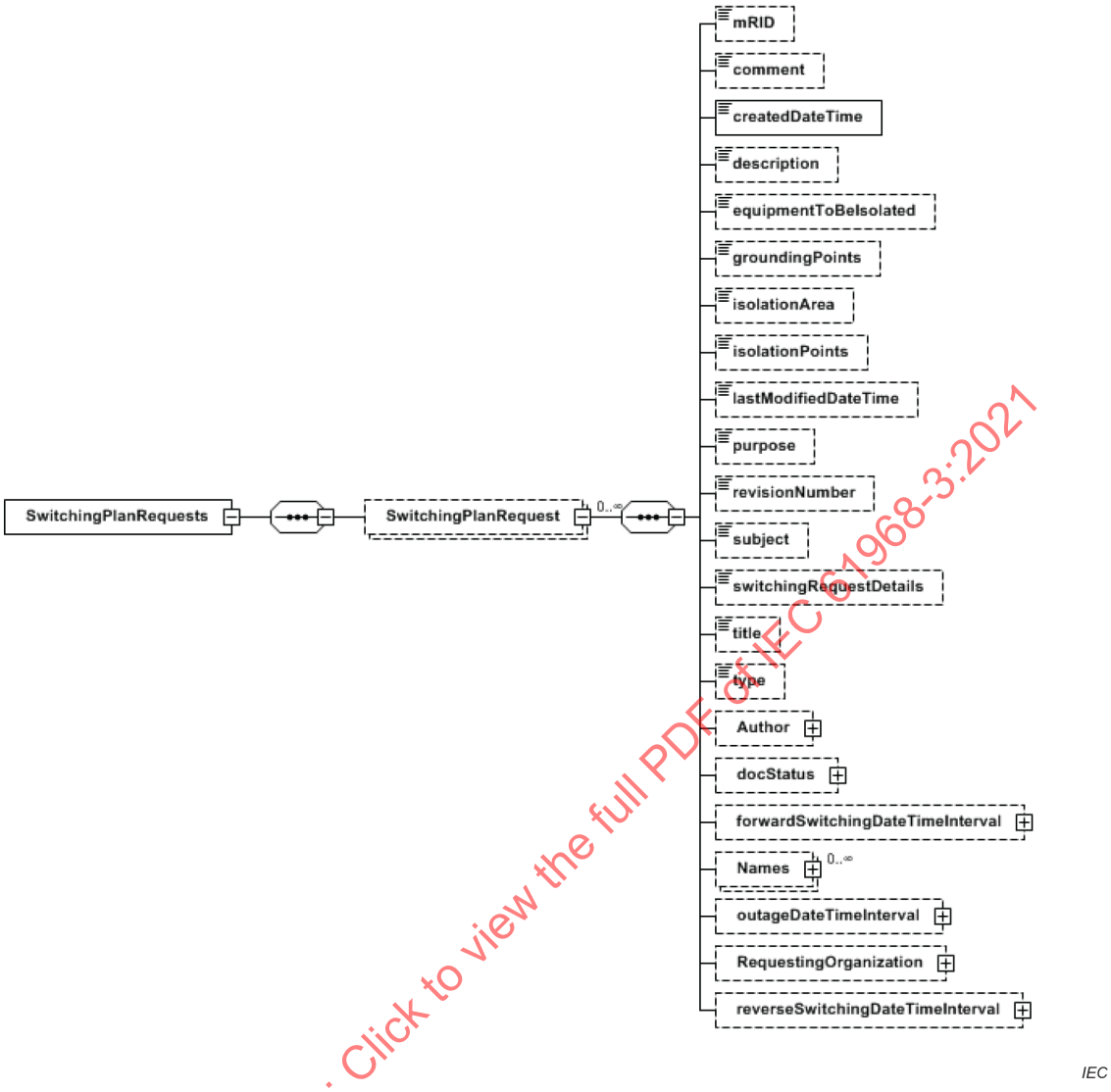


Figure 26 – SwitchingPlanRequests payload (Part 1)

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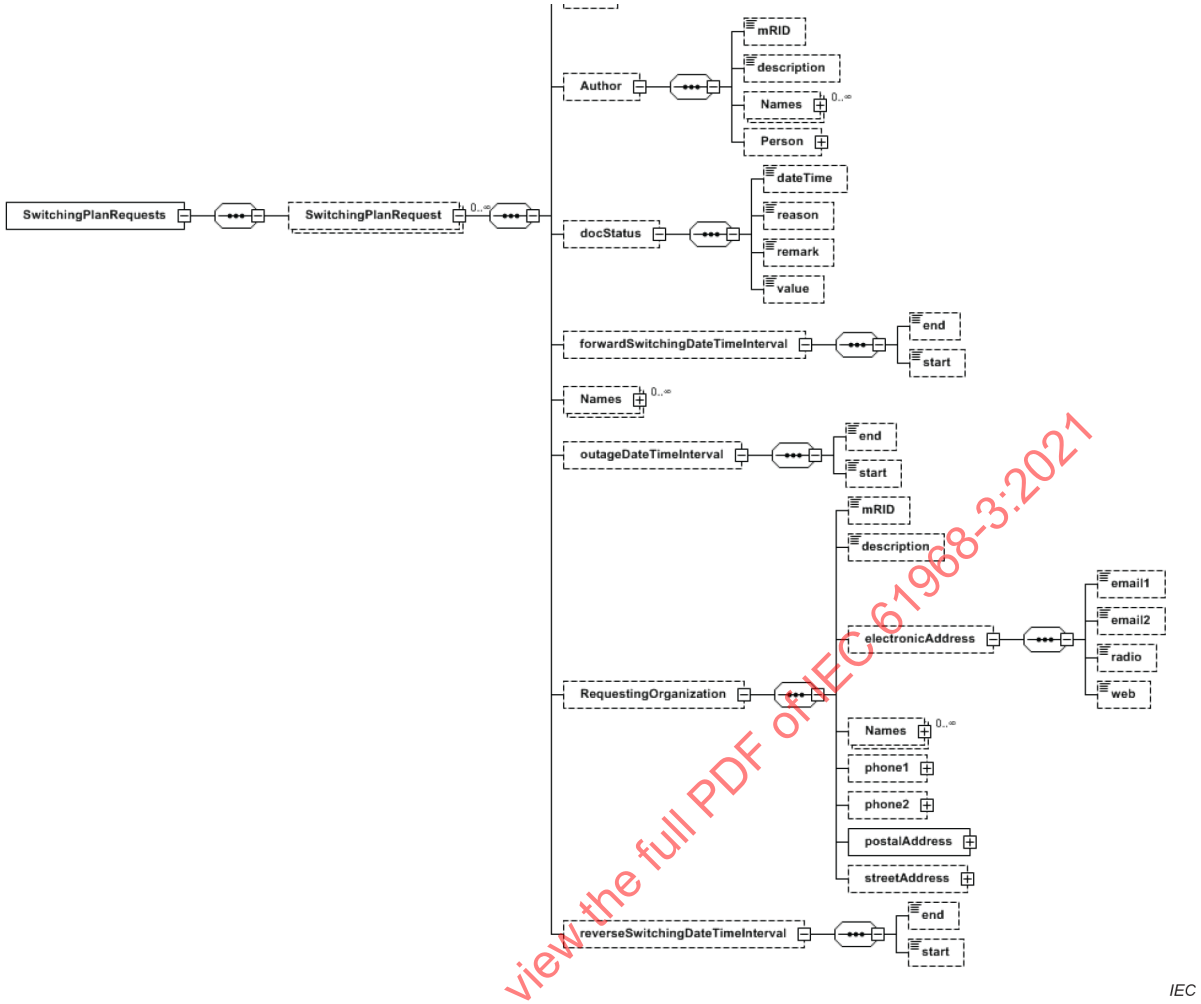


Figure 27 – SwitchingPlanRequests payload (Part 2)

5.6.3 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:SwitchingPlanRequests xmlns:m="http://iec.ch/TC57/2018/SwitchingPlanRequests#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/SwitchingPlanRequests# SwitchingPlanRequests.xsd
">
  <m:SwitchingPlanRequest>
    <m:mRID>2050a0b-0422-4184-8cfe-b9fdfc433509</m:mRID>
    <m:comment>Line extension on 13 kV line at Bonkers Creek</m:comment>
    <m:createdDateTime>2019-04-01T12:12:12</m:createdDateTime>
    <m:description>Isolate line section between Cotter's Grove Lane and Snarly Brook
Street</m:description>
    <m:equipmentToBeIsolated> Switch SW-13423, Recloser R-4267</m:equipmentToBeIsolated>
    <m:groundingPoints>Ground switches GS-73456, GS-76721, manual grounds at SW-13423, R-
4267</m:groundingPoints>
    <m:isolationArea>Area bounded by SW-12113 to the North and SW-13211 to the
South</m:isolationArea>
    <m:isolationPoints> SW-12113, SW-13211</m:isolationPoints>
    <m:lastModifiedDateTime>2019-04-13T12:12:12</m:lastModifiedDateTime>
    <m:purpose>New construction</m:purpose>
    <m:revisionNumber>A</m:revisionNumber>
    <m:subject>Switching Plan Request</m:subject>
    <m:switchingRequestDetails> Capital expenditure project #14122-
A</m:switchingRequestDetails>
    <m:title>Substation: Lizard Lick; Feeder: 321</m:title>
    <m:type>Construction</m:type>
    <m:Author>
      <m:Person>
        <m:firstName>Mick</m:firstName>
        <m:lastName>Jagger</m:lastName>
        <m:electronicAddress>
          <m:email1>mickj@abc-utility.com</m:email1>
```

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```
        </m:electronicAddress>
        <m:mobilePhone>
          <m:areaCode>919</m:areaCode>
          <m:cityCode>555</m:cityCode>
          <m:localNumber>1212</m:localNumber>
        </m:mobilePhone>
      </m:Person>
    </m:Author>
    <m:docStatus>
      <m:dateTime>2019-04-01T12:12:12</m:dateTime>
      <m:remark>Created</m:remark>
      <m:value>New</m:value>
    </m:docStatus>
    <m:forwardSwitchingDateTimeInterval>
      <m:end>2019-05-01T09:00:00</m:end>
      <m:start>2019-05-01T08:00:00</m:start>
    </m:forwardSwitchingDateTimeInterval>
    <m:Names>
      <m:name>Switching Request 2019-04-142</m:name>
    </m:Names>
    <m:outageDateTimeInterval>
      <m:end>2019-05-01T10:30:00</m:end>
      <m:start>2012-12-13T09:45:00</m:start>
    </m:outageDateTimeInterval>
    <m:RequestingOrganization>
      <m:electronicAddress>
        <m:email1>maint@abc-utility.com</m:email1>
      </m:electronicAddress>
      <m:Names>
        <m:name>Maintenance and Construction</m:name>
      </m:Names>
      <m:phone1>
        <m:areaCode>919</m:areaCode>
        <m:cityCode>555</m:cityCode>
        <m:localNumber>1234</m:localNumber>
      </m:phone1>
    </m:RequestingOrganization>
    <m:reverseSwitchingDateTimeInterval>
      <m:end>2019-05-01T12:00:00</m:end>
      <m:start>2019-05-01T11:30:00</m:start>
    </m:reverseSwitchingDateTimeInterval>
  </m:SwitchingPlanRequest>
</m:SwitchingPlanRequests>
```

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5.7 SwitchingPlan Definition and Execution

The actual operational steps for a **SwitchingPlan** are defined using the **SwitchingPlans** profile. Operational steps can comprise different **SwitchingActions** that determine what operation is to be performed and on what network component. At the time that the **SwitchingPlan** is executed, different profiles are used to coordinate the execution between the control room, field crews and SCADA. It is possible for a **SwitchingPlan** to consist solely of operational steps that are performed by a field crew or solely operational steps that are performed automatically via SCADA, or a combination of the two.

Table 11 shows which actions are coordinated with which messages. With the exception of the SCADA enabled **MeasurementAction**, all interactions follow the consequential event pattern defined in IEC 61968-100. The SCADA enabled **MeasurementAction** follows the request/response pattern defined in IEC 61968-100. The first column shows what action is defined in the **SwitchingPlans** profile as a **SwitchingPlanStep**. The second column shows which action and profile is used to send a request to a field crew or SCADA to execute a **SwitchingPlanStep**. The third column shows what action and profile is used to confirm that the step has been executed.

Table 11 – Messages used to coordinate different types of SwitchingSteps

Action defined in SwitchingPlan	Instruction to execute	Confirmation of execute
ClearanceAction	**SwitchingAction - ClearanceAction** sent to field crew	**SwitchingEvent - ClearanceAction** received from field crew
ControlAction (manual, no telemetry)	**SwitchingAction** – **ControlAction** sent to field crew	**SwitchingEvent** – **ControlAction** received from field crew
ControlAction (automatic via SCADA, if there is telemetry)	**PSRControls** sent to SCADA	**PSRMeasurements** received from SCADA
CutAction	**SwitchingAction** – **CutAction** sent to field crew	**SwitchingEvent** – **CutAction** received from field crew
EnergySourceAction	**SwitchingAction - EnergySourceAction** sent to field crew	**SwitchingEvent - EnergySourceAction** received from field crew
GenericAction	**SwitchingAction - GenericAction** sent to field crew	**SwitchingEvent - GenericAction** received from field crew
GroundAction	**SwitchingAction - GroundAction** sent to field crew	**SwitchingEvent - GroundAction** received from field crew
JumperAction	**SwitchingAction - JumperAction** sent to field crew	**SwitchingEvent - JumperAction** received from field crew
MeasurementAction (manual, no telemetry)	**SwitchingAction - MeasurementAction** sent to field crew	**SwitchingEvent** – **MeasurementAction** received from field crew
MeasurementAction (automatic via SCADA, if there is telemetry)	**GetPSRMeasurements** sent to SCADA	**PSRMeasurements** received from SCADA
SwitchAction	**SwitchingAction - SwitchAction** sent to field crew	**SwitchingEvent - SwitchAction** received from field crew
TagAction	**SwitchingAction** – **TagAction** sent to field crew	**SwitchingEvent** – **TagAction** received from field crew
VerificationAction	**SwitchingAction - VerificationAction** sent to field crew	**SwitchingEvent - VerificationAction** received from field crew

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5.8 SwitchingPlans payload

5.8.1 General

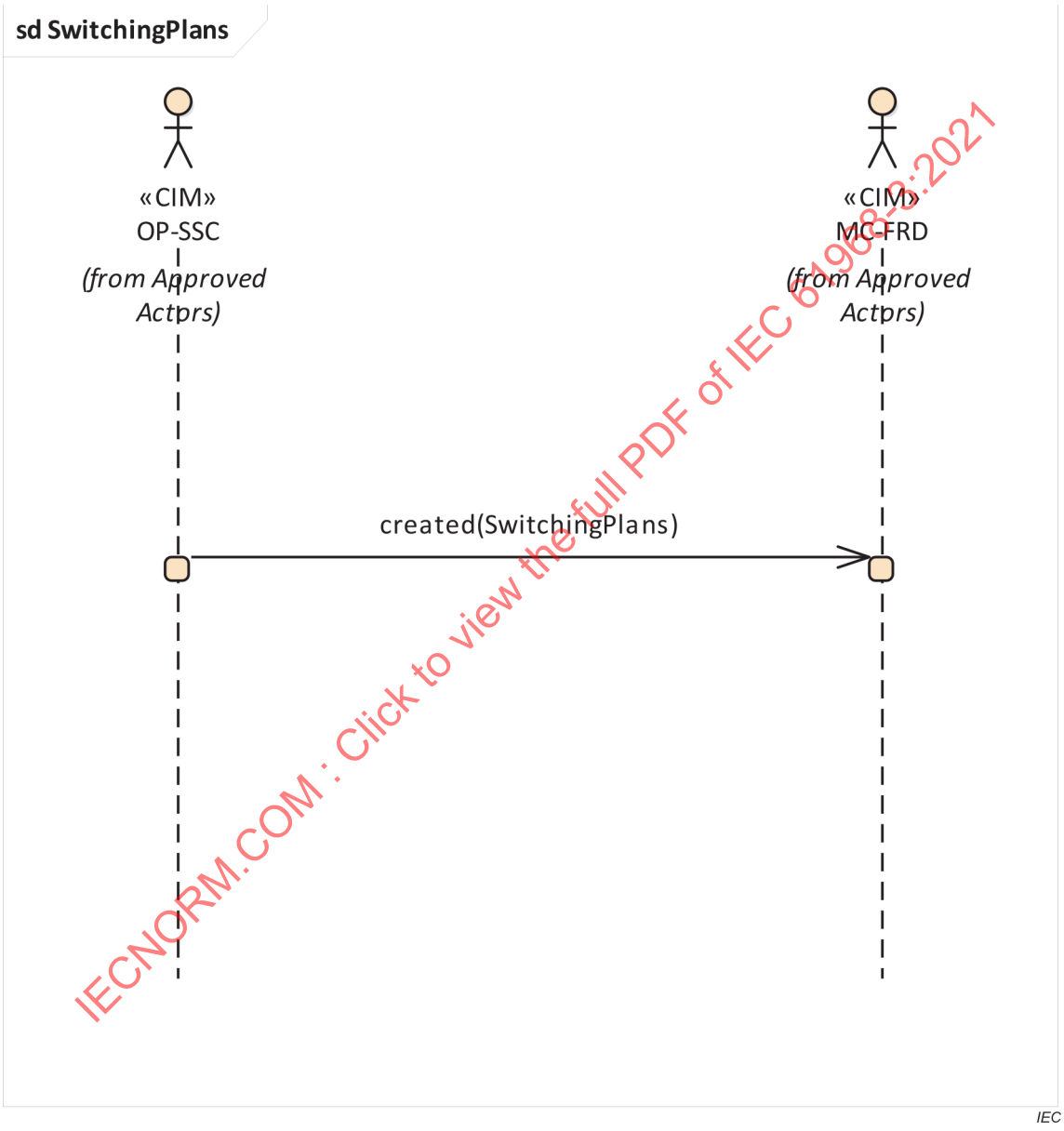
SwitchingPlans message payloads are designed to communicate a set of **SwitchingActions** that form a sequence of operations to manage a complete operational task. **SwitchingPlans** payloads define the sequence of steps that will be executed, while other messages are used to coordinate the execution of the **SwitchingPlan**. Figure 25 is a sequence diagram that illustrates the instantiation of a **SwitchingPlan** in the context of planned maintenance, while Figure 28 shows the communication of **SwitchingPlans** to field crews. **SwitchingPlans** may also be created in order to perform emergency switching.

Additional use cases include:

- Fault Management proposes one or more switching plans as alternative solutions for fault or work area isolations and/or service restoration.

- Network optimization applications such as Volt/Var control, optimal feeder reconfiguration, etc. propose one or more switching plans as alternative solutions to optimize the entire distribution grid or selected parts of the distribution grid.
- A request to generate a switching plan may be result of a user interaction or issued from an application as part of a complete workflow like fault location, isolation and restoration.

A switching plan may include non-network actions such as placement or removal of tags, placement or removal of temporary elements, or general instructions to a field crew or operator.



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Figure 28 – SwitchingPlans sequence diagram

5.8.2 Message payload

The attributes of the **SwitchingPlans** profile are described in Table 12.

Table 12 – SwitchingPlans Profile

SwitchingPlans					
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**	**Profiles Used In, in addition to this profile.**
SwitchingPlans	SwitchingPlan	[1..*]			
Profile Attributes					
mRID	String	[0..1]	GUID	mRID of this SwitchingPlan	PlannedOutageNotifications, PlannedOutages, TroubleOrders
description	String	[0..1]		Free-form text field that describes the **SwitchingPlan**	PlannedOutageNotifications, PlannedOutages, TroubleOrders
Names	Name	[0..*]	See B.56	List of human-readable names for the SwitchingPlan	PlannedOutageNotifications, PlannedOutages, TroubleOrders
approvedDateTime	DateTime	[0..1]		DateTime that the SwitchingPlan was approved.	
cancelledDateTime	DateTime	[0..1]		DateTime that the SwitchingPlan was cancelled.	
comment	String	[0..1]		Comments associated with the SwitchingPlan	
createdDateTime	DateTime	[0..1]		DateTime that the SwitchingPlan was initially created.	
lastModifiedDateTime	DateTime	[0..1]		DateTime that the SwitchingPlan was last changed.	
purpose	String	[0..1]		The purpose of the switching plan	
rank	Integer	[0..1]		Priority of this SwitchingPlan relative to other SwitchingPlans	
revisionNumber	String	[0..1]		Revision number of the **SwitchingPlan**. Typically this would be used to track changes after the SwitchingPlan has been approved, but it could also be used to track changes during the development and review cycle.	
title	String	[0..1]		Title of the SwitchingPlan	

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SwitchingPlans					
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**	**Profiles Used In, in addition to this profile.**
type	String	[0..1]		Type of the SwitchingPlan	
Approver	Approver	[0..1]	See B.8	Person who approved the **SwitchingPlan**	
Author	Author	[0..1]	See B.13	Person who wrote the SwitchingPlan	
docStatus	Status	[0..1]	See B.79	docStatus.value is used to specify the overall status of the SwitchingPlan document, such as draft, in review, approved, cancelled, etc.	
plannedPeriod	DateTimeInterval	[0..1]		Planned start and end dates for the SwitchingPlan	
SafetyDocuments	SafetyDocument	[0..*]	See B.75	List of SafetyDocuments associated with the SwitchingPlan.	
SwitchingPlanRequest	SwitchingPlanRequest	[0..1]	See 5.7	Reference to the SwitchingPlanRequest that resulted in the creation of this SwitchingPlan, identified by its mRID, description and Names. The SwitchingPlanRequest contains more detailed information about the SwitchingPlan, including where it originated and its purpose.	
SwitchingStepGroups	SwitchingStepGroup	[0..1]	See 5.8.3	Detailed instructions on what switching is to be performed.	

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Since the **SwitchingPlans** message is large, the payload description is broken up into a series of subclauses in this document in order to assist the reader's understanding of the payload.

This message payload, shown at its highest level in the diagrams in Figure 29, Figure 30 and Figure 31, can be used for exchanging 0 to many **SwitchingPlans**.

Figure 29 shows the high level part of a **SwitchingPlan.**

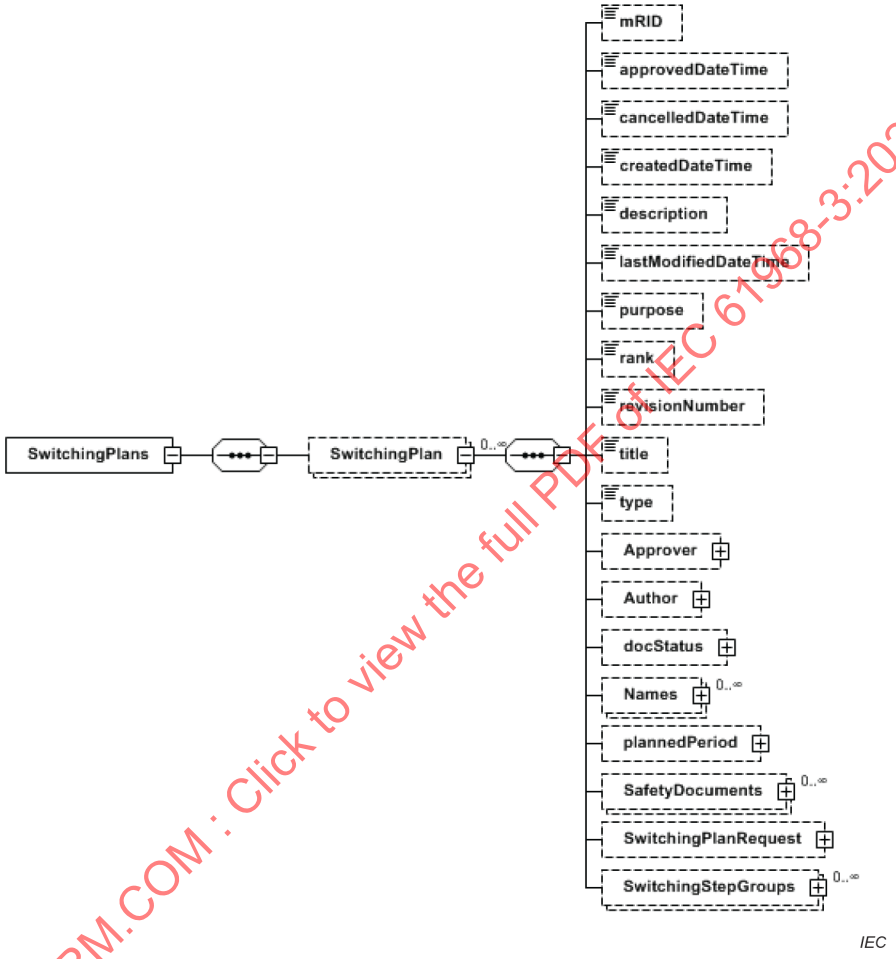


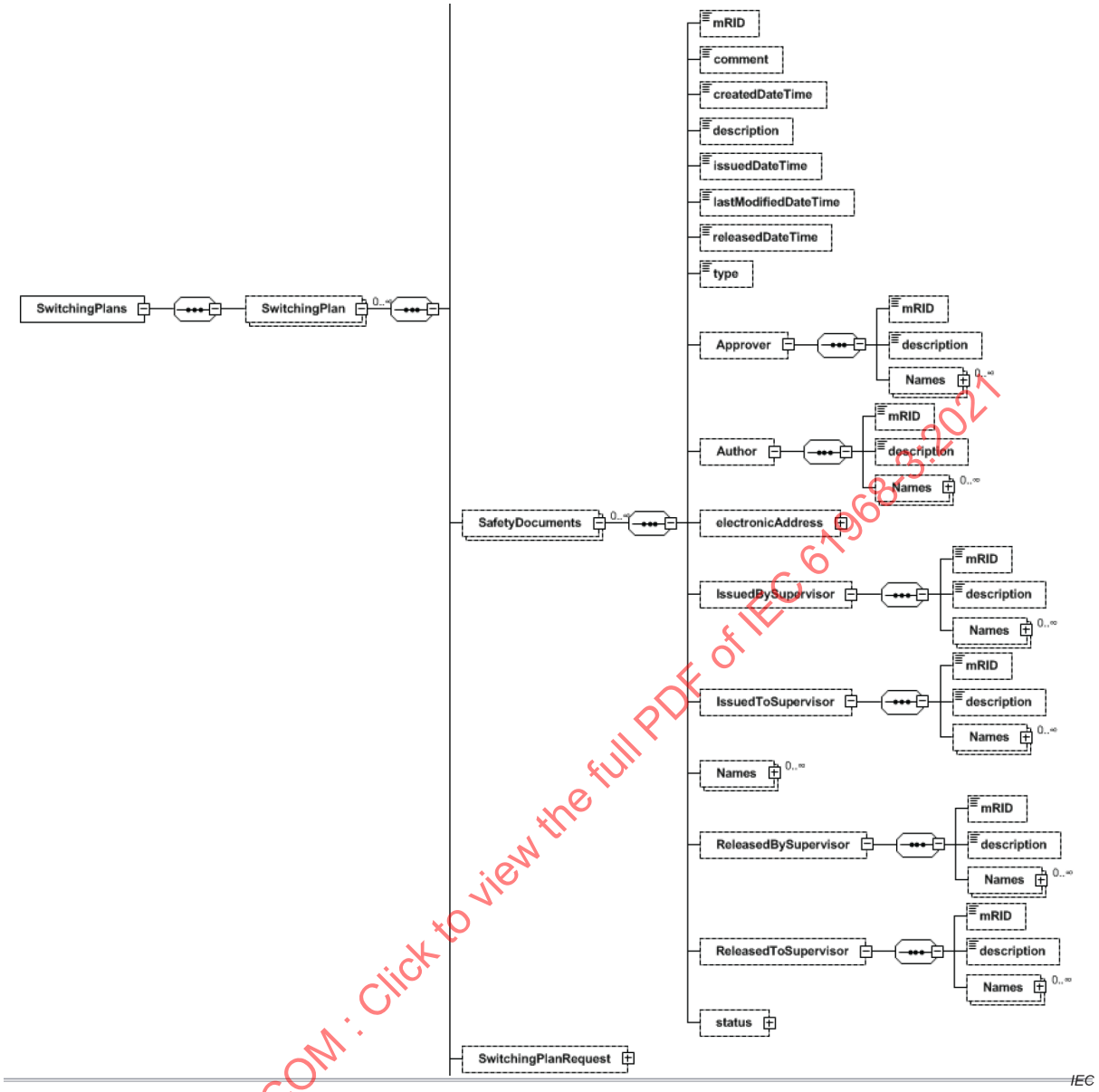
Figure 29 – SwitchingPlans message payload top level

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Figure 30 shows an optional set of **SafetyDocument**s that are associated with managing the safety aspects of the **SwitchingPlan**. **SafetyDocument**s are used to track handoffs between different parties to ensure safe operation of the electric network. At the **SwitchingPlan** level, **SafetyDocuments** are used to control access to a part of the network. **SafteyDocument**s may also appear as specific steps in a **SwitchingPlan**, where they are referred to as **ClearanceAction**s.

It is possible to have a **SwitchingPlan** that has no switching steps but has one or more **SafetyDocuments**. Examples of this include safety documents to allow access to a substation or to allow access to customer equipment where no switching is involved.

The attributes of the **SafetyDocument** payload fragment are described in Subclause B.75.



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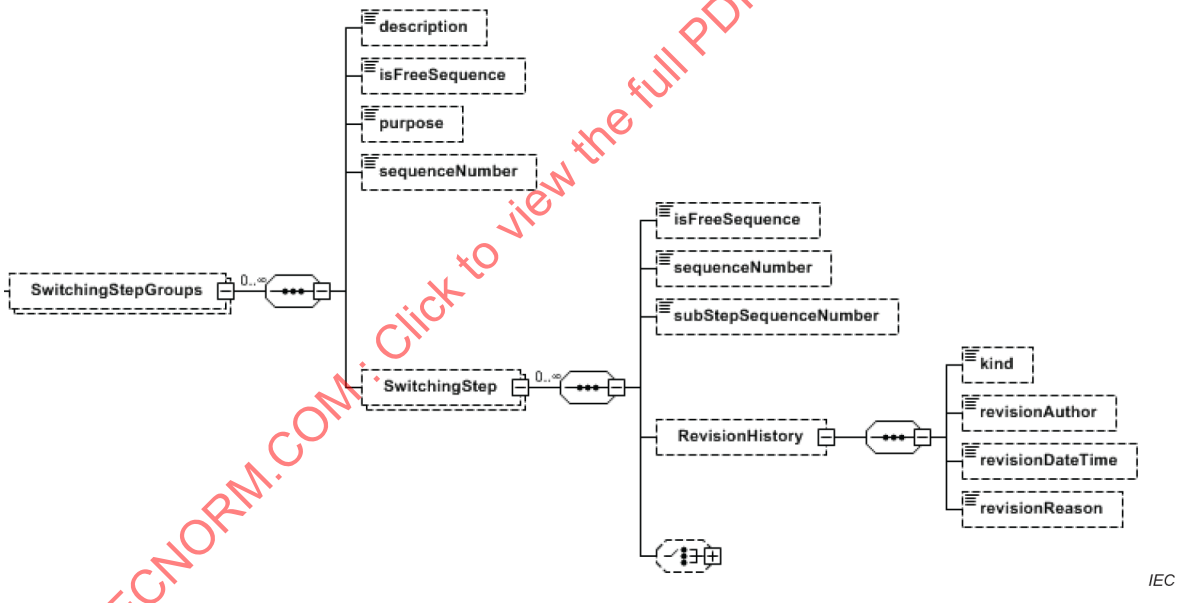
Figure 30 – SwitchingPlans message – SafetyDocuments payload fragment

5.8.3 SwitchingPlans payload – SwitchingStepGroups fragment

The attributes of **SwitchingStepGroups** that are used in this profile are shown in Table 13. As shown in Figure 31, each **SwitchingPlan** may include 0 to many **SwitchingStepGroups**. **SwitchingStepGroups** are used to define the sequence (order) for groups of actions. See also Subclause 5.8.5 for further information on the order of execution.

Table 13 – SwitchingPlans – SwitchingStepGroups payload fragment

Operations: SwitchingStepGroup				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
purpose	String	[0..1]		Comments or free-form instructions
description	String	[0..1]		Comments or free-form instructions
sequenceNumber	Integer	[0..1]		Defines the order in which step groups appear in the **SwitchingPlan** and, in conjunction with isFreeSequence, defines the sequence in which step groups are to be executed in the **SwitchingPlan.** See Subclause 5.8.5 for further details. The first **SwitchingStepGroup** in a given SwitchingPlan has a sequenceNumber of 1. Successsive **sequenceNumbers** increment by 1.
isFreeSequence	Boolean	[0..1]		See Subclause 5.8.5 for further details regarding isFreeSequence and the order in which SwitchingStepGroups and SwitchingSteps may be executed.
SwitchingStep	SwitchingStep	[0..*]	See 5.8.4	



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Figure 31 – SwitchingPlans message payload – SwitchingStepGroups

5.8.4 SwitchingPlans payload – SwitchingStep fragment

The attributes of **SwitchingStep** that are used in this profile are shown in Table 14.

Table 14 – SwitchingPlans – SwitchingStep payload fragment

Operations: SwitchingStep				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
sequenceNumber	Integer	[0..1]		Determines the execution sequence within the SwitchingStep. The first **SwitchingStep** in a given **SwitchingPlan** has a **sequenceNumber** of 1. Successsive **sequenceNumbers** increment by 1, regardless of which **SwitchingStepGroup** the **SwitchingStep** appears in.
isFreeSequence	Boolean	[0..1]		See subclause 5.8.5 for further details regarding **isFreeSequence** and the order in which **SwitchingStepGroups** and **SwitchingSteps** may be executed.
RevisionHistory	RevisionHistory	[0..1]	See B.74	The revision history of the step. Used to indicate whether the step has been added or deleted (voided) from the plan after it has been approved,
subStepSequenceNumber	Integer	[0..1]		Allows a second level of steps to be defined for each SwitchingStep. **subStepSequenceNumber**s always start numbering at 1 within a given SwitchingStep. Sub steps are uniquely identified by their **SwitchingStep sequenceNumber** and their **subStepSequenceNumber**. Substeps that have been inserted after the switching plan has been approved will have a **RevisionHistory**.
		[1..1]		Choice of one action as shown below
Actions				
ClampAction	ClampAction		See 5.8.6	
ClearanceAction	ClearanceAction		See 5.8.7	
ControlAction	ControlAction		See 5.8.8	
CutAction	CutAction		See 5.8.9	
EnergyConsumerAction	EnergyConsumerAction		See 5.8.10	
EnergySourceAction	EnergySourceAction		See 5.8.11	
GenericAction	GenericAction		See 5.8.12	
GroundAction	GroundAction		See 5.8.13	
JumperAction	JumperAction		See 5.8.14	
MeasurementAction	MeasurementAction		See 5.8.15	
ShuntCompensatorAction	ShuntCompensatorAction		See 5.8.16	
SwitchAction	SwitchAction		See 5.8.17	
TagAction	TagAction		See 5.8.18	
VerificationAction	VerificationAction		See 5.8.19	

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This allows a switching plan to be constructed of any combination of action steps as well as comment or header steps. It also allows a complex step to be defined as a combination of action steps. For example, a complex step could consist of a single numbered step to 'open and place do not operate tag'. This would be represented as a **SwitchingStep** with a **SwitchAction** (**subStepSequenceNumber** = 1) and a **TagAction** (**subStepSequenceNumber** = 2). Sub steps must be executed in strict **subStepSequenceNumber** order.

Each **SwitchingStep** consists of a choice of actions, as shown in Figure 32.

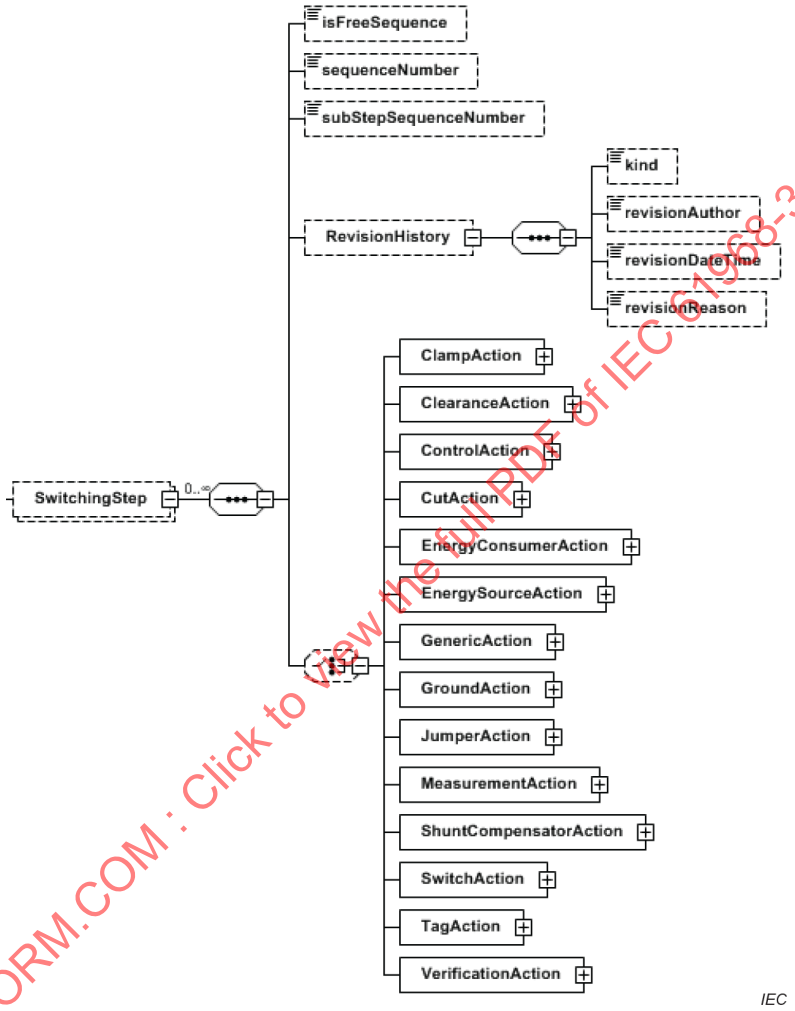


Figure 32 – SwitchingStep actions

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5.8.5 Specifying Order of Step Execution

It is possible to define the order of execution of both **SwitchingStepGroup**s and **SwitchingStep**s within a **SwitchingStepGroup**. Both the **SwitchingStepGroup** and the **SwitchingStep**s have a Boolean attribute, **isFreeSequence**.

For a step, if **isFreeSequence** is set to false or is not specified, all of the steps in the group must be executed in the order defined by the **sequenceNumber** attribute. The **sequenceNumber** for a step has a different meaning when there are two or more sequential steps that have the **isFreeSequence** attribute set to true. Execution must still be performed in **sequenceNumber** order until a set of two or more steps that have **isFreeSequence** set to true is encountered. In this case, these steps can be executed in any sequence, until a step is encountered that has **isFreeSequence** set to false. All of the steps preceding this step must be executed before the step can be executed.

An example is shown in Table 15. If **isFreeSequence** were set to false for all of the steps, the steps would have to be executed in order of **sequenceNumber**, starting at 1. However, it is set to true for steps 4, 5 and 6. The modified sequence is therefore to start at step 1, followed by step 2 and step 3. Steps 4, 5 and 6 can be executed in any order but must all be executed before step 7 can be executed.

Table 15 – Example of Switching Step Execution Order

Step	Attributes	Comments
SwitchingStep 1	sequenceNumber: 1 isFreeSequence: false	Must be executed first
SwitchingStep 2	sequenceNumber: 2 isFreeSequence: false	Must be executed after step 1.
SwitchingStep 3	sequenceNumber: 3 isFreeSequence: false	Must be executed after step 2
SwitchingStep 4	sequenceNumber: 4 isFreeSequence: true	Can be executed any time after step 3 has been executed.
SwitchingStep 5	sequenceNumber: 5 isFreeSequence: true	Can be executed any time after step 3 has been executed.
SwitchingStep 6	sequenceNumber: 6 isFreeSequence: true	Can be executed any time after step 3 has been executed.
SwitchingStep 7	sequenceNumber: 7 isFreeSequence: false	Can only be executed after steps 4, 5 and 6 have been executed.

Similar logic applies to a **SwitchingStepGroup**.

If a **SwitchingStep** has sub steps, all sub steps within a step must be executed in the order defined by **subStepSequenceNumber**.

Figure 33 is an example and shows steps that must be run sequentially and switching step groups that can be run in parallel. In the example, **SwitchingStepGroup** 1 must be run before Group 2, Group 3 and Group 4. Once Group 1 has been executed, Groups 2 and 3 can be executed in parallel or in any order. Group 4 cannot be executed until Groups 2 and 3 have been executed.

Also shown is that steps within Groups 1, 2 and 4 must be executed in sequence within their group, while steps 5 and 6 within Group 3 can be executed in any sequence. Step 7 in Group 3 must be executed after steps 5 and 6.

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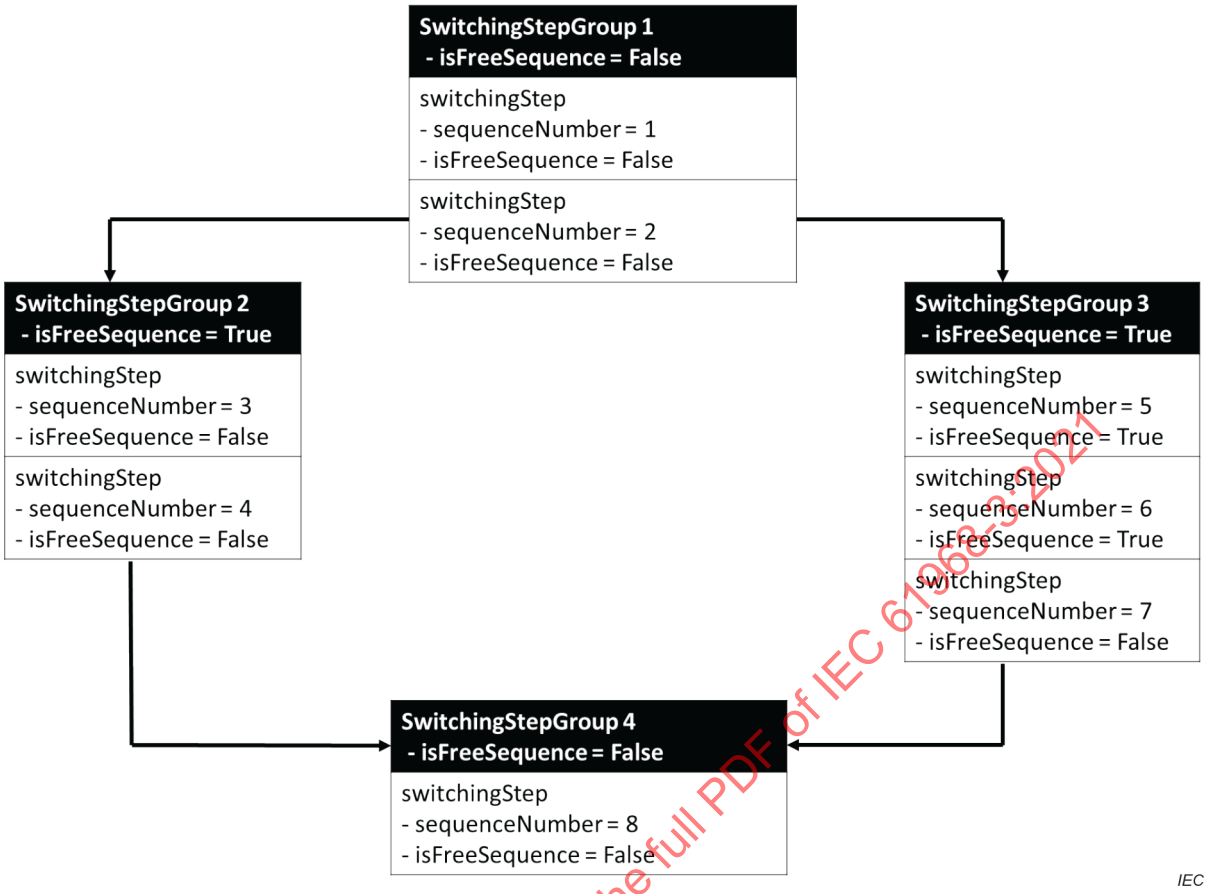


Figure 33 – SwitchingStepGroup and SwitchingStep Execution Order

5.8.6 SwitchingPlans payload – ClampAction

The **ClampAction** part of a **SwitchingPlan** is shown in Figure 34.

A **ClampAction** is a kind of step in a **SwitchingPlan** that involves placing a temporary **Clamp** on a conductor (**ACLineSegment**).

A **Clamp** is a galvanic connection at a line segment where other equipment is connected. A **Clamp** does not cut the line segment. A **Clamp** is **ConductingEquipment** and has one **Terminal** which is associated with a **ConnectivityNode**. A terminal of any other **ConductingEquipment** can be associated with the same **ConnectivityNode**.

Clamps are typically used to connect **jumpers** to an **ACLineSegment** in the case where the **jumper** is to be connected part way along an **ACLineSegment**. If the **jumper** is to be connected at either end of an **ACLineSegment**, then a **clamp** is not required.

The attributes of **ClampAction** that are used in this profile are shown in Table 16.

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Table 16 – ClampAction payload fragment for SwitchingPlans

Operations: ClampAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	**mRID of the ClampAction**
description	String	[0..1]		**Free form description**
Names	Name	[0..*]	See Annex B.56	Names for the ClampAction
kind	TempEquipActionKind	[0..1]	See Annex C.22	Determines whether the clamp is placed or removed. Enumeration with possible values place, remove.
Clamp	Clamp	[0..1]	See Annex B.14	Defines the actual clamp that is to be placed or removed.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See Annex B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See Annex B.59	This will be blank until the action is sent to the crew..

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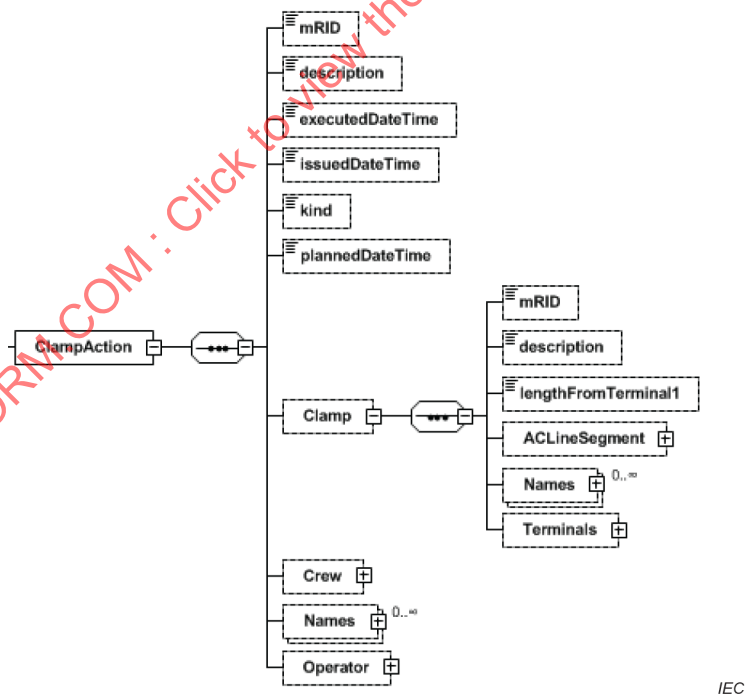


Figure 34 – SwitchingPlans – ClampAction

5.8.7 SwitchingPlans payload – ClearanceAction

The **ClearanceAction** part of a **SwitchingPlan** is shown in Figure 35.

A **ClearanceAction** is a kind of step in a **SwitchingPlan** that involves the transfer of control of a defined part of the electrical network after that part of the network is declared safe for field personnel to work.

The **ClearanceAction** can be used in a **SwitchingPlan** to define the transfer of control between a control room and field personnel when field work is ready to start. This is accomplished by defining a **ClearanceAction** with a **ClearanceAction.kind** of **issue**.

Control is passed back from the field to a control room after the field work is complete. This is accomplished by defining a **ClearanceAction** in the **SwitchingPlan** with a **ClearanceAction.kind** of **release**.

A **ClearanceAction.kind** of **update** in a **SwitchingPlan** can be used to change the list of **TaggedPSRs** when the **SwitchingPlan** requires the clearance scope to be expanded or contracted, or other attributes related to responsibilities.

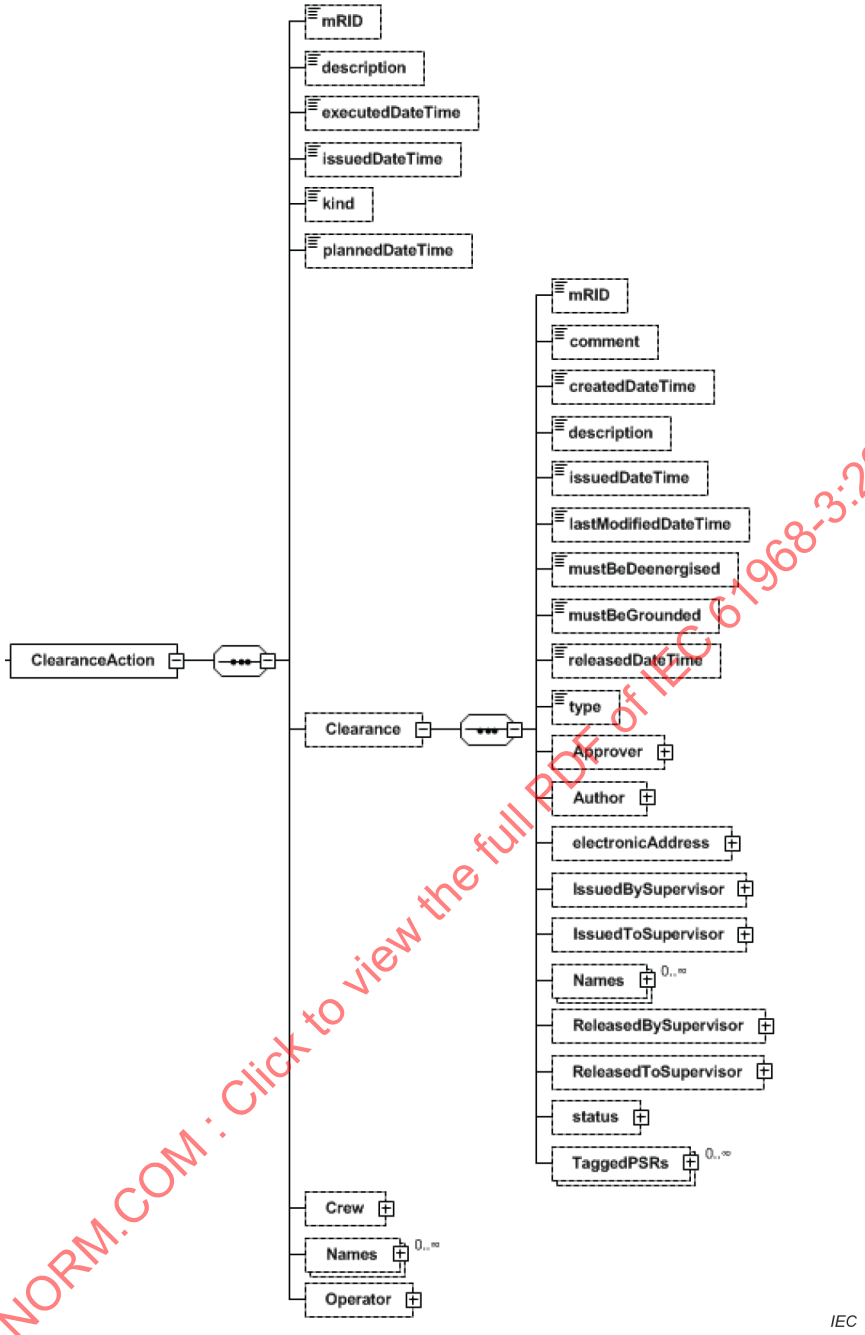
The fields for a **ClearanceAction** are shown in Figure 35.

The attributes of **ClearanceAction** that are used in this profile are shown in Table 17.

Table 17 – ClearanceAction payload fragment for SwitchingPlans

Operations: ClearanceAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the ClearanceAction
description	String	[0..1]		Free form description of the ClearanceAction
Names	Name	[0..*]	See B.56	Human-readble names for the ClearanceAction
kind	ClearanceActionKind	[0..1]	See C.4	Whether to issue, update or release the Clearance.
Clearance	Clearance	[0..1]	See B.16	Defines the actual Clearance to be issued, updated or released.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.

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Figure 35 – SwitchingPlans – ClearanceAction

5.8.8 SwitchingPlans Payload – ControlAction

The **ControlAction** part of the **SwitchingPlans** payload is shown in Figure 36. The fields that are unique to a **ControlAction** are a choice of different types of control actions:

- **AccumulatorReset** – see Subclause 5.5.3
- **AnalogControl** – see Subclause 5.5.3.2
- **Command** – see Subclause 5.5.4.2
- **RaiseLowerCommand** – see Subclause 5.5.5.2
- **SetPoint** – see Subclause 5.5.6.2

A **ControlAction** is a **SwitchingPlan** step to change the state of equipment in the field. This may be accomplished either through a **SwitchingActions** message (manual) or a PSRControls message (automated). See 5.7 for further details.

The attributes of **ControlAction** that are used in this profile are shown in Table 18.

Table 18 – ControlAction payload fragment for SwitchingPlans

Operations: ControlAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of this ControlAction.
description	String	[0..1]		Free-form description of this ControlAction
Names	Name	[0..*]	See B.56	Human-readable names for this ControlAction
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See Annex B.59	This will be blank until the action is sent to the crew.
Choice of Controls		[1..1]		
Choice of one of the following				
AccumulatorReset	AccumulatorReset		See 5.6.4	
AnalogControl	AnalogControl		See 5.6.5	
Command	Command		See 5.6.6	
RaiseLowerCommand	RaiseLowerCommand		See 5.6.7	
SetPoint	SetPoint		See 5.6.8	

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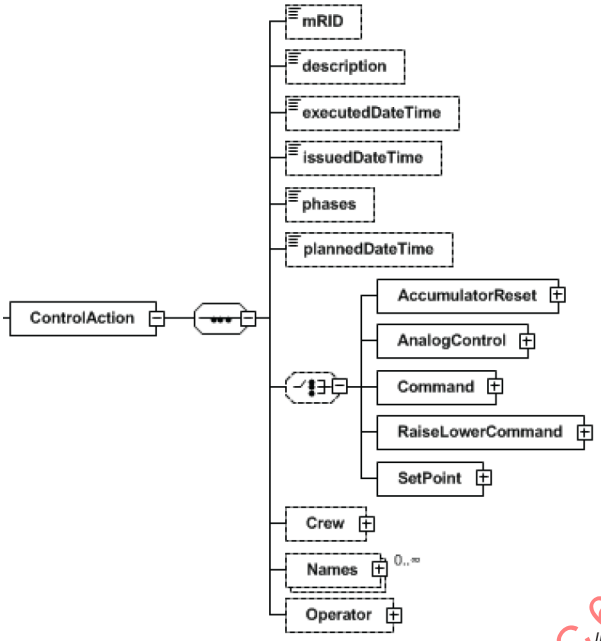


Figure 36 – SwitchingPlans – ControlAction

The **ControlAction** is required to be part of the **SwitchingPlan** so that manual control actions can be captured as part of the **SwitchingPlan**. A 'manual control' action is a request for the field crew to perform control actions using the local controls of a field device, such as changing a setpoint or changing a voltage regulator tap position. During execution of the SwitchingPlan, requests to the field crew are issued using a **SwitchingAction**.**ControlAction** and results are returned from the field with a **SwitchingEvent**.**ControlAction**.

If there is remote control capability available then the **SwitchingPlan** still defines a step of type **ControlAction**. However, during execution of the **SwitchingPlan**, requests for controls are sent to SCADA. Remote **ControlActions** are performed using **PSRControls** and **PSRMeasurements** as shown in the sequence diagram in Figure 19 and as described in Subclause 5.7.

5.8.9 SwitchingPlans Payload – CutAction

A **CutAction** is used to specify a switching step to add or remove a **Cut** to/from a conductor (**ACLineSegment**).

The **CutAction** part of the **SwitchingPlans** payload is shown in Figure 37.

The attributes of **CutAction** that are used in this profile are shown in Table 19. The **Cut** payload contents are described in B.18.

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Table 19 – CutAction payload fragment for SwitchingPlans

Operations: CutAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of this CutAction.
description	String	[0..1]		Free-form description of this CutAction
Names	Name	[0..*]	See B.56	Human-readable names for this CutAction
kind	TempEquipActionKind	[0..1]	See C.20	Indicates whether the cut should be placed or removed.
Cut	Cut	[0..1]	See B.18	The cut that is to be placed or removed.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field.
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew.
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.

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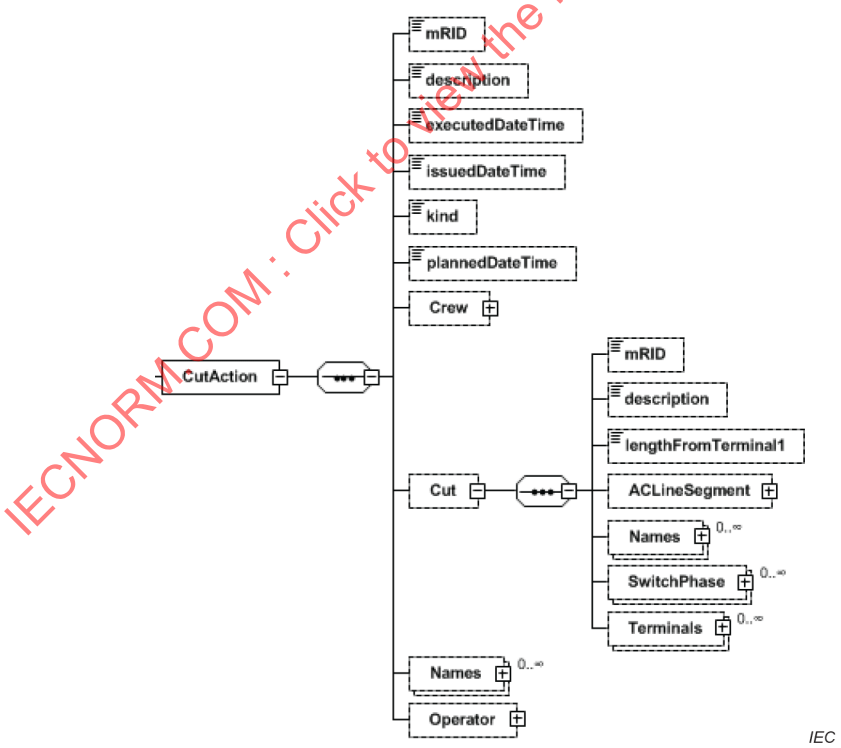


Figure 37 – SwitchingPlans – CutAction

A full description of a **Cut** and an example is given in IEC 61970-301.

5.8.10 SwitchingPlans payload – EnergyConsumerAction

The **EnergyConsumerAction** of the **SwitchingPlans** payload is shown in Figure 38.

An **EnergyConsumerAction** is used to specify a switching step to temporarily disconnect or connect a permanent **EnergyConsumer** from its terminals. **TempEquipAction.kind** defines whether to disconnect or connect the **EnergyConsumer** and can have values of **disconnect** or **connect**.

The attributes of **EnergyConsumerAction** that are used in this profile are shown in Table 20.

Table 20 – EnergyConsumerAction payload fragment for SwitchingPlans

Operations: EnergyConsumerAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the EnergyConsumerAction
description	String	[0..1]		Free form description of EnergyConsumerAction
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	TempEquipActionKind	[0..1]	See C.20	Defines whether to disconnect or connect the energy consumer.
phases	PhaseCode	[0..1]	See C.12	Phases to perform the action on.
EnergyConsumer	EnergyConsumer	[0..1]	See B.34	EnergyConsumer to disconnect or connect.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew.
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.

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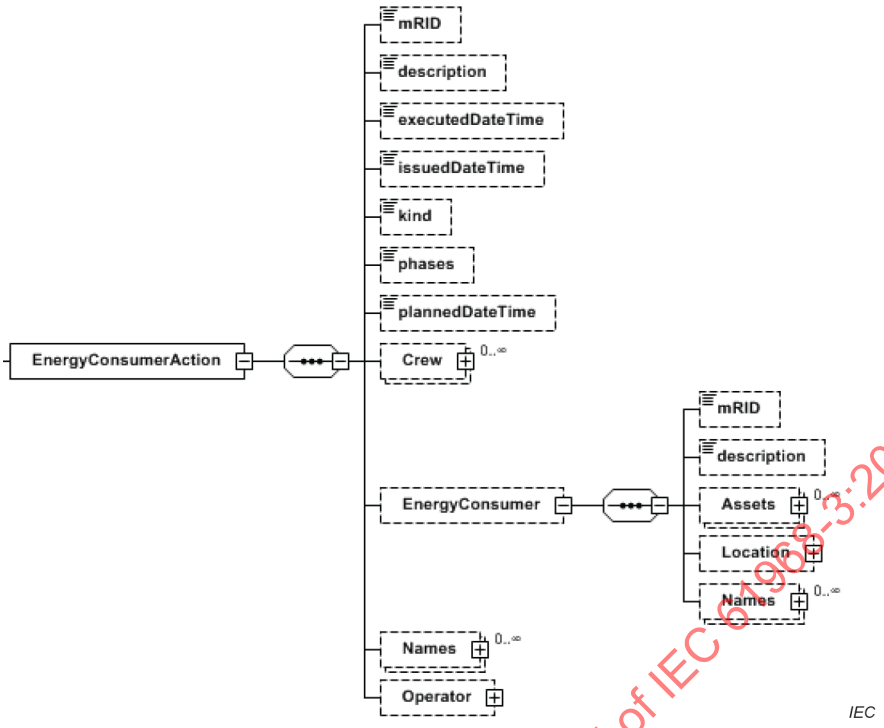


Figure 38 – SwitchingPlans – EnergyConsumerAction

5.8.11 SwitchingPlans payload – EnergySourceAction

The **EnergySourceAction** of the **SwitchingPlans** payload is shown in Figure 39.

An **EnergySourceAction** is used to specify a switching step to add or remove a temporary **EnergySource**. **TempEquipAction.kind** defines whether to add or remove the **EnergySource** and can have values of **place** or **remove**. In addition, an **EnergySourceAction** is used to specify a switching step to temporarily disconnect or connect a permanent **EnergySource** from its terminals. **EnergySourceAction.kind** defines whether to disconnect or connect the **EnergySource** and can have values of **disconnect** or **connect**.

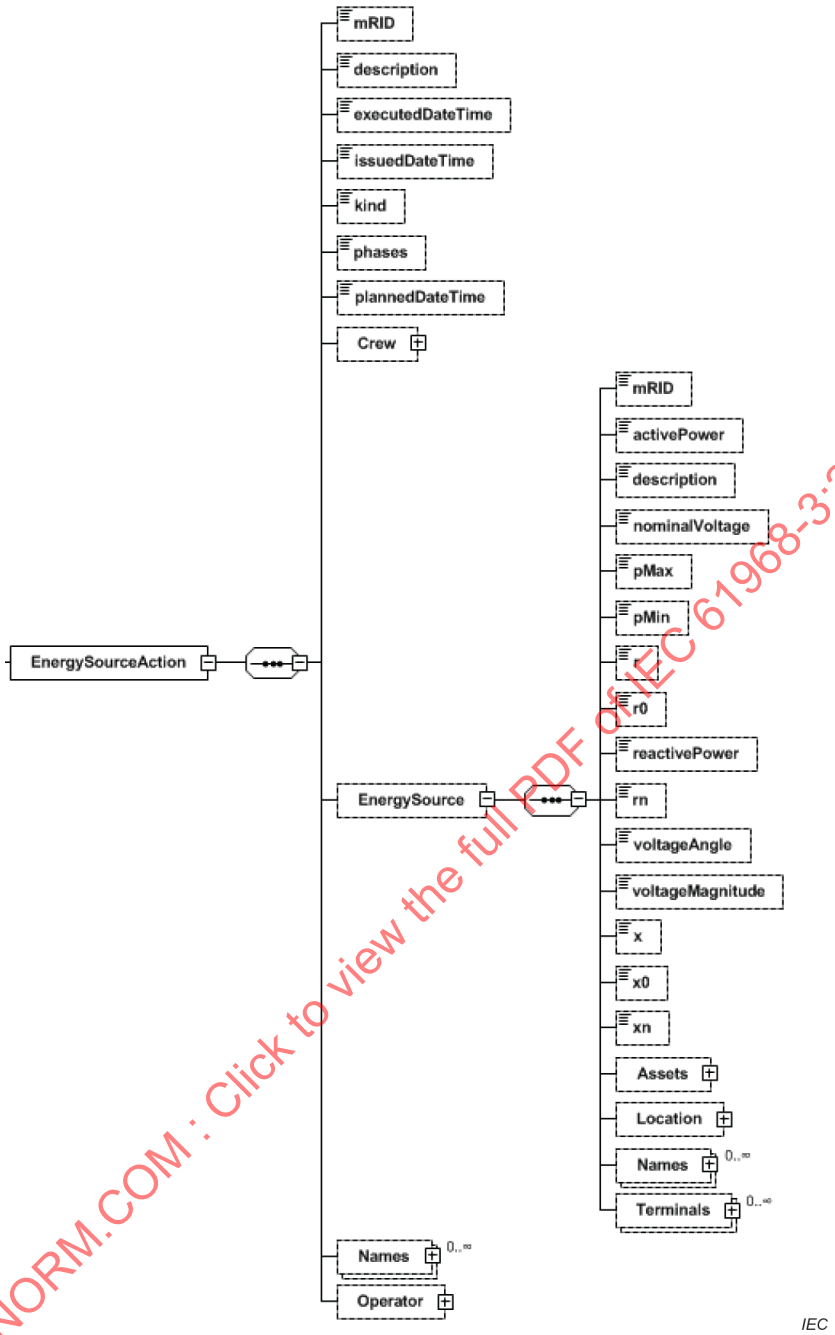
The attributes of **EnergySourceAction** that are used in this profile are shown in Table 21.

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Table 21 – EnergySourceAction payload fragment for SwitchingPlans

Operations: EnergySourceAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the EnergySourceAction
description	String	[0..1]		Free form description of EnergySourceAction
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	TempEquipActionKind	[0..1]	See C.20	Defines whether to place, remove, disconnect or connect the energy source.
EnergySource	EnergySource	[0..1]	See B.35	EnergySource to place, remove, disconnect or connect
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew.
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.

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Figure 39 – SwitchingPlans – EnergySourceAction

5.8.12 SwitchingPlans payload – GenericAction

The **GenericAction** part of the **SwitchingPlans** payload is shown in Figure 40.

Generic actions within a **SwitchingPlan** define the set of actions that are performed as a switching step that do not impact the state of the network or to perform an action on a part of the network that is not modelled.

An example of an action that does not impact the state of the network is manually changing the mode of a device (e.g. place in manual when the mode is not remotely controllable) to be recorded as a switching step. In this case, the **description** is used to define the action, e.g. “Place in manual” and the **PowerSystemResource** would define the network component to place in manual.

An example of an action on a part of the network that is not modelled would be operating customer-owned equipment that is operated by the utility but not owned by them. In this case, the **description** is used to define what is to be done, and all parts of the **PowerSystemResource** are blank, other than the **Location**, which is used to define the geographic **Location** of where the action is to be performed.

The attributes of **GenericAction** that are used in this profile are shown in Table 22.

Table 22 – GenericAction payload fragment for SwitchingPlans

Operations: GenericAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of this GenericAction.
description	String	[0..1]		Free-form description of this GenericAction
Names	Name	[0..*]	See B.56	Human-readable names for this GenericAction
phases	PhaseCode	[0..1]	See C.12	Phases to be operated by this action.
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	Defines the PowerSystemResource to perform the GenericAction on.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.

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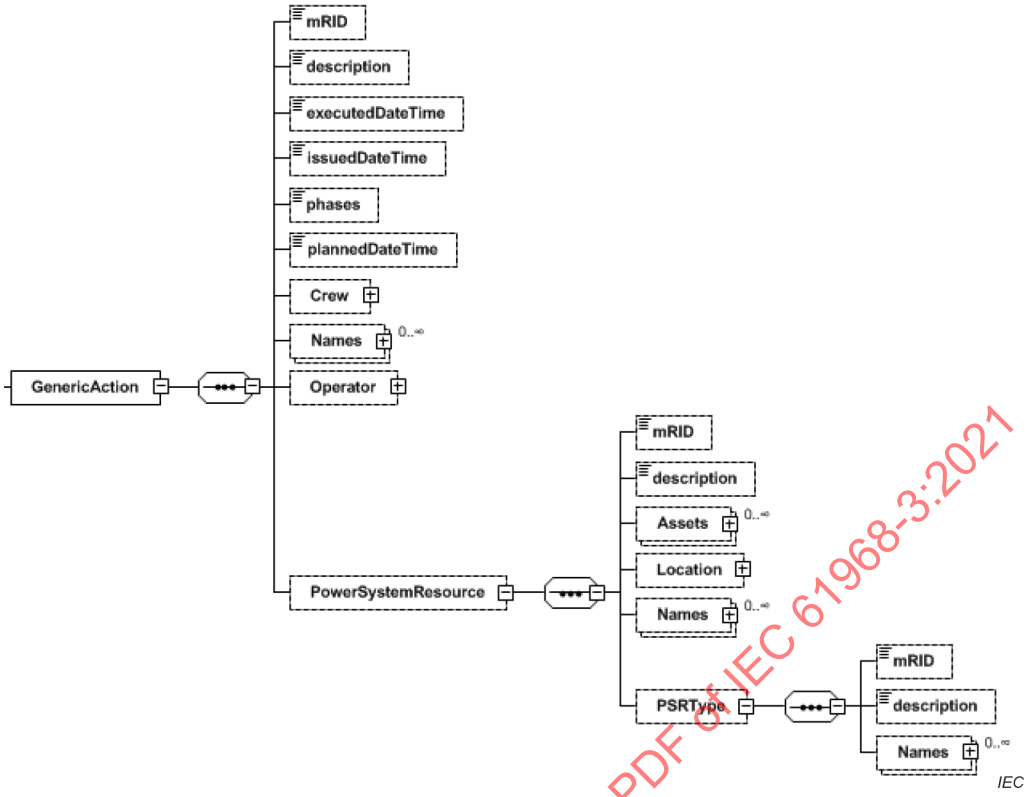


Figure 40 – SwitchingPlans – GenericAction

5.8.13 SwitchingPlans payload – GroundAction

A **GroundAction** is used to specify a switching step to place or remove a **Ground** to/from a conductor or equipment, as defined by **GroundAction.kind**.

A **Ground** is a point where the system is grounded. It is used for connecting conducting equipment to ground. The power system model can have any number of **Ground**s.

The **Ground** may be placed on one of the terminals of an **ACLineSegment** or may be placed on one of the terminals of **ConductingEquipment**. If the **Ground** needs to be placed part way along an **ACLineSegment**, then the **Ground** must be placed on the terminal of a **Clamp**. The **Clamp** must already have been placed. It is important to make sure that the ground is attached to the correct terminal of a component that has more than one terminal. For example, if attaching a ground to an open switch that is energized on one side, the ground should be attached to the terminal that is expected to be de-energized.

If the ground is to be placed on less than all of the available phases, the phase is specified by **Ground.Terminal.phases**. This is shown in Figure 42.

The **GroundAction** part of the **SwitchingPlans** payload is shown in Figure 41.

The attributes of **GroundAction** that are used in this profile are shown in Table 23.

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Table 23 – GroundAction payload fragment for SwitchingPlans

Operations: GroundAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID for the GroundAction
description	String	[0..1]		free-form description of the GroundAction
Names	Name	[0..*]	See B.56	Human-readable names for this GroundAction.
kind	TempEquipActionKind	[0..1]	See C.22	Defines the action to be performed, either place the ground or remove the ground
Ground	Ground	[0..1]	See B.44	Ground to place or remove.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.
Choice of one of the following				
ACLineSegment	ACLineSegment		See B.4	Conductor where the ground is to be placed.
Clamp	Clamp		See B.14	Clamp where the ground is to be placed, if the ground is to be placed part way along a conductor
ConductingEquipment	ConductingEquipment		See B.14	ConductingEquipment where the ground is to be placed.

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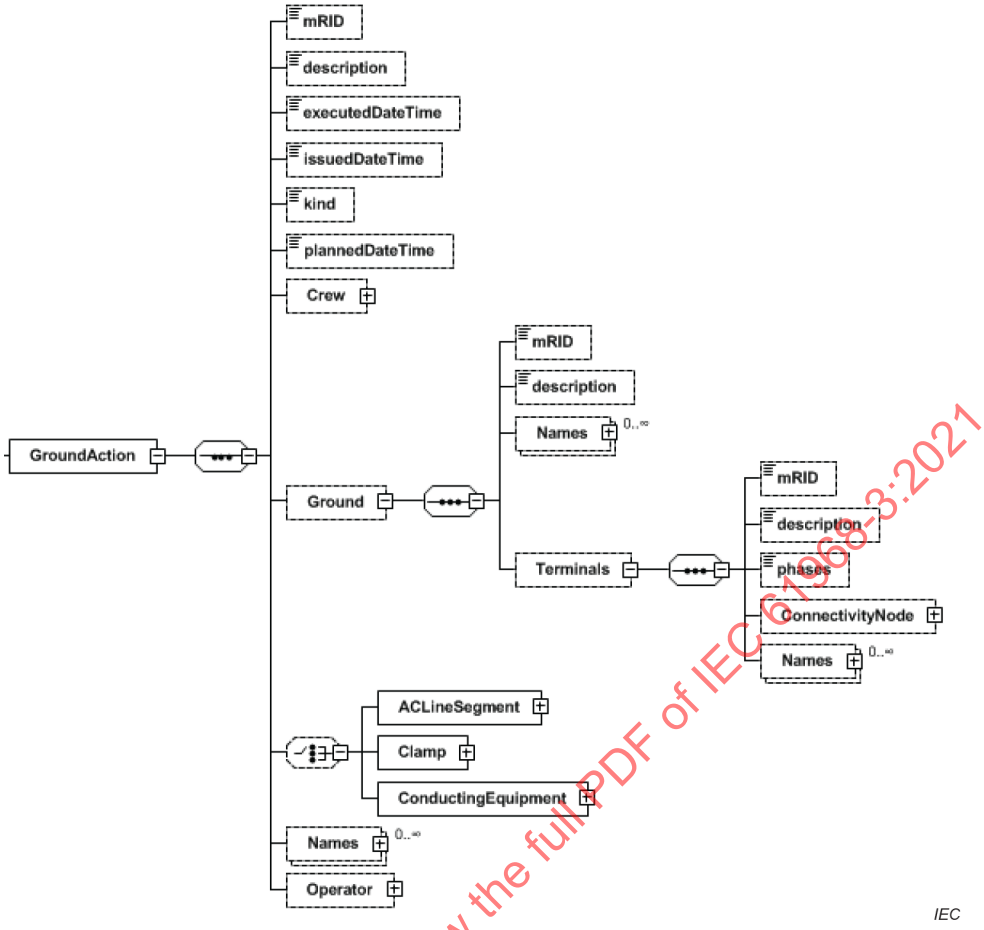


Figure 41 – SwitchingPlans – GroundAction

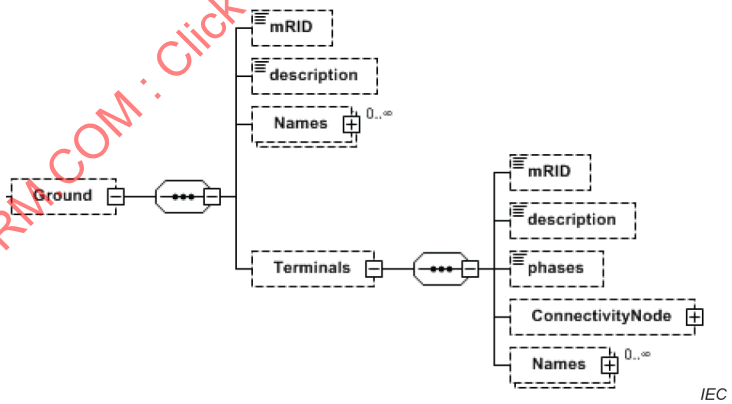


Figure 42 – SwitchingPlans – GroundAction – Ground

The ground can be placed at one of three possible choices. The terminal associated with the ground is connected to the terminal defined in each of the possible choices. For ConductingEquipment that has more than one terminal, the ground is attached to the terminal defined in the payload. Figure 43 shows the payload fragment for the **ACLineSegment** choice.

ACLineSegment fields are defined in Clause B.4.

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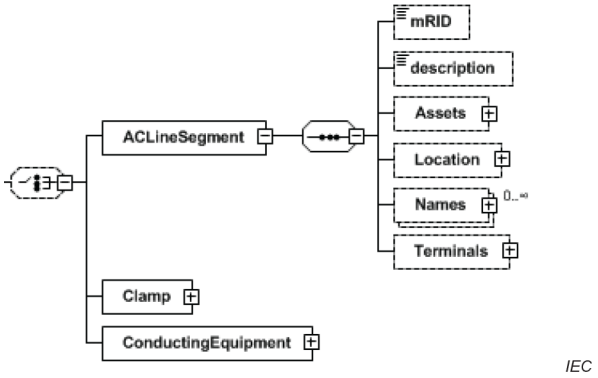


Figure 43 – ACLineSegment choice for connecting ground

Figure 44 shows the payload fragment for the **Clamp** choice.

Clamp fields are defined in Clause B.14.

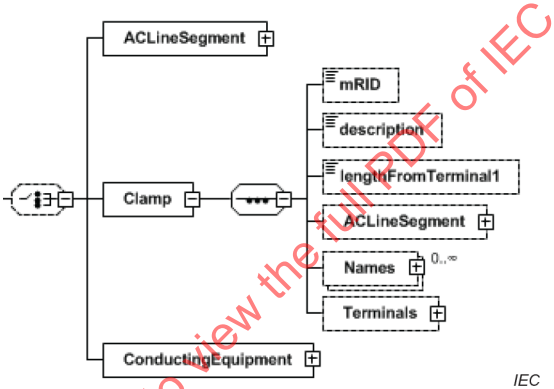


Figure 44 – Clamp choice for connecting ground

Figure 45 shows the payload fragment for the **ConductingEquipment** choice.

ConductingEquipment fields are defined in Clause B.17.

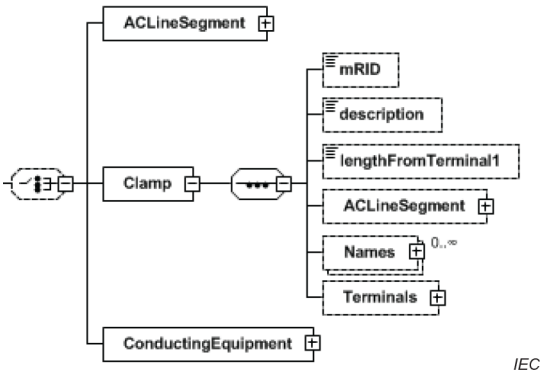


Figure 45 – ConductingEquipment choice for connecting ground

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5.8.14 **SwitchingPlans** payload – **JumperAction**

A **JumperAction** is used to specify a switching step to add or remove a **Jumper**. A **Jumper** is a temporary conductor that is used to energize the network and has negligible impedance. In CIM, a **Jumper** inherits from **Switch** and therefore has two **Terminals** and can be open or closed.

Depending on the type of the network (balanced / unbalanced), a **JumperAction** may affect either three phases, two phases or a single phase. In the case of creating a single or two phase jumper, this jumper may connect two or three different phases of the respective field resources (cross phase jumper).

Jumpers must be placed between two **terminals**. Each **terminal** may be one of the following:

- One of the **terminals** of an **ACLineSegment**
- The **terminal** of a **clamp**
- One of the **terminals** of a **ConductingEquipment**.

If used, the **clamp**(s) must already have been placed before the **jumper** can be placed. When the **jumper** is removed, the **clamp**(s) shall remain and must be explicitly removed by a **ClampAction**.

In order to ensure that the correct side of the jumper is placed at the correct terminal, the **ConnectivityNode** in each pair of **terminals** to be connected must be the same in the payload. In other words, the **ConnectivityNode** for the **terminal** with sequence number 1 in the **jumper** must be the same as the **ConnectivityNode** for the terminal of the **ACLineSegment**, **Clamp** or **ConductingEquipment** that side 1 of the **jumper** connects to. The same applies for side 2 of the **jumper**.

The **JumperAction** part of the **SwitchingPlans** payload is graphically shown in Figure 46.

The attributes of **JumperAction** that are used in this profile are shown in Table 24.

Table 24 – JumperAction payload fragment for SwitchingPlans

Operations: JumperAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of this ControlAction.
description	String	[0..1]		Free-form description of this ControlAction
Names	Name	[0..*]	See B.56	Human-readable names for this ControlAction
kind	TempEquipActionKind	[0..1]	See C.20	Indicates whether the jumper should be placed or removed.
ACLineSegment	ACLineSegment	[0..*]	See B.4	There could be zero, one or two ACLineSegments in the payload, depending on where the jumper is to be attached. Each ACLineSegment defines where one end of the jumper is to be placed.
Clamp	Clamp	[0..*]	See B.14	There could be zero, one or two Clamps in the payload, depending on where the jumper is to be attached. Each clamp defines where one end of the jumper is attached to

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Operations: JumperAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
JumpedEquipments	ConductingEquipment	[0..*]	See B.14	There could be zero, one or two JumpedEquipments in the payload, depending on where the jumper is to be attached. Each JumpedEquipments defines the ConductingEquipment that one end of the jumper is attached to.
Jumper	Jumper	[0..1]	See B.35	The jumper that is to be placed or removed.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.

The **Jumper** part of the payload is defined in Clause B.35.

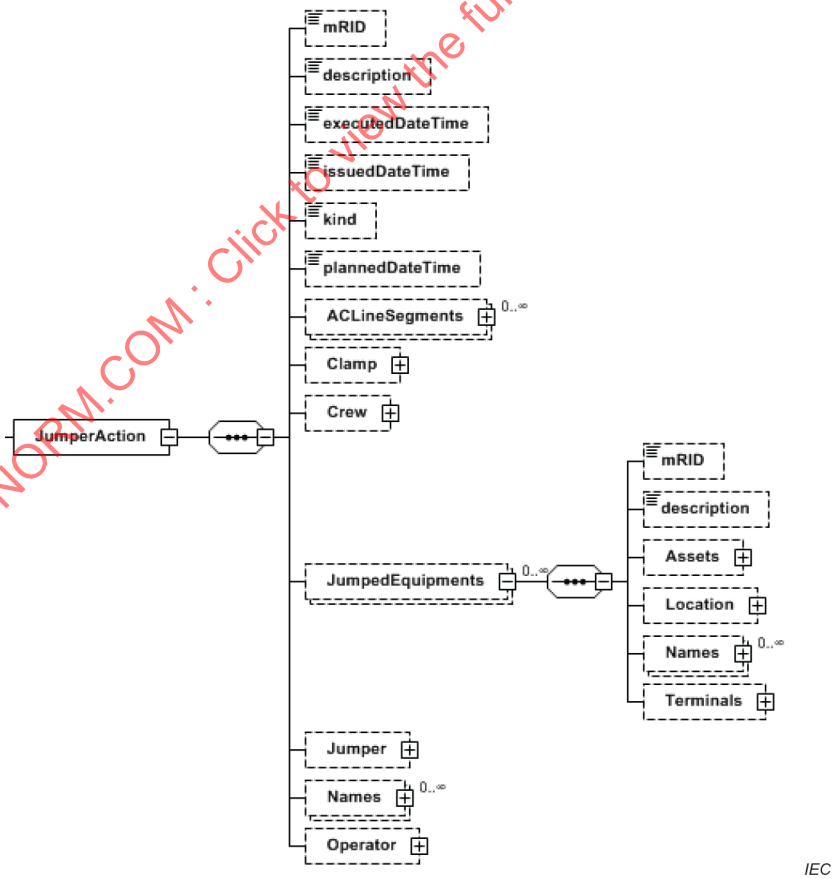


Figure 46 – SwitchingPlans – JumperAction

The payload fragment for **Jumper** is shown in Figure 47.

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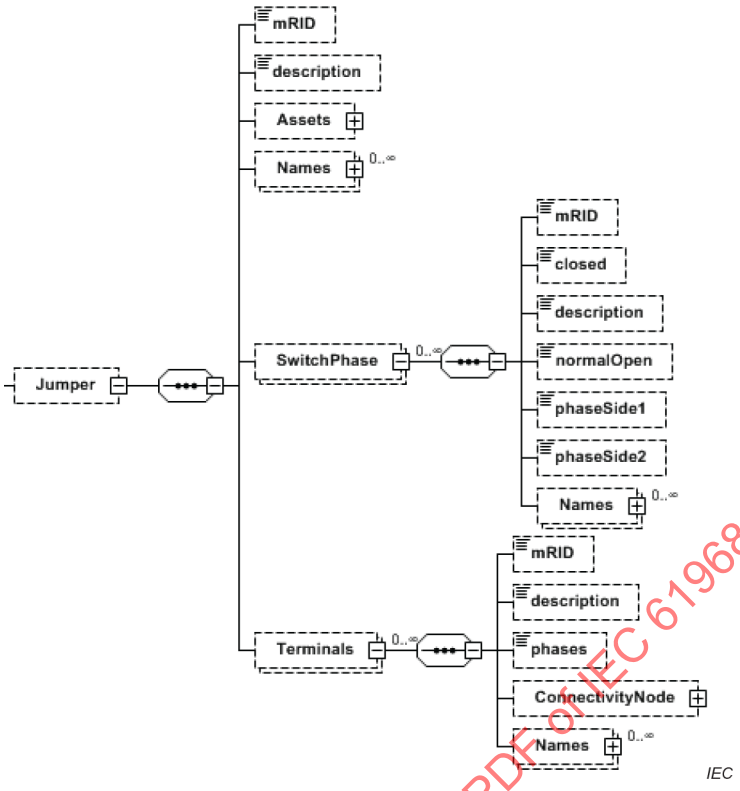


Figure 47 – SwitchingPlans – Jumper payload fragment

5.8.15 SwitchingPlans payload – MeasurementAction

Figure 48 shows the **MeasurementAction** field in the **SwitchingPlans** message payload.

The attributes of **MeasurementAction** that are used in this profile are shown in Table 25.

A **MeasurementAction** within a **SwitchingPlan** defines a measurement associated with a power system resource that must be manually recorded as part of the **SwitchingStep**. For example, an Amps measurement may be taken prior to closing a switch and then a second measurement is taken after the switch is closed, in order to confirm that the switch has actually closed. These measurements form a permanent record of the switching that was performed. Please see Subclause 5.4 for a description of the **GetPSRMeasurements** and **PSRMeasurements** profiles that can be used to obtain measurements electronically.

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Table 25 – MeasurementAction payload fragment for SwitchingPlans

Operations: MeasurementAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of this MeasurementAction.
description	String	[0..1]		Free-form description of this MeasurementAction
Names	Name	[0..*]	See B.56	Human-readable names for this MeasurementAction
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed.
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.
Choice of one of the following				
Accumulator	Accumulator		See B.2	
Analog	Analog		See B.6	
Discrete	Discrete		See B.28	
StringMeasurement	StringMeasurement		See B.82	

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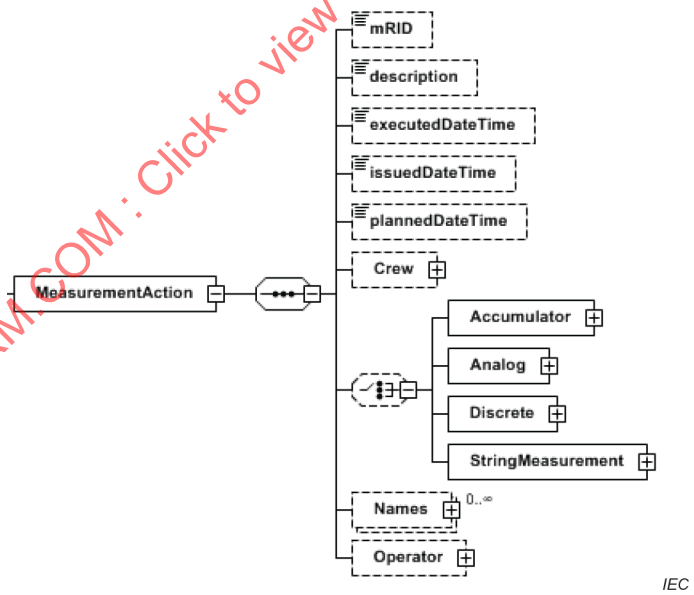


Figure 48 – SwitchingPlans – MeasurementAction

The **MeasurementAction** is included in the **SwitchingPlan** payload so that manual measurements can be captured as part of the **SwitchingPlan**. During execution of the **SwitchingPlan**, requests to the field crew are issued using a **SwitchingAction**.**MeasurementAction** and results are returned from the field with a **SwitchingEvent**.**MeasurementAction**. Please see the sequence diagram in Figure 59 that shows **SwitchingEvents** and **SwitchingActions**.

If there is telemetry available then the **SwitchingPlan** can also define a step of type **MeasurementAction**. In this case, during execution of the **SwitchingPlan**, requests for measurements are sent to SCADA using **PSRMeasurements** as shown in Figure 49. In the diagram there is a request to get a **PSRMeasurements**, and then the actual measurements being sent back as a reply **PSRMeasurements**. Please refer to IEC 61968-100 for a description on the usage of get profiles.

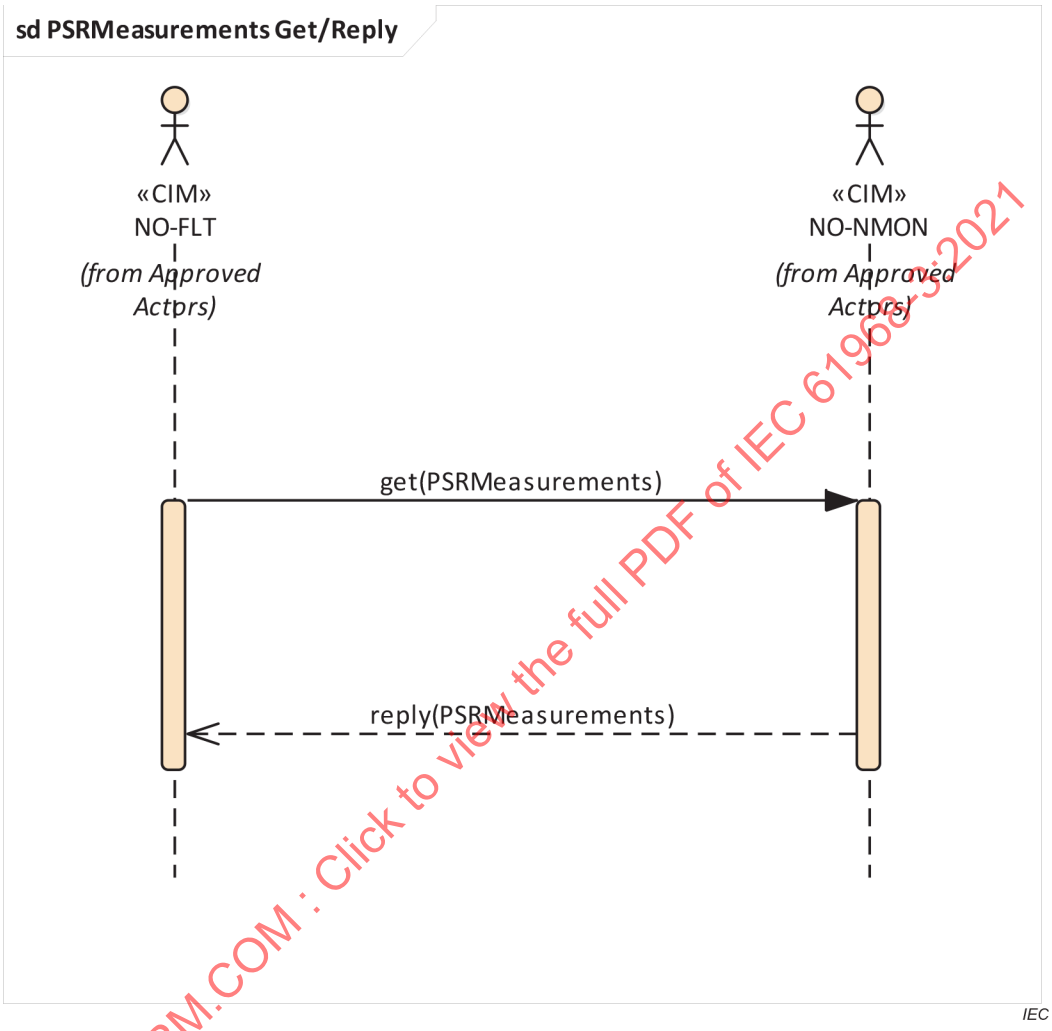


Figure 49 – Execution of a SwitchingStep with a MeasurementAction and the quantity is telemetered

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5.8.16 SwitchingPlans payload – ShuntCompensatorAction

The **ShuntCompensatorAction** of the **SwitchingPlans** payload is shown in Figure 50.

A **ShuntCompensatorAction** is used to specify a switching step to temporarily disconnect or connect a permanent **ShuntCompensator** from its terminals. **kind** defines whether to disconnect or connect the **ShuntCompensator** and can have values of **disconnect** or **connect**.

The attributes of **ShuntCompensatorAction** that are used in this profile are shown in Table 26.

Table 26 – ShuntCompensatorAction payload fragment for SwitchingPlans

Operations: ShuntCompensatorAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the ShuntCompensatorAction
description	String	[0..1]		Free form description of ShuntCompensatorAction
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	TempEquipActionKind	[0..1]	See C.20	Defines whether to disconnect or connect the shunt compensator.
phases	PhaseCode	[0..1]	See C.12	Phases to perform the action on.
ShuntCompensator	ShuntCompensator	[0..1]	See B.78	ShuntCompensator to disconnect or connect.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew.
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.

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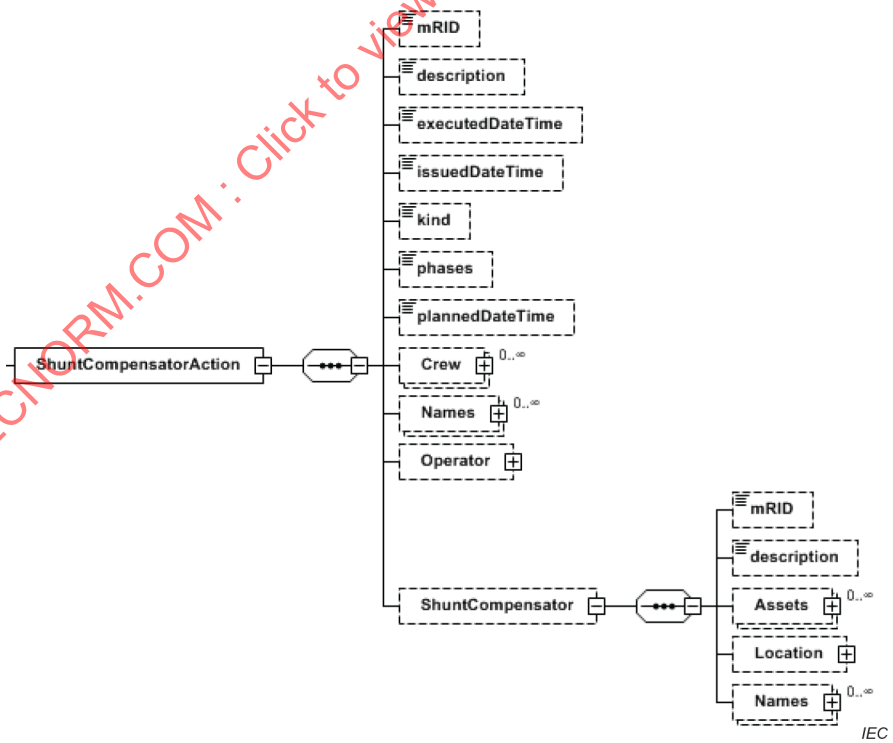


Figure 50 – SwitchingPlans – ShuntCompensatorAction

5.8.17 **SwitchingPlans** payload – **SwitchAction**

The **SwitchAction** part of the **SwitchingPlans** payload is shown in Figure 51. **SwitchAction** is used to specify a switching step to open or close one or more phases of an **OperatedSwitch**. If some phases on a multi-phase switch are to be opened, and some are to be closed, two separate **SwitchActions**, each specifying the particular **SwitchPhase,** are required. This is because **SwitchAction.kind** applies to the switch as a whole..

The attributes of **SwitchAction** that are used in this profile are shown in Table 27.

Table 27 – SwitchAction payload fragment for SwitchingPlans

Operations: SwitchAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the action
description	String	[0..1]		Free form description of the action
Names	Name	[0..*]	See B.56	Human-readable names for the SwitchAction.
kind	SwitchActionKind	[0..1]	See C.20	Switching action to perform – open, close, disableReclosing, enableReclosing
OperatedSwitch	Switch	[0..1]	See B.86	Switch to operate.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.

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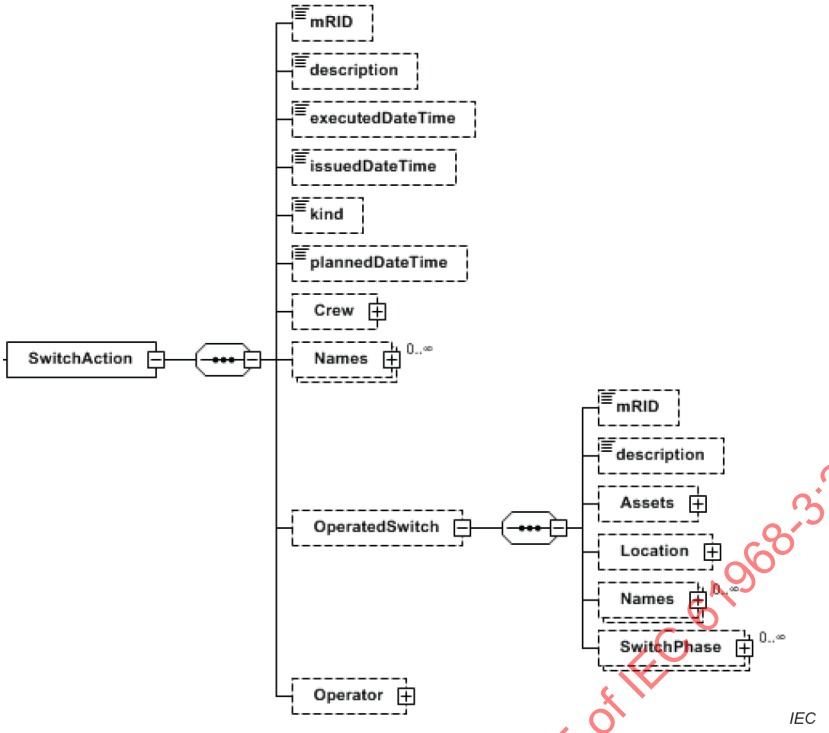


Figure 51 – SwitchingPlans – SwitchAction

5.8.18 SwitchingPlans payload – TagAction

The **SwitchingPlans TagAction** payload is shown in Figure 52. The **TagAction** is used to specify a switching step to **place**, **remove** or **verify** an **OperationalTag**, as defined by **TagAction.kind**. The function that the tag performs, such as do not operate, do not close, etc, is defined by **TagAction.OperationalTag.type**. If not all of the available phases are to be tagged, the **phases** attribute specifies which phase(s) are to be tagged.

The allowable values of **TagAction.OperationalTag.type** are not defined in this document.

The attributes of **TagAction** that are used in this profile are shown in Table 28.

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Table 28 – TagAction payload fragment for SwitchingPlans

Operations: TagAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of this TaglAction.
description	String	[0..1]		Free-form description of this TagAction.
Names	Name	[0..*]	See B.56	Human-readable names for this TagAction.
kind	TagActionKind	[0..1]	See C.21	Operation to be performed on the Tag – place, remove, verify.
OperationalTag	OperationalTag	[0..1]	See B.59	The actual tag that is to be placed, removed or verified.
phases	PhaseCode	[0..1]	See C.12	Phases on which the tag is to be placed,. e.g. A, AB, AC, ABC, etc.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.

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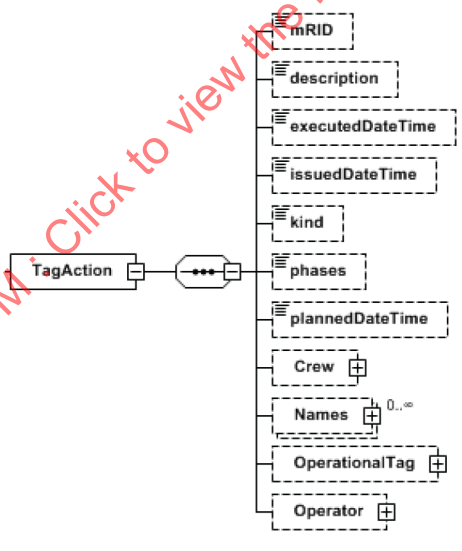


Figure 52 – SwitchingPlans – TagAction payload

The payload for the **OperationalTag** part of the **TagAction** is shown in Figure 53. Its contents are defined in Clause B.59.

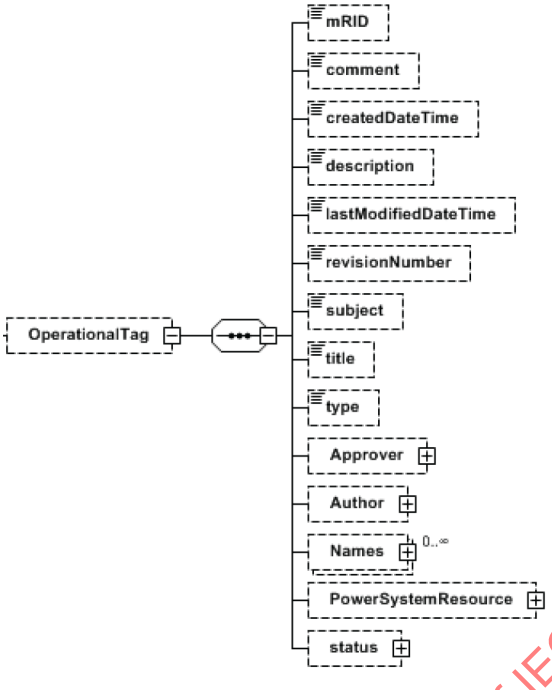


Figure 53 – SwitchingPlans – OperationalTag payload fragment

5.8.19 SwitchingPlans payload – VerificationAction

The **SwitchingPlans VerificationAction** payload fragment is shown in Figure 54. The **VerificationAction** is used to specify a switching step to verify that the **PowerSystemResource** is in an expected state, such as checking that a switch is open.

The attributes of **VerificationAction** that are used in this profile are shown in Table 29.

Table 29 – VerificationAction payload fragment for SwitchingPlans

Operations: VerificationAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of this VerificationAction.
description	String	[0..1]		Free-form description of this VerificationAction
Names	Name	[0..*]	See B.56	Human-readable names for this VerificationAction
phases	PhaseCode	[0..1]	See C.12	Phases to perform the action on, e.g. A, AB, AC, ABC, etc.
verificationCondition	String	[0..1]		Free from text string describing the condition to verify, e.g. check open, disable reclosing, put into manual mode, etc.
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	PowerSystemResource to perform the verification action on.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		This will be blank until the action is sent to the crew
plannedDateTime	DateTime	[0..1]		Date and time of when the step is planned to be executed

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Operations: VerificationAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
Crew	Crew	[0..1]	See B.22	Crew assigned to the step. A Crew can be pre-assigned to perform the step.
Operator	Operator	[0..1]	See B.59	This will be blank until the action is sent to the crew.

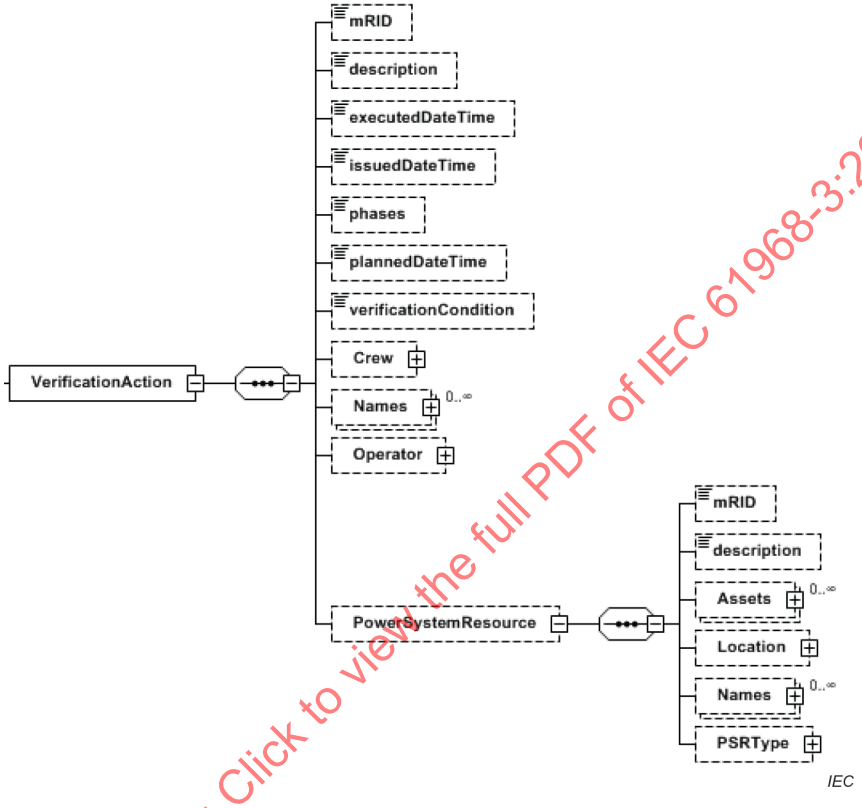


Figure 54 – SwitchingPlans – VerificationAction payload

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5.8.20 Example SwitchingPlan

Table 30 shows example switching plan steps and their mapping to CIM objects. The Step Number column and Operation column are what would be shown in a typical real-world switching plan. The explanation and mapping columns are provided to describe what the purpose of each step is and how it maps to the CIM. In this example there is only one **SwitchingStepGroup.**

Table 30 – Example of a switching plan

Step Number	Operation	Explanation	Mapping
	Isolate and Place Tags	Heading step that is not numbered and is not executable	**SwitchingStepGroup** with a **sequenceNumber** of 1 and a **description** of “Isolate and Place Tags” No **SwitchingStep**
1	Contact aluminium plant to tell them their planned outage is about to start	Executable comment step to tell the control room to do something that is not related to the network	**SwitchingStep** with a **sequenceNumber** of 1 and a **GenericAction** that has a **description** of “Contact aluminium plant to tell them their planned outage is about to start”
2	Open switch 12345	Executable step that changes the network	**SwitchingStep** with a **sequenceNumber** of 2 and a **SwitchAction**.
3	Place do not operate tag on switch 12345	Executable tag step	**SwitchingStep** with a **sequenceNumber** of 3 and a **TagAction**.
4	Check open switch 6789 and place do not operate tag	Executable compound step made up of a verification step and a tag step	**SwitchingStep** with a **sequenceNumber** of 4, a **subStepSequenceNumber** of 1 and a **VerificationAction**. **SwitchingStep** with a **sequenceNumber** of 4 a **subStepSequenceNumber** of 2 and a **TagAction**.
5	Issue clearance number 99 to crew Joe Blow using do not operate tag on switch 12345 and do not operate tag on switch 6789	Executable clearance action step	**SwitchingStep** with a **sequenceNumber** of 5 and a **ClearanceAction**.
	Return to Normal	Heading step that is not numbered and is not executable	**SwitchingStepGroup** with a **sequenceNumber** of 2 and a description of “Return to Normal” No **SwitchingStep**
6	Release clearance number 99 from crew Joe Blow using do not operate tag on switch 12345 and do not operate tag on switch 6789	Executable clearance action step	**SwitchingStep** with a **sequenceNumber** of 6 and a **ClearanceAction**.
7	Remove do not operate tag from switch 6789	Executable tag step	**SwitchingStep** with a **sequenceNumber** of 7 and a **TagAction**.
8	Remove do not operate tag from switch 12345	Executable tag step	**SwitchingStep** with a **sequenceNumber** of 8 and a **TagAction**.
9	Close switch 12345	Executable step that changes the network	**SwitchingStep** with a **sequenceNumber** of 9 and a **SwitchAction**.
10	Contact aluminium plant to tell them their planned outage is over	Executable comment step to tell the control room to do something that is not related to the network	**SwitchingStep** with a **sequenceNumber** of 10 and a **GenericAction** that has a **description** of “Contact aluminium plant to tell them their planned outage is over”

Sample XML for the steps of the above switching plan is shown in Figure 55. Note: this is a fragment, not a complete SwitchingPlan.

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```
<SwitchingPlans>
   <SwitchingPlan>
        <SwitchingStepGroups>
            <sequenceNumber>1</sequenceNumber>
            <Description>Isolate and Place Tags</Description>
            <SwitchingStep>
                <sequenceNumber>1</sequenceNumber>
                    <GenericAction>
                    <description>Contact Aluminum plant to tell them that their planned outage
is about to start</description>
                    </GenericAction>
            </SwitchingStep>
            <SwitchingStep>
                <sequenceNumber>2</sequenceNumber>
                <SwitchAction>
                    <OperatedSwitch>
                        <Name>switch 12345</Name>
                        <SwitchPhase>
                            <Names>ABC</names>
                            <closed>0</closed>
                        </SwitchPhase>
                    </OperatedSwitch>
                </SwitchAction>
            </SwitchingStep>
            <SwitchingStep>
                <sequenceNumber>3</sequenceNumber>
                <TagAction>
                    <kind>place</kind>
                    <OperationalTag>
                        <PowerSystemResource>
                            <Names>switch 12345</Names>
                        </PowerSystemResource>
                    </OperationalTag>
                </TagAction>
            </SwitchingStep>
            <SwitchingStep>
                <sequenceNumber>4</sequenceNumber>
                <subStepSequenceNumber>1</subStepSequenceNumber>
                <VerificationAction>
                    <VerificationCondition>check open</VerificationCondition>
                    <PowerSystemResource>
                        <Names>switch 6789</Names>
                    </PowerSystemResource>
                </VerificationAction>
                <sequenceNumber>4</sequenceNumber>
                <subStepSequenceNumber>2</subStepSequenceNumber>
                <TagAction>
                    <kind>place</kind>
                    <OperationalTag>
                        <PowerSystemResource>
                            <Names>switch 6789</Names>
                        </PowerSystemResource>
                    </OperationalTag>
                </TagAction>
            </SwitchingStep>
            <SwitchingStep>
                <sequenceNumber>5</sequenceNumber>
                <ClearanceAction>
                    <Kind>issue</Kind>
                    <Clearance>
                        <TaggedPSRs>
                            <Names>switch 6789</Names>
                            <Names>switch 12345</Names>
                        </TaggedPSRs>
                    </Clearance>
                </ClearanceAction>
            </SwitchingStep>
        </SwitchingStepGroups>
        <SwitchingStepGroups>
            <sequenceNumber>2</sequenceNumber>
            <Description>Return to Normal</Description>
            <SwitchingStep>
                <sequenceNumber>6</sequenceNumber>
                <ClearanceAction>
                    <Kind>release</Kind>
                    <Clearance>
                        <TaggedPSRs>
                            <Names>switch 6789</Names>
```

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```
                        <Names>switch 12345</Names>
                    </TaggedPSRs>
                </Clearance>
            </ClearanceAction>
        </SwitchingStep>
        <SwitchingStep>
            <sequenceNumber>7</sequenceNumber>
            <TagAction>
                <kind>remove</kind>
                <OperationalTag>
                    <PowerSystemResource>
                        <Names>switch 6789</Names>
                    </PowerSystemResource>
                </OperationalTag>
            </TagAction>
        </SwitchingStep>
        <SwitchingStep>
            <sequenceNumber>8</sequenceNumber>
            <TagAction>
                <kind>remove</kind>
                <OperationalTag>
                    <PowerSystemResource>
                        <Names>switch 12345</Names>
                    </PowerSystemResource>
                </OperationalTag>
            </TagAction>
        </SwitchingStep>
        <SwitchingStep>
            <sequenceNumber>9</sequenceNumber>
            <SwitchAction>
                <OperatedSwitch>
                    <Name>switch 12345</Name>
                    <SwitchPhase>
                        <Names>ABC</names>
                        <closed>1</closed>
                    </SwitchPhase>
                </OperatedSwitch>
            </SwitchAction>
        </SwitchingStep>
        <SwitchingStep>
            <sequenceNumber>10</sequenceNumber>
                <GenericAction>
                <description>Contact Aluminum plant to tell them that their planned outage
is over</description>
                </GenericAction>
        </SwitchingStep>
    </SwitchingStepGroups>
  </SwitchingPlan>
</SwitchingPlans>
```

Figure 55 – Sample XML for SwitchingPlans

5.8.21 Example XML for a complete SwitchingPlan

The example below shows a SwitchingPlan complete with a header and a single SwitchingAction. It is intended to illustrate the XML structure rather than be a real-world example of a SwitchingPlan.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:SwitchingPlans xmlns:m="http://iec.ch/TC57/2019/SwitchingPlans#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/SwitchingPlans# SwitchingPlans.xsd ">
  <m:SwitchingPlan>
    <m:mRID>6571f4c4-acee-4024-8d1f-6c4a0398e5fa</m:mRID>
    <m:approvedDateTime>2019-04-10T14:14:14</m:approvedDateTime>
    <m:createdDateTime>2019-04-01T09:15:00</m:createdDateTime>
    <m:description>Example switching plan</m:description>
    <m:lastModifiedDateTime>2019-04-23T10:46:22</m:lastModifiedDateTime>
    <m:purpose>New Construction</m:purpose>
    <m:revisionNumber>C</m:revisionNumber>
    <m:Approver>
      <m:Names>
        <m:name>Keith Richards</m:name>
      </m:Names>
    </m:Approver>
    <m:Author>
```

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```
  <m:Names>
    <m:name>Mick Jagger</m:name>
  </m:Names>
</m:Author>
<m:Names>
  <m:name>Switching Plan PO-2019-04-142</m:name>
</m:Names>
<m:plannedPeriod>
  <m:end>2019-05-01T12:00:00</m:end>
  <m:start>2019-01-01T08:00:00</m:start>
</m:plannedPeriod>
<m:SafetyDocuments>
  <m:mRID> 0f8aca59-1d58-4054-ac22-8d00487e91ee </m:mRID>
  <m:comment>Clearance #1 for Switching Plan PO-2019-04-142</m:comment>
  <m:createdDateTime>2019-04-05T11:11:11</m:createdDateTime>
  <m:description>Isolate using SW-13231 and SW-131542</m:description>
  <m:issuedDateTime>2019-05-01T10:12:00</m:issuedDateTime>
  <m:lastModifiedDateTime>2019-04-23T15:09:00</m:lastModifiedDateTime>
  <m:releasedDateTime></m:releasedDateTime>
  <m:type>Clearance</m:type>
  <m:Approver>
    <m:Names>
      <m:name>Keith Richards</m:name>
    </m:Names>
  </m:Approver>
  <m:Author>
    <m:Names>
      <m:name>Mick Jagger</m:name>
    </m:Names>
  </m:Author>
  <m:IssuedBySupervisor>
    <m:Names>
      <m:name>Samuel Adams</m:name>
    </m:Names>
  </m:IssuedBySupervisor>
  <m:IssuedToSupervisor>
    <m:Names>
      <m:name>Billy Scruggs</m:name>
      <m:NameType>
        <m:name>Contractor</m:name>
        <m:NameTypeAuthority>
          <m:name>XYZ Electrical Services LLC</m:name>
        </m:NameTypeAuthority>
      </m:NameType>
    </m:Names>
  </m:IssuedToSupervisor>
  <m:Names>
    <m:name>Clearance PO-2019-04-142-1</m:name>
  </m:Names>
  <m:ReleasedBySupervisor>
    <m:Names>
      <m:name>Billy Scruggs</m:name>
      <m:NameType>
        <m:name>Contractor</m:name>
        <m:NameTypeAuthority>
          <m:name>XYZ Electrical Services LLC</m:name>
        </m:NameTypeAuthority>
      </m:NameType>
    </m:Names>
  </m:ReleasedBySupervisor>
  <m:ReleasedToSupervisor>
    <m:Names>
      <m:name>Samuel Adams</m:name>
    </m:Names>
  </m:ReleasedToSupervisor>
  <m:status>
    <m:dateTime>2019-05-01T10:31:42</m:dateTime>
    <m:reason>Status change</m:reason>
    <m:remark>Issued to Billy Scruggs</m:remark>
    <m:value>Issued</m:value>
  </m:status>
</m:SafetyDocuments>
<m:status>
  <m:dateTime>2019-05-01T07:12:19</m:dateTime>
  <m:reason>State Change</m:reason>
  <m:remark>Approved and ready to execute. Checked in study mode this morning</m:remark>
  <m:value>Approved</m:value>
</m:status>
```

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```
    <m:SwitchingPlanRequest>
      <m:mRID>205c0a0b-0422-4184-8cfe-b9fdfc433509 </m:mRID>
      <m:description>Isolate line section between Cotter's Grove Lane and Snarly Brook
Street</m:description>
      <m:Names>
        <m:name>Switching Request 2019-04-142</m:name>
      </m:Names>
    </m:SwitchingPlanRequest>
    <m:SwitchingStepGroups>
      <m:description>First and only group</m:description>
      <m:isFreeSequence>false</m:isFreeSequence>
      <m:purpose>First group of the switching plan</m:purpose>
      <m:sequenceNumber>1</m:sequenceNumber>
      <m:SwitchingStep>
        <m:isFreeSequence>false</m:isFreeSequence>
        <m:sequenceNumber>1</m:sequenceNumber>
        <m:subStepSequenceNumber>1</m:subStepSequenceNumber>
        <m:ClampAction>
          <m:description>Place clamp on feeder 179-01</m:description>
          <m:kind>place</m:kind>
          <m:Clamp>
            <m:description>13.8 kV clamp</m:description>
            <m:lengthFromTerminal1>120</m:lengthFromTerminal1>
            <m:ACLineSegment>
              <m:mRID>69bdf28b-b4d2-4d05-91f4-ee7f9815b481</m:mRID>
              <m:description>13.8 kV 2ACSR</m:description>
              <m:Location>
                <m:direction>Two blocks south of Highway 27 at Crows Feet Street<m:direction>
                <m:mainAddress>
                  <m:townDetail>
                    <m:name>Bloomsbury</m:name>
                    <m:stateOrProvince>North Carolina</m:stateOrProvince>
                  </m:townDetail>
                </m:mainAddress>
                <m:PositionPoints>
                  <m:groupNumber>0</m:groupNumber>
                  <m:sequenceNumber>0</m:sequenceNumber>
                  <m:xPosition>35.7718409</m:xPosition>
                  <m:yPosition>-78.6801357</m:yPosition>
                </m:PositionPoints>
              </m:Location>
              <m:Names>
                <m:name>13.8 kV line</m:name>
              </m:Names>
            </m:ACLineSegment>
            <m:Names>
              <m:name>Clampy Mc Clamp Face</m:name>
            </m:Names>
            <m:Terminals>
              <m:mRID>6c8a6da5-bb10-49de-a682-710d9a6ee3e9</m:mRID>
              <m:description>New terminal associated with the clamp</m:description>
              <m:phases>ABC</m:phases>
            </m:Terminals>
          </m:Clamp>
        </m:ClampAction>
      </m:SwitchingStep>
    </m:SwitchingStepGroups>
  </m:SwitchingPlan>
</m:SwitchingPlans>
```

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5.9 SwitchingOrders payload

5.9.1 General

SwitchingOrders message payloads are designed to communicate requests for scheduling the execution of a **SwitchingPlan** for emergency or planned switching. An example of how a **SwitchingOrder** may be communicated between different parties during its life cycle as shown in Figure 56.

- A request to schedule a **SwitchingPlan** is made through a request to create a **SwitchingOrder**
- The **SwitchingPlan** is scheduled within work management, resulting in the creation of a **SwitchingOrder**

- The schedule is communicated to Switch Order Scheduling through a **SwitchingOrder** reply

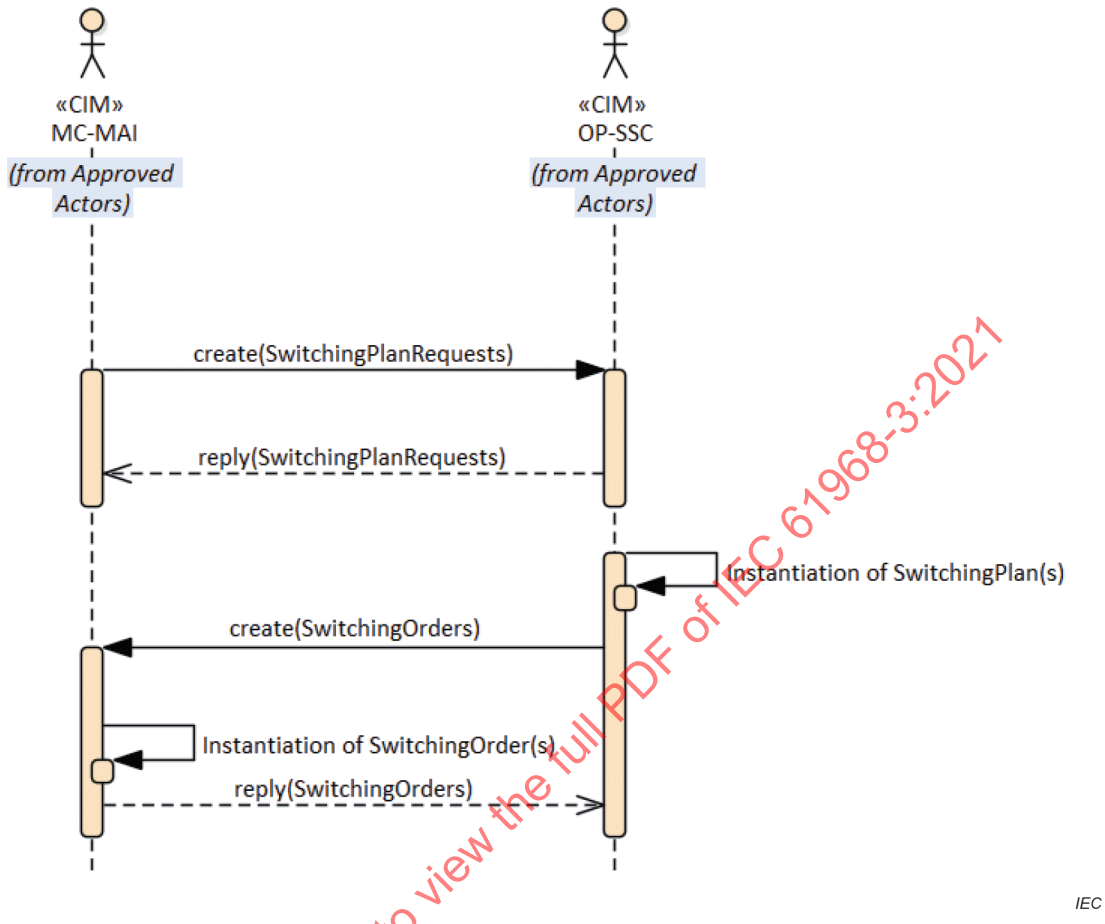


Figure 56 – SwitchingOrders sequence diagram

5.9.2 Message payload

The **SwitchingOrders** payload is shown in Figure 57.

The attributes of the **SwitchingOrders** profile are described in Table 31.

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Table 31 – SwitchingOrders Profile

SwitchingOrders				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
SwitchingOrders	SwitchingOrder	[0..*]		
Profile Attributes				
mRID	String	[0..1]	GUID	mRID for the SwitchingOrder.
description	String	[0..1]		Free-form text field that describes the **SwitchingOrder**
Names	Name	[0..*]	See B.56	List of human-readable names for the SwitchingOrder
comment	String	[0..1]		Free-form text
createdDateTime	DateTime	[0..1]		DateTime that the SwitchingOrder was initially created.
lastModifiedDateTime	DateTime	[0..1]		DateTime that the SwitchingOrder was last changed.
revisionNumber	String	[0..1]		Revision number of the **SwitchingOrder**. Typically this would be used to track changes after the SwitchingOrder has been approved and scheduled.
subject	String	[0..1]		Free-form text
Title	String	[0..1]		Free-form text
Type	String	[0..1]		Free-form text
Approver	Approver	[0..1]	See B.8	Person who approved the **SwitchingOrder**
electronicAddress	ElectronicAddress	[0..1]		Email address of person who should be contacted regarding the SwitchingOrder.
Issuer	DateTimeInterval	[0..1]		Person who issued the SwitchingOrder (e.g. the person who sent the SwitchingOrder to be scheduled)
Location	Location	[0..*]	See B.52	Location(s) of the SwitchingOrder. Location includes the CrewType required at each Location. This defines the skill set and quantity of each crew type required at each Location.
plannedExecutionInterval	DateTimeInterval	[0..1]		Requested start time/date and end time/date
status	Status	[0..1]	See B.79	Status.value is used to specify the overall status of the SwitchingOrder, such as draft, in review, approved, cancelled, etc.
SwitchingPlan	SwitchingPlan	[0..1]	See 5.8.2	mRID, description and Names of associated SwitchingPlan.

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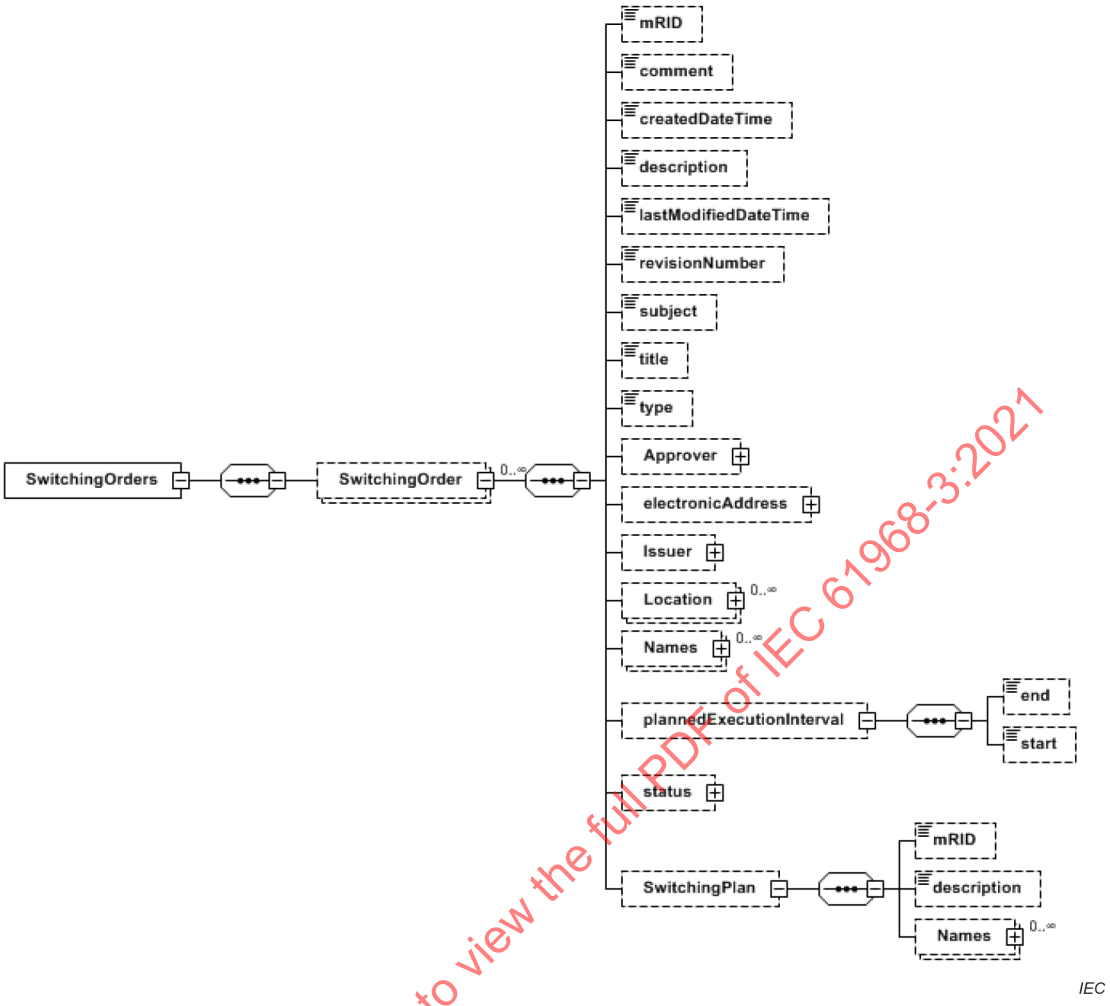


Figure 57 – SwitchingOrders message payload

The Location part of this payload is shown in Figure 58. It allows the requesting system to specify a number of **CrewType**(s) that are required at each Location, in order to have the work scheduled. In the reply, the actual **CrewType**(s) and **Names** and/or **CrewMembers** should be returned.

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Figure 58 – SwitchingOrders – Location fragment

5.9.3 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:SwitchingOrders xmlns:m="http://iec.ch/TC57/2019/SwitchingOrders#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/SwitchingOrders# SwitchingOrders.xsd ">
  <m:SwitchingOrder>
    <m:mRID>m:mRID</m:mRID>
    <m:comment>Line extension on 13 kV line at Bonkers Creek</m:comment>
    <m:createdDateTime>2019-05-31T12:01:11</m:createdDateTime>
    <m:description> Isolate line section between Cotter's Grove Lane and Snarly Brook Street
</m:description>
    <m:lastModifiedDateTime>2019-05-31T12:01:11</m:lastModifiedDateTime>
    <m:revisionNumber>B</m:revisionNumber>
    <m:subject>Switching Order</m:subject>
    <m:title>Substation: Lizard Lick; Feeder: 321</m:title>
    <m:type>Construction</m:type>
    <m:Approver>
      <m:Names>
        <m:name>James T Kirk</m:name>
      </m:Names>
    </m:Approver>
    <m:electronicAddress>
      <m:email1>jtkirk@enterprise.gov</m:email1>
    </m:electronicAddress>
    <m:Issuer>
      <m:Names>
        <m:name>John Snow</m:name>
      </m:Names>
    </m:Issuer>
    <m:Location>
      <m:description>Area bounded by SW-12113 to the North and SW-13211 to the
South</m:description>
      <m:direction>Highway 27 2 blocks South</m:direction>
        <m:CrewType>
          <m:Names>
            <m:name>Switchman Level 2</m:name>
          </m:Names>
        </m:CrewType>
        <m:CrewType>
          <m:Names>
            <m:name>Switchman Level 2</m:name>
          </m:Names>
        </m:CrewType>
      </m:Crew>
    </m:Location>
    <m:Names>
```

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```
      <m:name>Switching Order PO-2019-04-142</m:name>
    </m:Names>
    <m:plannedExecutionInterval>
      <m:end>2001-05-01T12:00:00</m:end>
      <m:start>2019-05-01T08:00:00</m:start>
    </m:plannedExecutionInterval>
    <m:SwitchingPlan>
      <m:mRID>6571f4c4-acee-4024-8d1f-6c4a0398e5fa</m:mRID>
      <m:description>Example switching plan</m:description>
      <m:Names>
        <m:name>Switching Plan PO-2019-04-142</m:name>
      </m:Names>
    </m:SwitchingPlan>
  </m:SwitchingOrder>
</m:SwitchingOrders>
```

5.10 **SwitchingActions** payload

5.10.1 General

SwitchingActions are used to coordinate the manual execution of steps within **SwitchingPlans** between the control room and field crews. It is also possible to use **SwitchingActions** to communicate requests to perform switching outside of a **SwitchingPlan**. Automated step execution is coordinated with **PSRControls** messages.

Figure 59 gives an example of how a switching step could be sent from the control room to a field crew by using a **SwitchingActions** message. Even though the field crew may already have a complete copy of the **SwitchingPlan**, this message can be used to request the field crew to execute the specific step referenced in the message. The message exchange utilizes the consequential event message pattern defined in IEC 61968-100.

The reply indicates that the field crew has received the instruction to execute a switching step and whether the request is valid. If the request passes initial validation (or no validation has been performed), the Reply section of the IEC 61968-100 response shall indicate success. If the request fails initial validation, e.g. if the request refers to an unknown **SwitchingPlan**, then the Reply section of the response shall indicate failure. If the request was completed successfully, the **SwitchingEvents** message (see Subclause 5.11) is a confirmation that the switching step has been executed.

If the request was accepted, an attempt to execute the **SwitchingAction** shall be made. If the **SwitchingAction** could not be performed successfully, e.g. because the requested device could not be physically accessed, then a second reply shall communicate the failure and the reason for failure using the Reply section of the IEC 61968-100 response message. In this case no **SwitchingEvents** message shall be returned.

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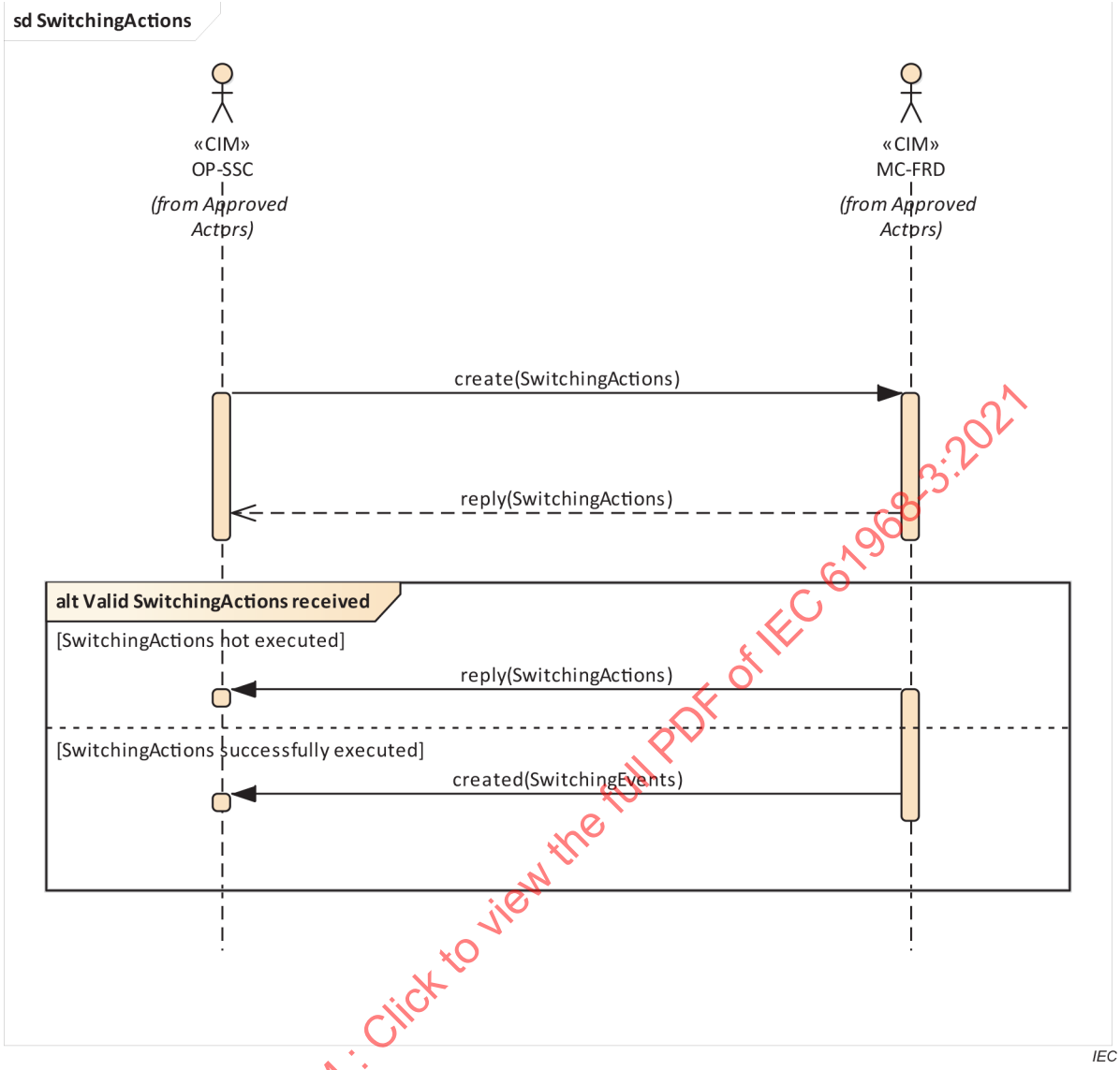


Figure 59 – Sequence Diagram of Switching Step Execution

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5.10.2 Message Payload

The top level payload for **SwitchingActions** is shown graphically in Figure 60. The attributes of the **SwitchingActions** profile are described in Table 32.

The message consists of a choice of zero, one or many actions. Multiple actions of different types can be sent in a single payload. This is necessary when a **SwitchingStep** is made up of several sub-steps that are part of the same step in the same **SwitchingPlan**. Each action must only contain one **SwitchingStep** or sub-step.

Please note that the actions for **SwitchingActions** have a different structure to those for **SwitchingPlans**.

Table 32 – SwitchingActions Profile

SwitchingActions				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
SwitchingActions	SwitchingAction	[0..*]		Choice of actions as shown below
Actions				
ClampAction	ClampAction		See 5.10.6	
ClearanceAction	ClearanceAction		See 5.10.7	
ControlAction	ControlAction		See 5.10.8	
CutAction	CutAction		See 5.10.9	
EnergyConsumerAction	EnergyConsumerAction		See 5.10.10	
EnergySourceAction	EnergySourceAction		See 5.10.11	
GenericAction	GenericAction		See 5.10.12	
GroundAction	GroundAction		See 5.10.13	
JumperAction	JumperAction		See 5.10.14	
MeasurementAction	MeasurementAction		See 5.10.15	
ShuntCompensatorAction	ShuntCompensatorAction		See 5.10.16	
SwitchAction	SwitchAction		See 5.10.17	
TagAction	TagAction		See 5.10.18	
VerificationAction	VerificationAction		See 5.10.19	

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Figure 60 – SwitchingActions top level payload

5.10.3 SwitchingActions payload – SwitchingStep fragment

The **SwitchingStep** fragment is shown in Table 33 and graphically in Figure 61.

This fragment is common to every action within the **SwitchingAction**.

Table 33 – SwitchingStep payload fragment for SwitchingActions

Operations: SwitchingStep				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
isFreeSequence	Boolean	[0..*]		When there are multiple SwitchingSteps in the SwitchingAction, this is used to determine the sequence of execution. See subclause 5.9.3.1 for further details.
sequenceNumber	Integer	[0..1]		Sequence number that identifies the SwitchingSstep within theSwitchingPlan.
subStepSequenceNumber	Integer	[0..1]		SequenceNumber of the SwitchingStepSubStep
RevisionHistory	RevisionHistory	[0..1]	See B.74	Indicates whether the step has been added or voided.

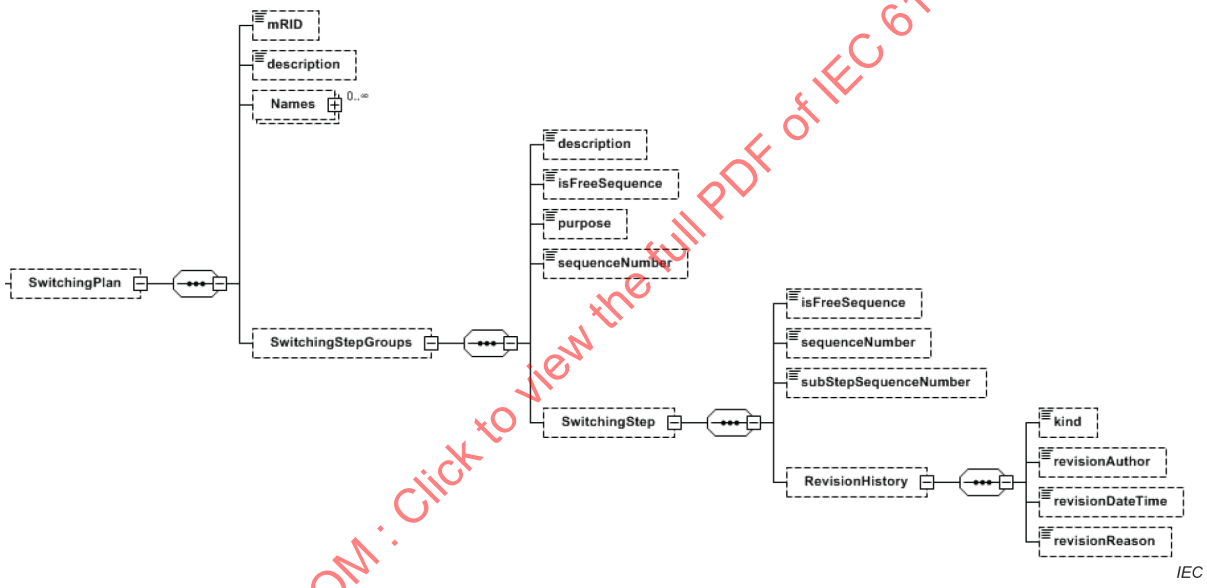


Figure 61 – SwitchingActions – SwitchingPlan fragment

5.10.4 SwitchingActions payload – SwitchingStepGroups fragment

The **SwitchingStepGroups** fragment is shown in Table 34 and graphically in Figure 61.

This fragment is common to every action within the **SwitchingAction**.

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Table 34 – SwitchingStepGroup payload fragment for SwitchingActions

Operations: SwitchingStepGroups				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
description	String	[0..1]		Free form text that describes the SwitchingStepGroup
isFreeSequence	Boolean	[0..*]		When there are multiple SwitchingStepGroups in the SwitchingAction, this is used to determine the sequence of execution. See subclause 5.9.3.1 for further details.
purpose	String	[0..1]		Free form text that describes the purpose of the SwitchingStepGroup
sequenceNumber	Integer	[0..1]		Sequence number that identifies the SwitchingStepGroup within the SwitchingPlan.
SwitchingStep	SwitchingStep	[0..1]	See 5.10.3	SwitchingStep that is associated with this SwitchingStepGroup

5.10.5 SwitchingActions payload – SwitchingPlan fragment

The **SwitchingPlan** fragment is shown in Table 35 and graphically in Figure 61.

This fragment is common to every action within the **SwitchingAction**.

Table 35 – SwitchingPlan payload fragment for SwitchingActions

Operations: SwitchingPlan				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		Free form text that describes the SwitchingPlan
Names	Name	[0..*]	See B.56	
purpose	String	[0..1]		Free form text that describes the purpose of the SwitchingStepGroup
sequenceNumber	Integer	[0..1]		Sequence number that identifies the switching step group within the switching plan.
SwitchingStepGroups	SwitchingStepGroup	[0..1]	See 5.10.4	SwitchingStepGroup that is associated with this SwitchingAction

5.10.6 SwitchingActions payload – ClampAction

The attributes of **ClampAction** that are used in this profile are shown in Table 36 and graphically in Figure 62.

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Table 36 – ClampAction payload fragment for SwitchingActions

Operations: ClampAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the ClampAction
description	String	[0..1]		Free form description of the action.
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the ClampAction
kind		[0..1]		Determines whether the clamp is placed or removed. Enumeration with possible values place, remove.
Clamp	Clamp	[0..1]	See B.14	The details of the actual clamp that is to be placed or removed.
executedDateTime	DateTime	[0..1]		This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed.
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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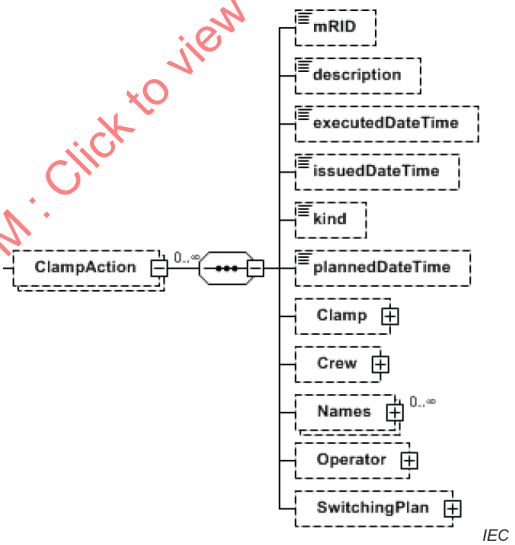


Figure 62 – SwitchingAction – ClampAction fragment

5.10.7 SwitchingActions payload – ClearanceAction

The attributes of **ClearanceAction** that are used in this profile are shown in Table 37 and graphically in Figure 63.

Table 37 – ClearanceAction payload fragment for SwitchingActions

Operations: ClearanceAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the ClearanceAction
description	String	[0..1]		Free form description of the ClearanceAction
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	ClearanceActionKind	[0..1]	See C.4	The ClearanceAction can be used in a SwitchingPlan to define the transfer of control between the control room and field personnel when field work is ready to start. This is accomplished by defining a ClearanceAction with a ClearanceAction.kind of issue. Control is passed back from the field to the control room after the field work is complete. This is accomplished by defining a ClearanceAction in the SwitchingPlan with a ClearanceAction.kind of release. A ClearanceAction.kind of update in a SwitchingPlan can be used to change the list of TaggedPSRs or other attributes.
Clearance	Clearance	[0..1]	See B.16	This defines the actual Clearance that is part of this action.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew. This will be blank until the action is sent to the crew
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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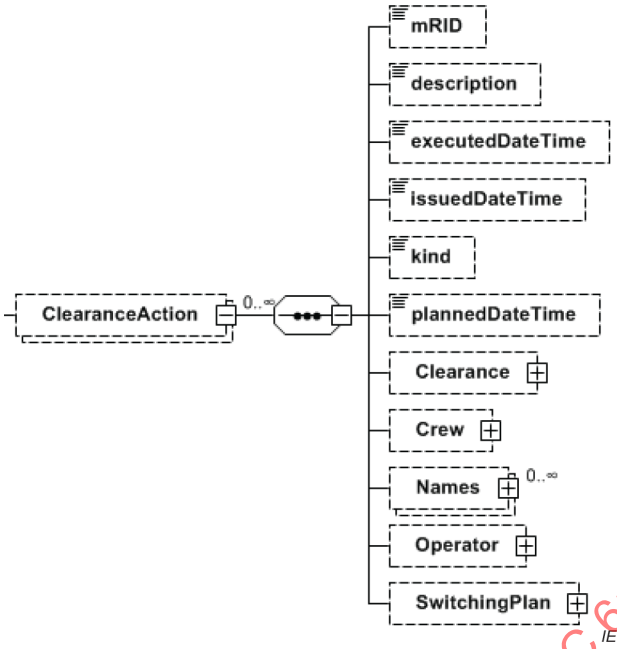


Figure 63 – SwitchingActions – ClearanceAction fragment

5.10.8 SwitchingActions payload – ControlAction

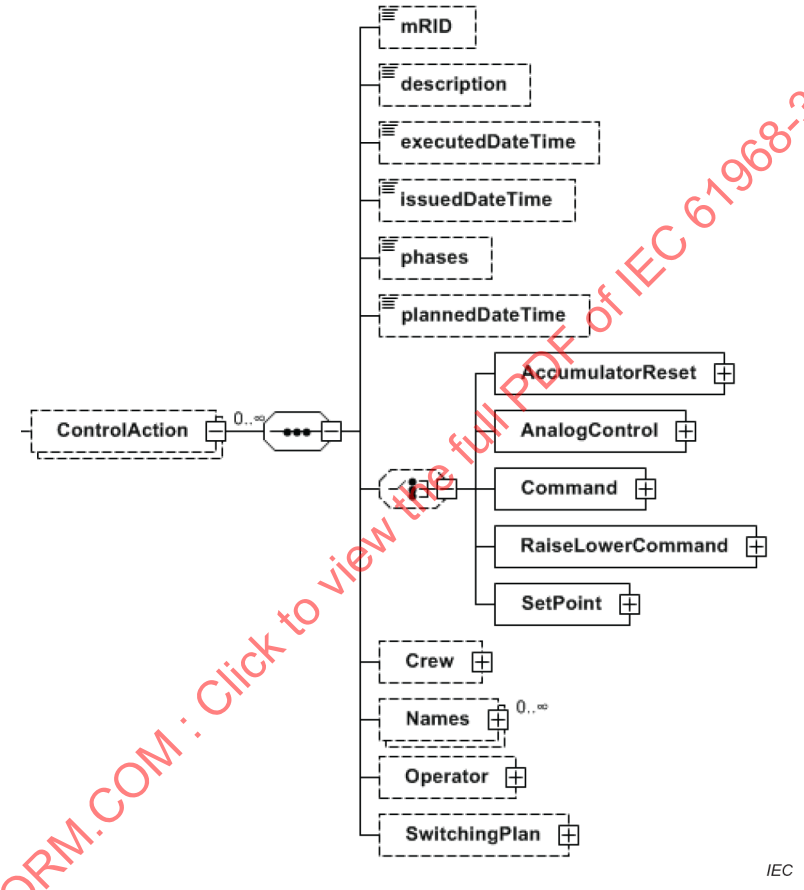
The attributes of **ControlAction** that are used in this profile are shown in Table 38 and graphically in Figure 64.

Table 38 – ControlAction payload fragment

Operations: ControlAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID for this ControlAction
description	String	[0..1]		Free form description of the action.
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
phases	PhaseCode	[0..1]	See C.12	Phases to be controlled.
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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Operations: ControlAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
Choice of one of the following Controls				
AccumulatorReset	AccumulatorReset		See 5.6.4	
AnalogControl	AnalogControl		See 5.6.5	
Command	Command		See 5.6.6	
RaiseLowerCommand	RaiseLowerCommand		See 5.6.7	
SetPoint	SetPoint		See 5.6.8	



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Figure 64 – SwitchingActions – ControlAction fragment

5.10.9 SwitchingActions Payload – CutAction

The attributes of **CutAction** that are used in this profile are shown in Table 39 and graphically in Figure 65.

Table 39 – CutAction payload fragment for SwitchingActions

Operations: CutAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of this CutAction
description	String	[0..1]		Free form description of the action.
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	TempEquipActionKind	[0..1]	See C.20	Indicates whether the cut should be placed or removed.
Cut	Cut	[0..1]	See B.18	The cut that is to be placed or removed.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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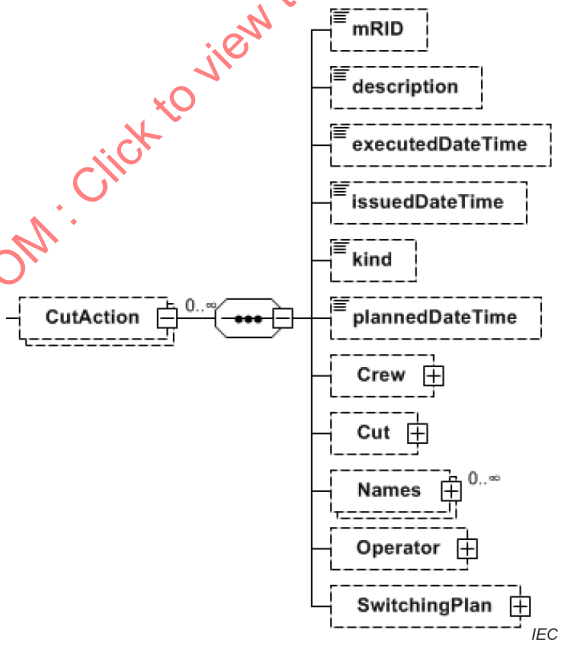


Figure 65 – SwitchingActions – CutAction fragment

5.10.10 SwitchingActions payload – EnergyConsumerAction

The attributes of **EnergyConsumerAction** that are used in this profile are shown in Table 40 and graphically in Figure 66.

Table 40 – EnergyConsumerAction payload fragment for SwitchingActions

Operations: EnergyConsumerAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the EnergyConsumerAction
description	String	[0..1]		Free form description of EnergyConsumerAction
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	TempEquipActionKind	[0..1]	See C.20	Defines whether to disconnect or connect the energy consumer from/to its terminals.
phases	PhaseCode	[0..1]	See C.12	Phases to perform the action on.
EnergyConsumer	EnergyConsumer	[0..1]	See B.34	EnergyConsumer to connect or disconnect.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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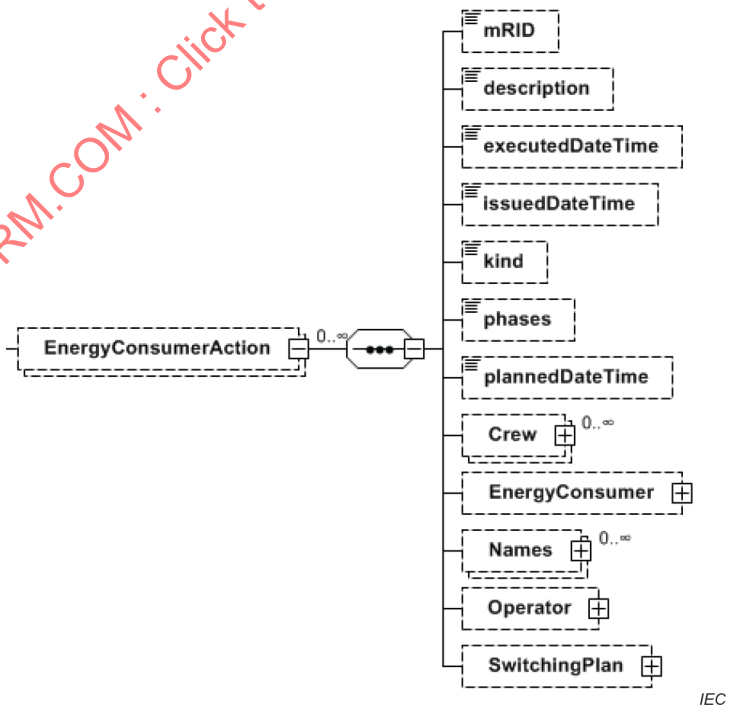


Figure 66 – SwitchingActions – EnergyConsumerAction fragment

5.10.11 **SwitchingActions** payload – **EnergySourceAction**

The attributes of **EnergySourceAction** that are used in this profile are shown in Table 41 and graphically in Figure 67.

Table 41 – EnergySourceAction payload fragment for SwitchingActions

Operations: EnergySourceAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the EnergySourceAction
description	String	[0..1]		Free form description of EnergySourceAction
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	TempEquipActionKind	[0..1]	See C.20	Defines whether to place or remove the energy source.
phases	PhaseCode	[0..1]	See C.12	Phases to perform the action on.
EnergySource	EnergySource	[0..1]	See B.35	EnergySource to place or remove.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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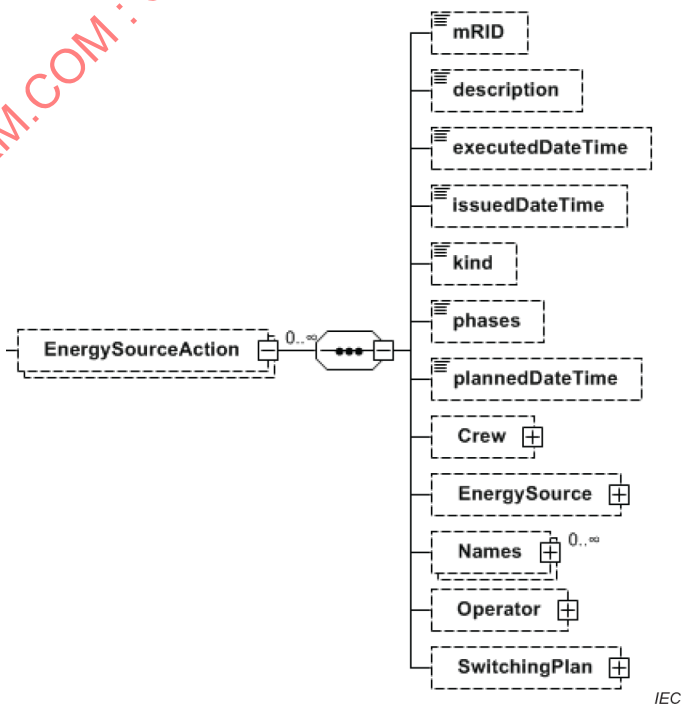


Figure 67 – SwitchingActions – EnergySourceAction fragment

5.10.12 **SwitchingActions** payload – **GenericAction**

The attributes of **GenericAction** that are used in this profile are shown in Table 42 and graphically in Figure 68.

Table 42 – GenericAction payload fragment for SwitchingActions

Operations: GenericAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of this GenericAction
description	String	[0..1]		Free form description of the action.
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
phases	PhaseCode	[0..1]	See C.12	Phases to be operated by this action.
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	Defines the PowerSystemResource to perform the GenericAction on.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
phases	PhaseCode	[0..1]	See C.12	Phases to operate.
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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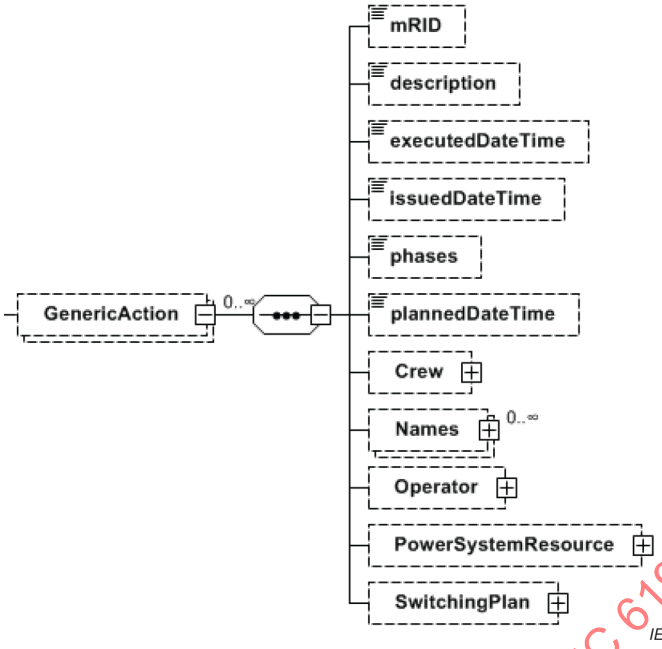


Figure 68 – SwitchingActions – GenericAction fragment

5.10.13 SwitchingActions payload – GroundAction

The attributes of **GroundAction** that are used in this profile are shown in Table 43 and graphically in Figure 69.

See 5.8.13 for a more detailed description of the **GroundAction**, although the payload is slightly different.

Table 43 – GroundAction payload fragment for SwitchingActions

Operations: GroundAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID for the GroundAction
description	String	[0..1]		Free-form description of the GroundAction
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	TempEquipActionKind	[0..1]	See C.22	Defines the action to be performed, either place the ground or remove the ground
Ground	Ground	[0..1]	See B.44	Ground to place or remove.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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Choice of one of the following				
ACLineSegment	ACLineSegment		See B.4	Conductor where the ground is to be placed.
Clamp	Clamp		See B.14	Clamp where the ground is to be placed, if the ground is to be placed part way along a conductor
ConductingEquipment	ConductingEquipment		See B.14	ConductingEquipment where the ground is to be placed.

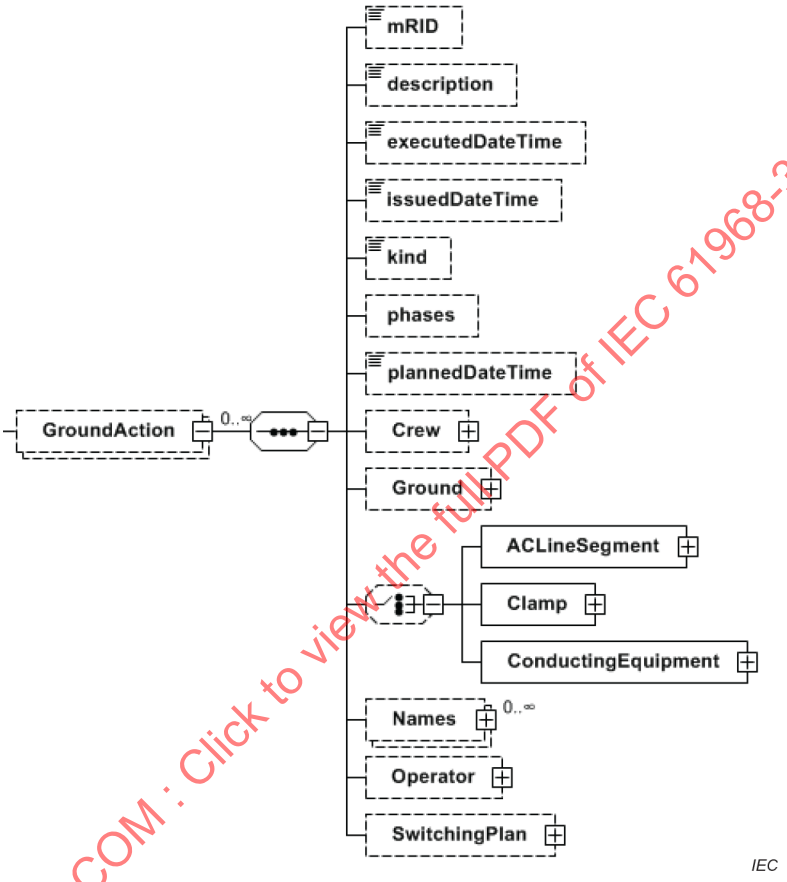


Figure 69 – SwitchingActions – GroundAction fragment

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5.10.14 SwitchingActions payload – JumperAction

The attributes of **JumperAction** that are used in IEC 61968-3 profiles are shown in Table 44 and graphically in Figure 70.

Table 44 – JumperAction payload fragment for SwitchingActions

Operations: JumperAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		Free form description of the action.
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	TempEquipActionKind	[0..1]	See C.20	Indicates whether the jumper should be placed or removed.
ACLineSegment	ACLineSegment	[0..*]	See B.4	There could be zero, one or two ACLineSegments in the payload, depending on where the jumper is to be attached. Each ACLineSegment defines where one end of the jumper is to be placed.
Clamp	Clamp	[0..*]	See B.14	There could be zero, one or two Clamps in the payload, depending on where the jumper is to be attached. Each clamp defines where one end of the jumper is attached to
JumpedEquipments	ConductingEquipment	[0..*]	See B.14	There could be zero, one or two JumpedEquipments in the payload, depending on where the jumper is to be attached. Each JumpedEquipments defines the ConductingEquipment that one end of the jumper is attached to.
Jumper	Jumper	[0..1]	See B.35	The jumper that is to be placed or removed.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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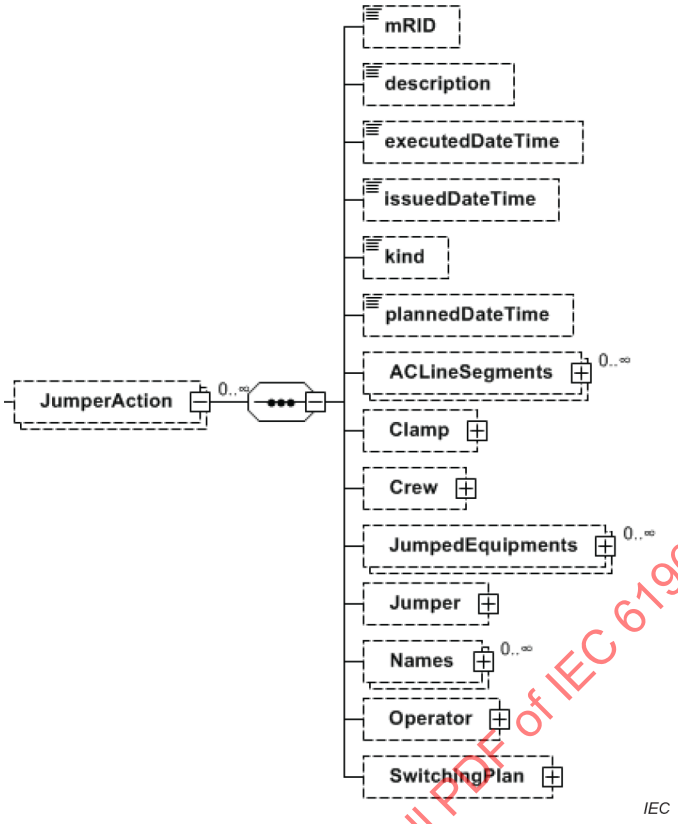


Figure 70 – SwitchingActions – JumperAction fragment

5.10.15 SwitchingActions payload – MeasurementAction

The attributes of **MeasurementAction** that are used in this profile are shown in Table 45 and graphically in Figure 71.

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Table 45 – MeasurementAction payload fragment for SwitchingActions

Operations: MeasurementAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		Free form description of the action.
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
phases	PhaseCode	[0..1]	See C.12	
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.
Choice of one of the following				
Accumulator	Accumulator		See 5.4.2	
Analog	Analog		See 5.4.2	
Discrete	Discrete		See 5.4.2	
StringMeasurement	StringMeasurement		See 5.4.2	

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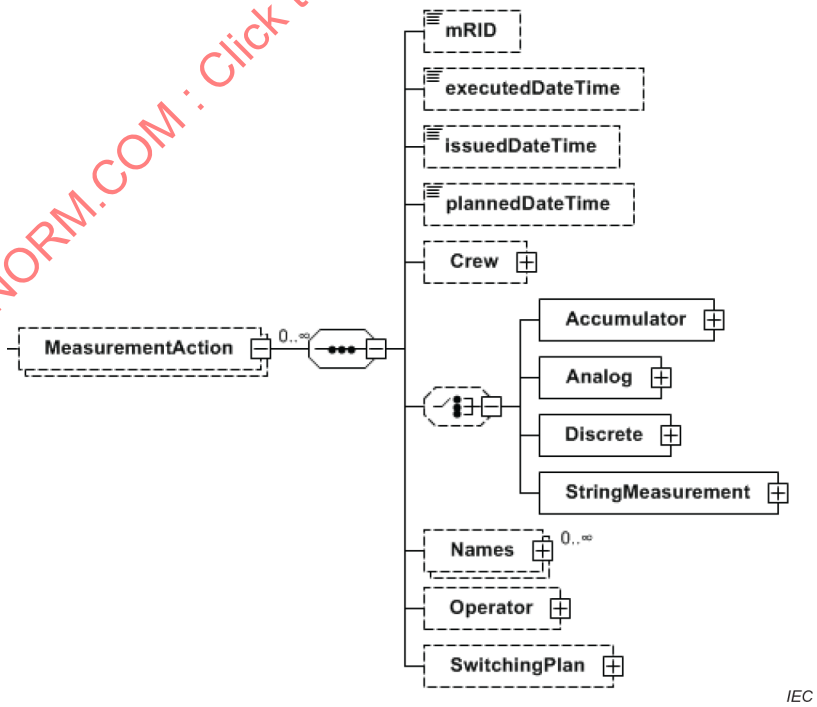


Figure 71 – SwitchingActions – MeasurementAction fragment

5.10.16 SwitchingActions payload – ShuntCompensatorAction

The attributes of **ShuntCompensatorAction** that are used in this profile are shown in Table 46 and graphically in Figure 72.

Table 46 – ShuntCompensatorAction payload fragment for SwitchingActions

Operations: ShuntCompensatorAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the action
description	String	[0..1]		Free form description of the action
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	TempEquipActionKind	[0..1]	See C.20	Action to perform – disconnect or connect
phases	PhaseCode	[0..1]	See C.12	Phases to disconnect or connect.
ShuntCompensator	ShuntCompensator	[0..1]	See B.78	ShuntCompensator to perform action on.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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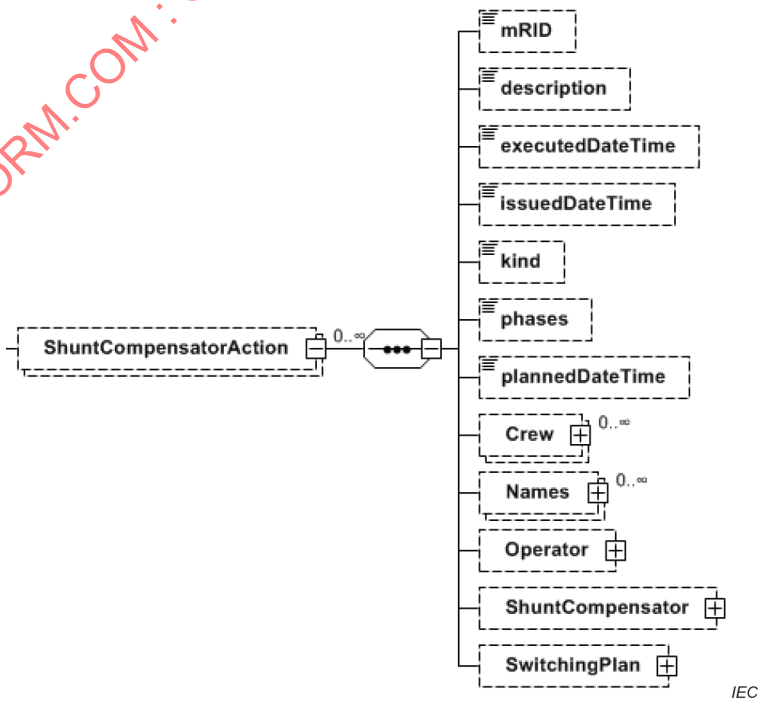


Figure 72 – SwitchingActions – ShuntCompensatorAction fragment

5.10.17 **SwitchingActions** payload – **SwitchAction**

The attributes of **SwitchAction** that are used in this profile are shown in Table 47 and graphically in Figure 73.

Table 47 – SwitchAction payload fragment for SwitchingActions

Operations: SwitchAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the action
description	String	[0..1]		Free form description of the action
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	SwitchActionKind	[0..1]	See C.20	Switching action to perform – open, close, disableReclosing, enableReclosing
OperatedSwitch	Switch	[0..1]	See B.86	Switch to operate.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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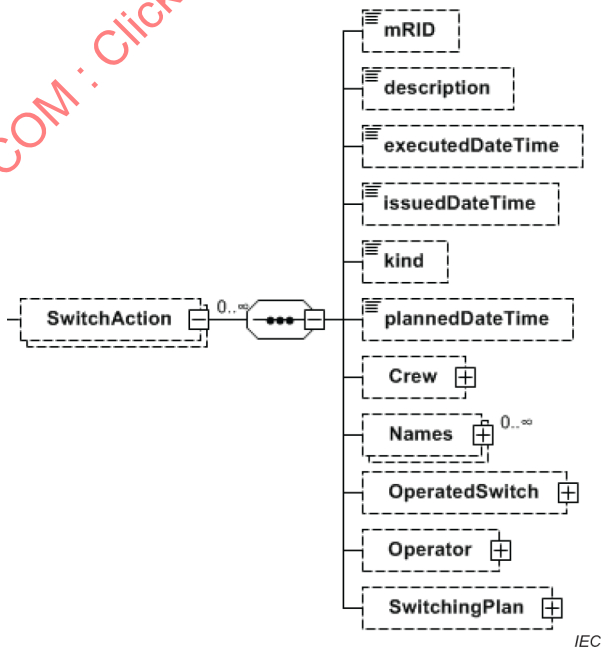


Figure 73 – SwitchingActions – SwitchAction fragment

5.10.18 **SwitchingActions** payload – **TagAction**

The attributes of **TagAction** that are used in this profile are shown in Table 48 and graphically in Figure 74.

Table 48 – TagAction payload fragment for SwitchingActions

Operations: TagAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		Free form description of the action.
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
kind	TagActionKind	[0..1]	See C.21	Operation to be performed on the Tag – place, remove, verify
OperationalTag	OperationalTag	[0..1]	See B.59	The actual tag that is to be placed, removed or verified.
phases	PhaseCode	[0..1]	See C.12	Phases on which the tag is to be placed, e.g. A, B, AC, ABC
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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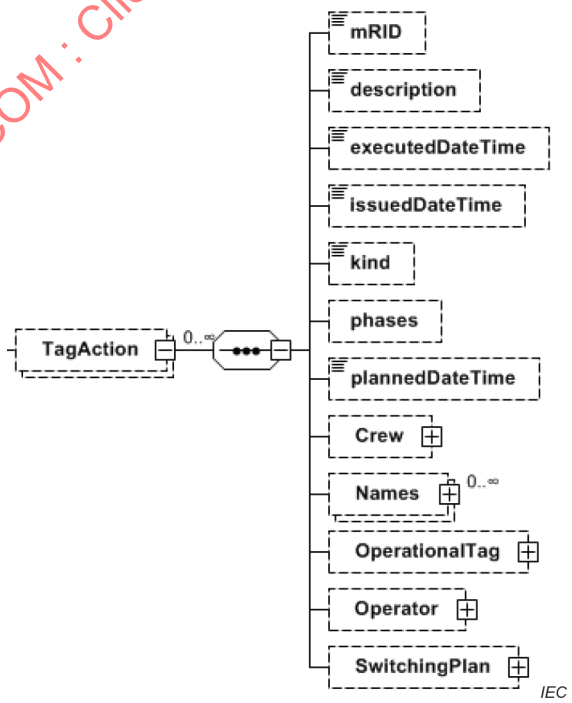


Figure 74 – SwitchingActions – TagAction fragment

5.10.19 **SwitchingActions** payload – **VerificationAction**

The attributes of **VerificationAction** that are used in this profile are shown in Table 49 and graphically in Figure 75.

Table 49 – VerificationAction payload fragment for SwitchingActions

Operations: VerificationAction				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		Free form description of the action.
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the action.
phases	PhaseCode	[0..1]	See C.12	Phases to perform the action on, e.g. A, AB, AC, ABC, etc.
verificationCondition	String	[0..1]		Free from text string describing the condition to verify, e.g. check open, disable reclosing, put into manual mode, etc.
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	PowerSystemResource to perform the verification action on.
executedDateTime	DateTime	[0..1]		DateTime of when the action was executed. This will be blank until the action is executed in the field
issuedDateTime	DateTime	[0..1]		DateTime of when the action was sent to the crew.
phases	PhaseCode	[0..1]	See C.12	
plannedDateTime	DateTime	[0..1]		DateTime of when the action is planned to be executed
Crew	Crew	[0..1]	See B.22	Crew that has been given the action to execute
Operator	Operator	[0..1]	See B.60	Operator who has given the crew this action to execute
SwitchingPlan	SwitchingPlan	[0..1]	See 5.10.3	SwitchingPlan that this action is associated with.

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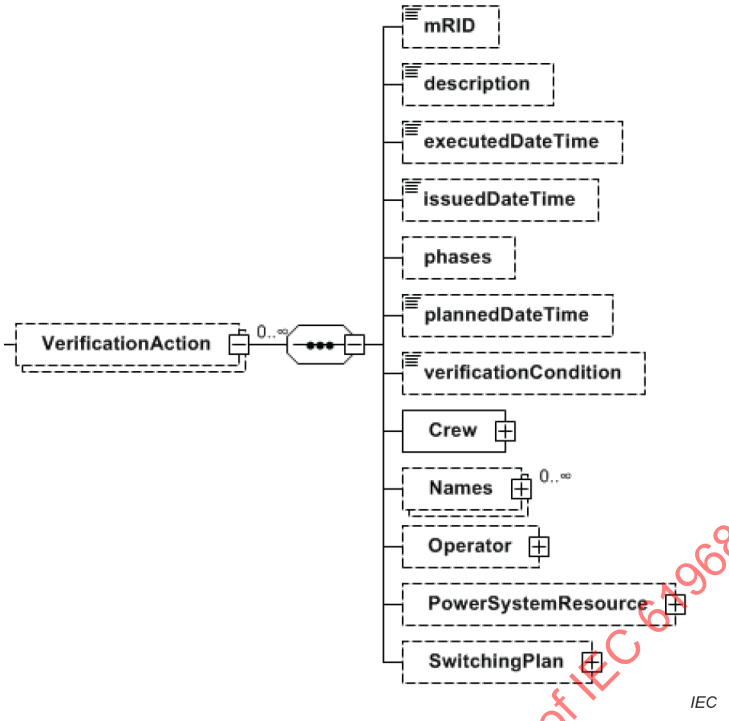


Figure 75 – SwitchingActions – VerificationAction fragment

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5.10.20 Example XML

The example shows one of the possible choices of actions, in this case a **SwitchAction**.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:SwitchingActions xmlns:m="http://iec.ch/TC57/2019/SwitchingActions#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/SwitchingActions# SwitchingActions.xsd ">
  <m:SwitchAction>
    <m:mRID>4dcc0e34-de05-4836-83ff-2afa11a6c8c4</m:mRID>
    <m:description>Request to close Switch 1083</m:description>
    <m:issuedDateTime>2019-06-01T08:00:00</m:issuedDateTime>
    <m:kind>close</m:kind>
    <m:Crew>
      <m:Names>
        <m:name>James Smedley IV</m:name>
      </m:Names>
    </m:Crew>
    <m:OperatedSwitch>
      <m:mRID>0738a0bd-0f26-499d-9c44-e2e8ce87a065</m:mRID>
      <m:Assets>
        <m:Names>
          <m:name>Switch 1083</m:name>
        </m:Names>
      </m:Assets>
      <m:Location>
        <m:direction>W Side 25th Ave N of Linden Ave Southbury</m:direction>
      </m:Location>
      <m:Names>
        <m:name>Switch 1083</m:name>
      </m:Names>
      <m:SwitchPhase>
        <m:closed>false</m:closed>
        <m:normalOpen>false</m:normalOpen>
        <m:phaseSide1>ABC</m:phaseSide1>
        <m:phaseSide2>ABC</m:phaseSide2>
      </m:SwitchPhase>
    </m:OperatedSwitch>
    <m:Operator>
      <m:Names>
        <m:name>Horatio Hornblower</m:name>
      </m:Names>
    </m:Operator>
    <m:SwitchingPlan>
      <m:mRID>6571f4c4-acee-4024-8d1f-6c4a0398e5fa</m:mRID>
      <m:description>Example switching plan</m:description>
      <m:Names>
        <m:name>Switching Plan PO-2019-04-142</m:name>
      </m:Names>
      <m:SwitchingStepGroups>
        <m:description>m:First Group</m:description>
        <m:isFreeSequence>false</m:isFreeSequence>
        <m:purpose>m:Close the switch</m:purpose>
        <m:sequenceNumber>1</m:sequenceNumber>
        <m:SwitchingStep>
          <m:isFreeSequence>false</m:isFreeSequence>
          <m:sequenceNumber>1</m:sequenceNumber>
          <m:subStepSequenceNumber>1</m:subStepSequenceNumber>
        </m:SwitchingStep>
      </m:SwitchingStepGroups>
    </m:SwitchingPlan>
  </m:SwitchAction>
</m:SwitchingActions>
```

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5.11 SwitchingEvents payload

5.11.1 General

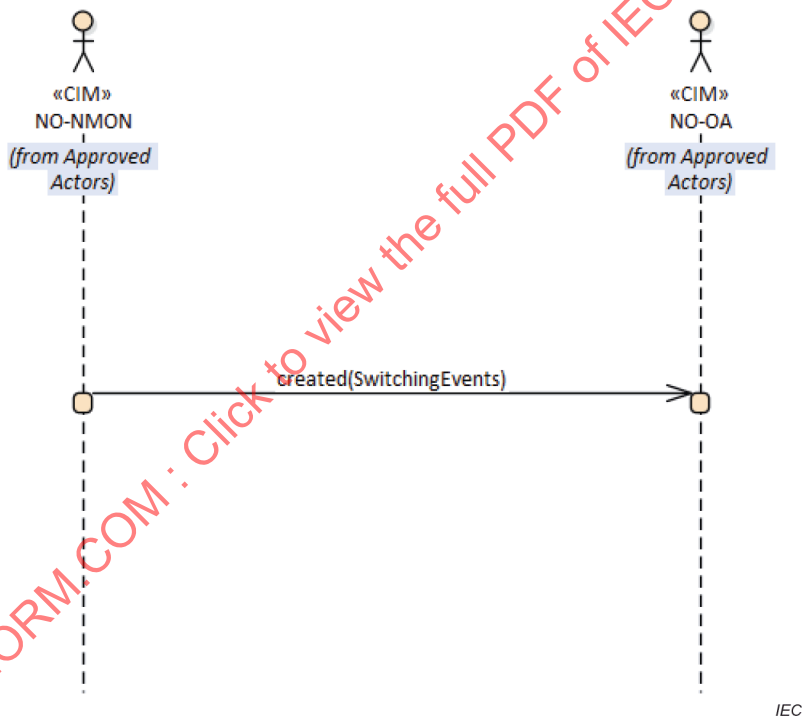
SwitchingEvents are used to communicate temporary network changes that have been made either as the result of the execution of a switching plan step or as a result of network operations outside of a switching plan.

SwitchingEvents are used to communicate temporary network changes that have been made as the result of the execution of a **SwitchingPlanStep** (see Subclause 5.8) in a **SwitchingPlan** that was initiated via a **SwitchingAction.**

The results of executing a **SwitchingPlanStep** that is a **ControlAction** are coordinated with **PSRControls** and **PSRMeasurements** messages, rather than **SwitchingEvents**.

SwitchingEvents are also used to communicate temporary network changes between enterprise systems that have been made outside of a **SwitchingPlan**. Temporary network changes are of special importance in the case of network construction, during outages caused by severe weather or other disaster, or as emergency backup during maintenance of the network or power plants. In those scenarios, the power utilities are forced to still maintain the balance between generation and consumption as well as to re-supply affected customers as fast as possible. Temporary network changes such as jumpers, cuts and grounds, are used to temporarily reconfigure the respective part of the network.

Figure 76 shows how a change in the network is communicated from one actor to another, in this case DMS communicates a network change to OMS and there is no **SwitchingPlan** involved.



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Figure 76 – SwitchingEvents sequence diagram for a notification

5.11.2 Message payload

Figure 77 shows the top level payload for **SwitchingEvents** in graphical form; Table 50 defines the attributes in detail.

Table 50 – SwitchingEvents Profile

SwitchingEvents				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
SwitchingEvents	SwitchingEvent	[0..*]		
mRID	String	[0..1]	GUID	mRID of this SwitchingEvent
description	String	[0..1]		Free-form description of this SwitchingEvent
Names	Name	[0..*]	See B.56	Human-readable names for this SwitchingEvent
reason	String	[0..1]		Free text reason for the **SwitchingEvent**
severity	String	[0..1]		Severity of this event
type	String	[0..1]		Free-form text
		[0..*]		Choice of actions as shown below
Actions				
ClampAction	ClampAction		See 5.10.6	
ClearanceAction	ClearanceAction		See 5.10.7	
ControlAction	ControlAction		See 5.10.8	
CutAction	CutAction		See 5.10.9	
EnergyConsumerAction	EnergyConsumerAction		See 5.10.10	
EnergySourceAction	EnergySourceAction		See 5.10.11	
GenericAction	GenericAction		See 5.10.12	
GroundAction	GroundAction		See 5.10.13	
JumperAction	JumperAction		See 5.10.14	
MeasurementAction	MeasurementAction		See 5.10.15	
ShuntCompensatorAction	ShuntCompensatorAction		See 5.10.16	
SwitchAction	SwitchAction		See 5.10.17	
TagAction	TagAction		See 5.10.18	
VerificationAction	VerificationAction		See 5.10.19	

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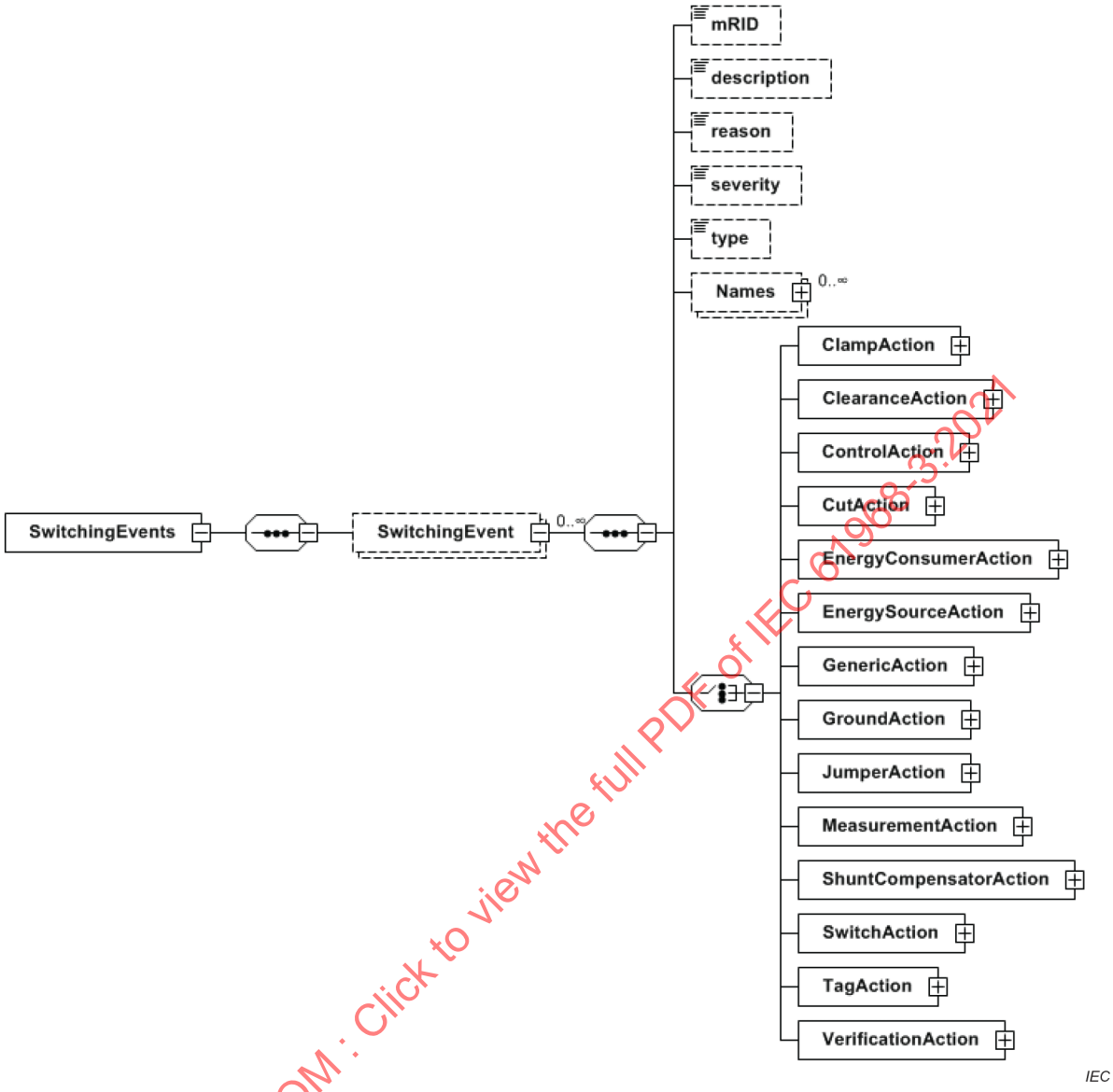


Figure 77 – SwitchingEvents top level payload

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The most important part of the payload is a choice of one of the possible actions that was performed on the network. The actions are the same as those in the **SwitchingActions** payload, although as shown in the sequence diagram, the **SwitchingEvents** does not need to be a response to a **SwitchingActions**.

5.11.3 SwitchingEvents payload – ClampAction

The **ClampAction** payload fragment in the **SwitchingEvents** message payload is the same as the **ClampAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.6

5.11.4 SwitchingEvents payload – ClearanceAction

The **ClearanceAction** payload fragment in the **SwitchingEvents** message payload is the same as the **ClearanceAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.7.

5.11.5 SwitchingEvents payload – ControlAction

The **ControlAction** payload fragment in the **SwitchingEvents** message payload is the same as the **ControlAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.8.

5.11.6 SwitchingEvents Payload – CutAction

The **CutAction** payload fragment in the **SwitchingEvents** message payload is the same as the **CutAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.9.

5.11.7 SwitchingEvents payload – EnergyConsumerAction

The **EnergyConsumerAction** payload fragment in the **SwitchingEvents** message payload is the same as the **EnergyConsumerAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.10.

5.11.8 SwitchingEvents payload – EnergySourceAction

The **EnergySourceAction** payload fragment in the **SwitchingEvents** message payload is the same as the **EnergySourceAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.11.

5.11.9 SwitchingEvents payload – GenericAction

The **GenericAction** payload fragment in the **SwitchingEvents** message payload is the same as the **GenericAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.12.

5.11.10 SwitchingEvents payload – GroundAction

The **GenericAction** payload fragment in the **SwitchingEvents** message payload is the same as the **GenericAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.13.

5.11.11 SwitchingEvents payload – JumperAction

The **JumperAction** payload fragment in the **SwitchingEvents** message payload is the same as the **JumperAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.14.

5.11.12 SwitchingEvents payload – MeasurementAction

The **MeasurementAction** payload fragment in the **SwitchingEvents** message payload is the same as the **MeasurementAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.15.

5.11.13 SwitchingEvents payload – ShuntCompensatorAction

The **ShuntCompensatorAction** payload fragment in the **SwitchingEvents** message payload is the same as the **ShuntCompensatorAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.16.

5.11.14 SwitchingEvents payload – SwitchAction

The **SwitchAction** payload fragment in the **SwitchingEvents** message payload is the same as the **SwitchAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.17.

5.11.15 SwitchingEvents payload – TagAction

The **TagAction** payload fragment in the **SwitchingEvents** message payload is the same as the **TagAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.18.

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5.11.16 **SwitchingEvents** payload – **VerificationAction**

The **TagAction** payload fragment in the **SwitchingEvents** message payload is the same as the **TagAction** payload fragment in the **SwitchingActions** message. See Subclause 5.10.19.

5.11.17 Example XML

The example below is a consequential response to the example **SwitchingAction** in 5.10.20, using the same switch, with a successful completion.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:SwitchingEvents xmlns:m="http://iec.ch/TC57/2019/SwitchingEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/SwitchingEvents# Copy of SwitchingEvents.xsd ">
  <m:SwitchingEvent>
    <m:mRID>0575495a-2767-4875-9134-11fd46045b95</m:mRID>
    <m:description>Response to request to close Switch 1083</m:description>
    <m:reason>Execution through switching plan</m:reason>
    <m:SwitchAction>
      <m:mRID>4dcc0e34-de05-4836-83ff-2afa11a6c8c4</m:mRID>
      <m:description>Request to close Switch 1083</m:description>
      <m:executedDateTime>2019-06-01T08:02:48</m:executedDateTime>
      <m:issuedDateTime>2019-06-01T08:00:00</m:issuedDateTime>
      <m:Crew>
        <m:Names>
          <m:name>James Smedley IV</m:name>
        </m:Names>
      </m:Crew>
      <m:OperatedSwitch>
        <m:mRID>0738a0bd-0f26-499d-9c44-e2e8ce87a065</m:mRID>
        <m:Names>
          <m:name>Switch 1083</m:name>
        </m:Names>
        <m:SwitchPhase>
          <m:closed>true</m:closed>
          <m:phaseSide1>ABC</m:phaseSide1>
          <m:phaseSide2>ABC</m:phaseSide2>
        </m:SwitchPhase>
      </m:OperatedSwitch>
      <m:Operator>
        <m:Names>
          <m:name> Horatio Hornblower </m:name>
        </m:Names>
      </m:Operator>
     <m:SwitchingPlan>
       <m:mRID>6571f4c4-a6ee-4024-8d1f-6c4a0398e5fa</m:mRID>
       <m:description>Example switching plan</m:description>
       <m:Names>
        <m:name>Switching Plan PO-2019-04-142</m:name>
       </m:Names>
       <m:SwitchingStepGroups>
         <m:description>m:First Group</m:description>
         <m:sequenceNumber>1</m:sequenceNumber>
         <m:SwitchingStep>
           <m:sequenceNumber>1</m:sequenceNumber>
            <m:subStepSequenceNumber>1</m:subStepSequenceNumber>
         </m:SwitchingStep>
       </m:SwitchingStepGroups>
     </m:SwitchingPlan>
    </m:SwitchAction>
  </m:SwitchingEvent>
</m:SwitchingEvents>
```

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5.12 **PlannedOutageNotification** payload

5.12.1 General

NOTE the distinction between and **PlannedOutageNotification** and a **PlannedOutage** is that the **PlannedOutageNotification** is created prior to customers being taken out of service, while the **PlannedOutage** is created once switching has started and customers are out of service.

PlannedOutageNotifications are used to notify a customer system that **UsagePoint**s will be impacted by a **SwitchingPlan**, prior to the execution of the **SwitchingPlan**.

A sequence diagram showing an example of the creation of **PlannedOutageNotification** is shown in Figure 78.

Firstly, a **SwitchingPlanRequest** is used to initiate the creation of a **SwitchingPlan**. The **SwitchingPlanRequest** identifies at a high level that work needs to be done, on a particular part of the network, and at what time and date. A **SwitchingPlan Author** will look at the requirements in the **SwitchingPlanRequest** and write a detailed **SwitchingPlan** to be associated with the **SwitchingPlanRequest**.

Once the **SwitchingPlan** has been created and approved, a request to create a **SwitchingOrder** is issued. The **SwitchingOrder** is used to schedule field crews to the work.

When the **SwitchingOrder** is created, it defines the time and date that the work will be performed and by whom. This provides the schedule information necessary to create a **PlannedOutageNotification**. The **PlannedOutageNotification** includes the scheduled start date/time and a list of customers to notify prior to the **SwitchingPlan** being executed.

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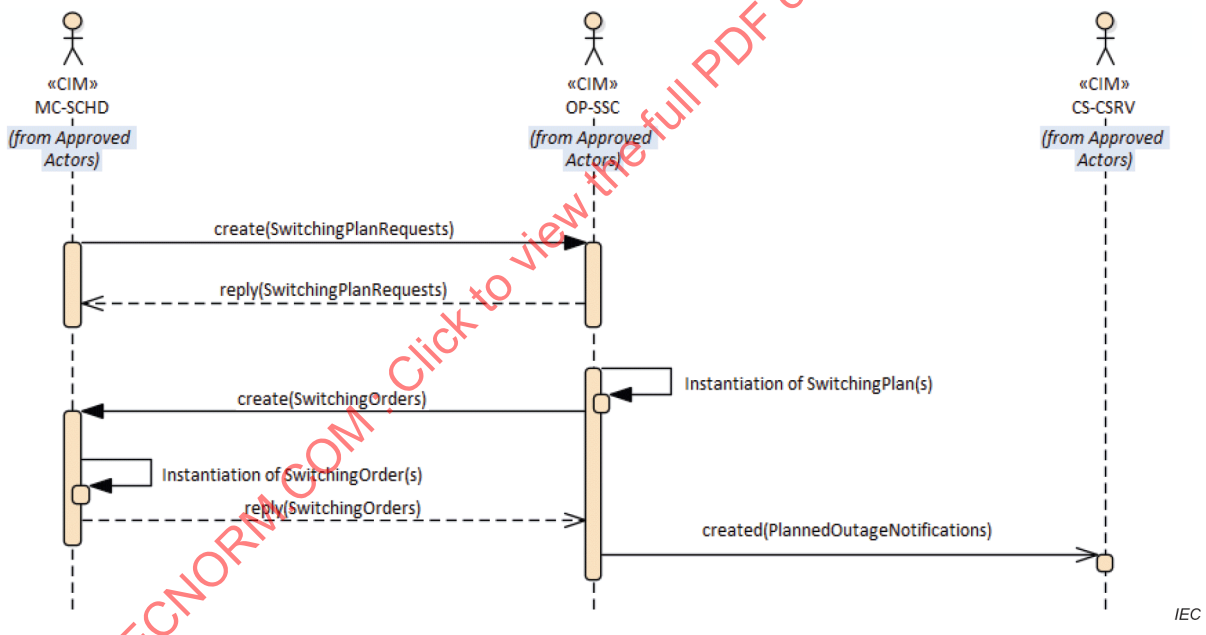


Figure 78 – PlannedOutageNotifications sequence diagram

PlannedOutageNotifications can be changed if the related **SwitchingOrder** is changed such that it either affects which **UsagePoint**s will be affected or if the scheduled time/date of execution changes. The **SwitchingOrder** can also be canceled. Changing **SwitchingOrders** and the consequent change to the **PlannedOutageNotification** is shown in Figure 79.

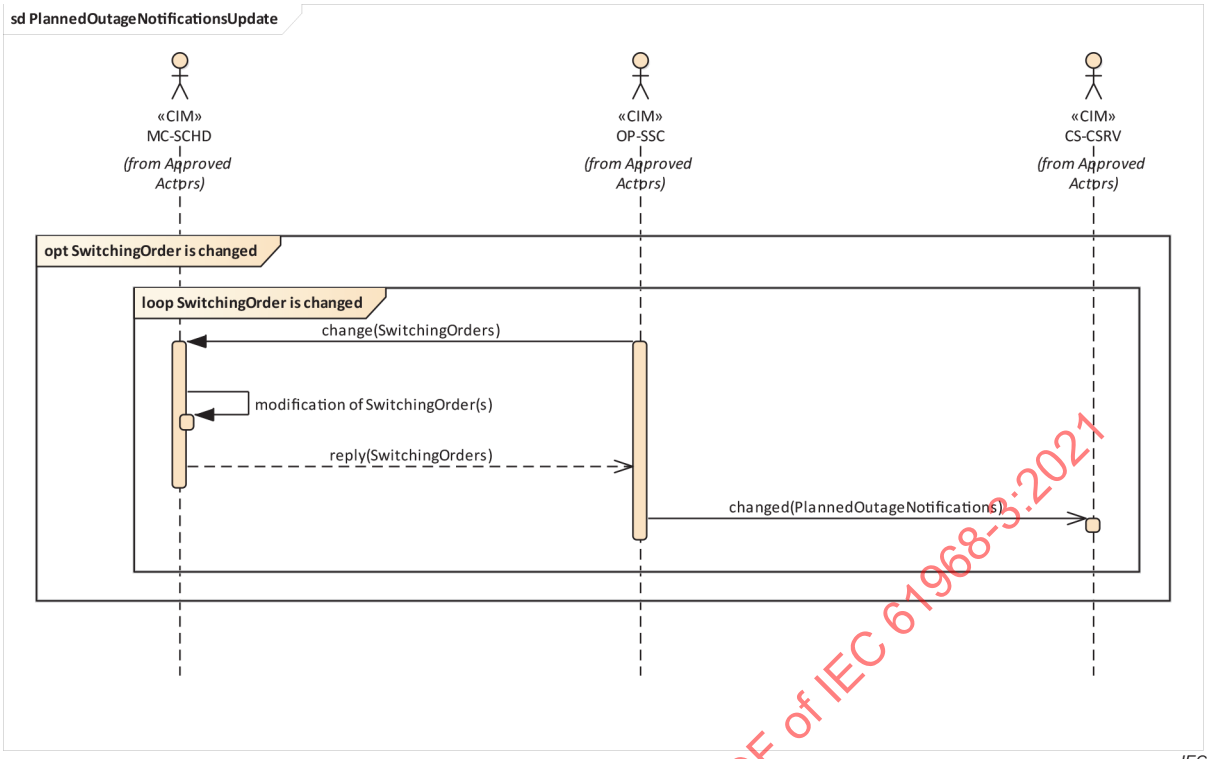


Figure 79 – change PlannedOutageNotifications sequence diagram

5.12.2 Message payload

Figure 80 shows the top level message payload for **PlannedOutageNotifications** in graphical form, while Table 51 shows the attributes in detail.

Table 51 – PlannedOutageNotifications Profile

PlannedOutageNotifications				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
PlannedOutageNotifications	PlannedOutageNotification	[1..*]		
Profile Attributes				
mRID	String	[0..1]	GUID	
description	String	[0..1]		Free-form text field that describes the **PlannedOutageNotification**
Names	Name	[0..1]	See B.56	Human-readable names associated with the PlannedOutageNotification
comment	String	[0..1]		Free-form text
createdDateTime	DateTime	[0..1]		DateTime that the PlannedOutageNotification was initially created.
lastModifiedDateTime	DateTime	[0..1]		DateTime that the PlannedOutageNotification was last modified.
revisionNumber	String	[0..1]		Revision number of this PlannedOutageNotification
subject	String	[0..1]		Free-form text.
title	String	[0..1]		Title of this PlannedOutageNotification. Free-form text
UsagePoint	UsagePoint	[0..*]	See B.97	UsagePoints that will be de-energized as a result of executing this SwitchingPlan.
SwitchingPlan	SwitchingPlan	[0..1]	See 5.8.2	Includes the start and end date/time of the SwitchingPlan.

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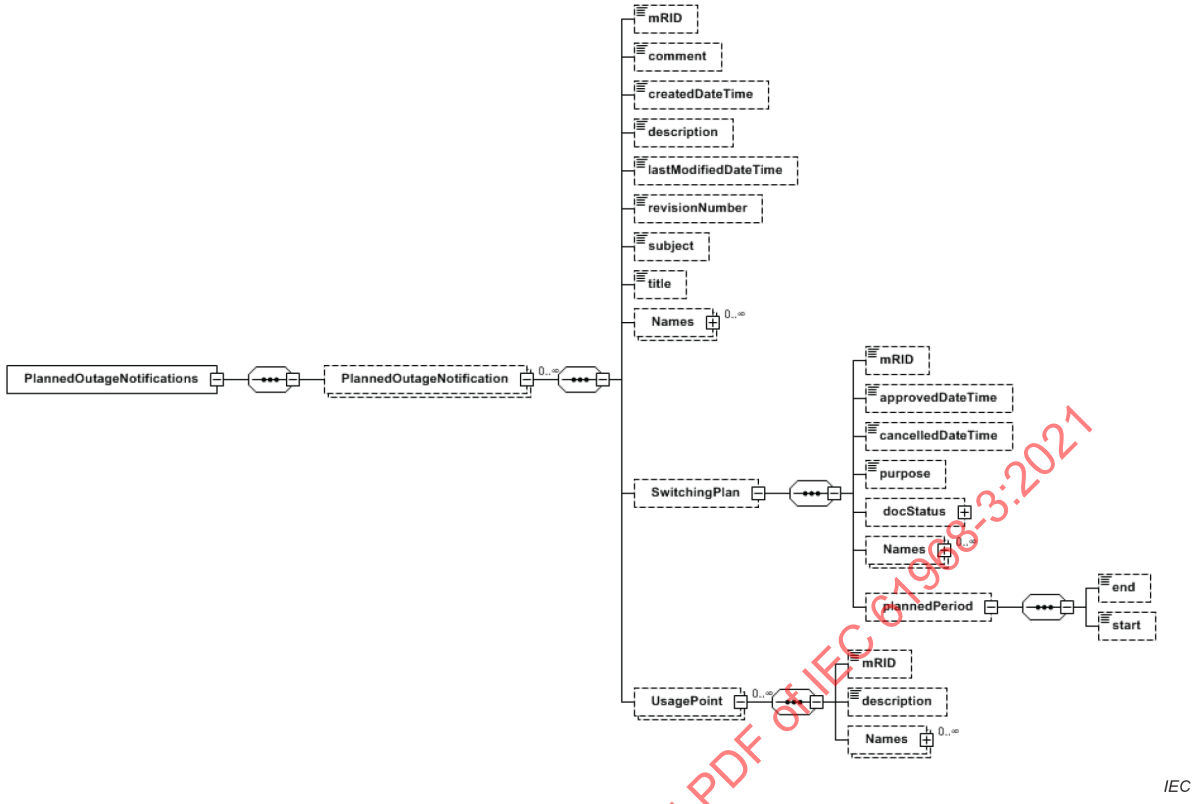


Figure 80 – PlannedOutageNotifications message payload

Attributes of the **SwitchingPlan** include the start and end date (**plannedPeriod.start**, **plannedPeriod.end**) as well as the status of the **SwitchingPlan**.

5.12.3 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PlannedOutageNotifications xmlns:m="http://iec.ch/TC57/2019/PlannedOutageNotifications#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PlannedOutageNotifications#
PlannedOutageNotifications.xsd ">
  <m:PlannedOutageNotification>
    <m:mRID>a52a3bb6-d05d-43db-8d46-ee629bc09ff6</m:mRID>
    <m:comment>Notification of planned outage</m:comment>
    <m:createdDateTime>2019-05-22T09:30:00</m:createdDateTime>
    <m:description>Notification for example switching plan</m:description>
    <m:lastModifiedDateTime>2019-05-25T16:45:00</m:lastModifiedDateTime>
    <m:revisionNumber>B</m:revisionNumber>
    <m:subject>Revised to exclude Our Lady of Mercy Hospital</m:subject>
    <m:title>New Construction</m:title>
    <m:UsagePoint>
      <m:mRID>326bc1f5-0c97-4ef9-b266-77be10f72fc8</m:mRID>
    </m:UsagePoint>
    <m:UsagePoint>
      <m:mRID>ec035307-40ee-4605-86eb-e1dc4985010a</m:mRID>
    </m:UsagePoint>
    <m:Names>
      <m:name>Planned Outage notification for Switching Plan PO-2019-04-142</m:name>>
    </m:Names>
    <m:SwitchingPlan>
      <m:mRID>6571f4c4-acee-4024-8d1f-6c4a0398e5fa </m:mRID>
      <m:approvedDateTime>2019-04-10T14:14:14</m:approvedDateTime>
      <m:purpose>New Construction</m:purpose>
      <m:docStatus>
        <m:dateTime>2019-05-25T16:45:00</m:dateTime>
        <m:reason>Revised</m:reason>
        <m:value>Approved</m:value>
      </m:docStatus>
      <m:Names>
        <m:name>Switching Plan PO-2019-04-142</m:name>
```

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```
      </m:Names>
      <m:plannedPeriod>
        <m:end>2019-05-01T12:00:00</m:end>
        <m:start>2019-01-01T08:00:00</m:start>
      </m:plannedPeriod>
    </m:SwitchingPlan>
  </m:PlannedOutageNotification>
</m:PlannedOutageNotifications>
```

5.13 **PlannedOutages** payload

5.13.1 General

PlannedOutages message payloads, shown in Figure 82, communicate **PlannedOutages** to ensure that other parts of the utility are aware that there is a planned outage in progress.

- A **PlannedOutage** is created and changes as shown in the sequence diagram, Figure 81. The **PlannedOutage** is created when steps in a **SwitchingPlan** are executed, either by a field crew or remotely by SCADA and the first customer(s) is de-energized. This is indicated by the number of **DeEnergizedUsagePoints** changing from zero to non-zero.
- A **PlannedOutage** changes when the **SwitchingPlan** continues executing and the number of customers impacted changes, or the estimated restoration time changes, for example. The diagram shows the number of impacted customers changing as the number of **DeEnergizedUsagePoints** changes from a non-zero value to another value. This can include going from non-zero to zero.

NOTE the distinction between a **PlannnedOutageNotification** and a **PlannedOutage** is that the **PlannedOutageNotification** is created prior to customers being taken out of service, while the **PlannedOutage** is created once switching has started and the first customer(s) are out of service.

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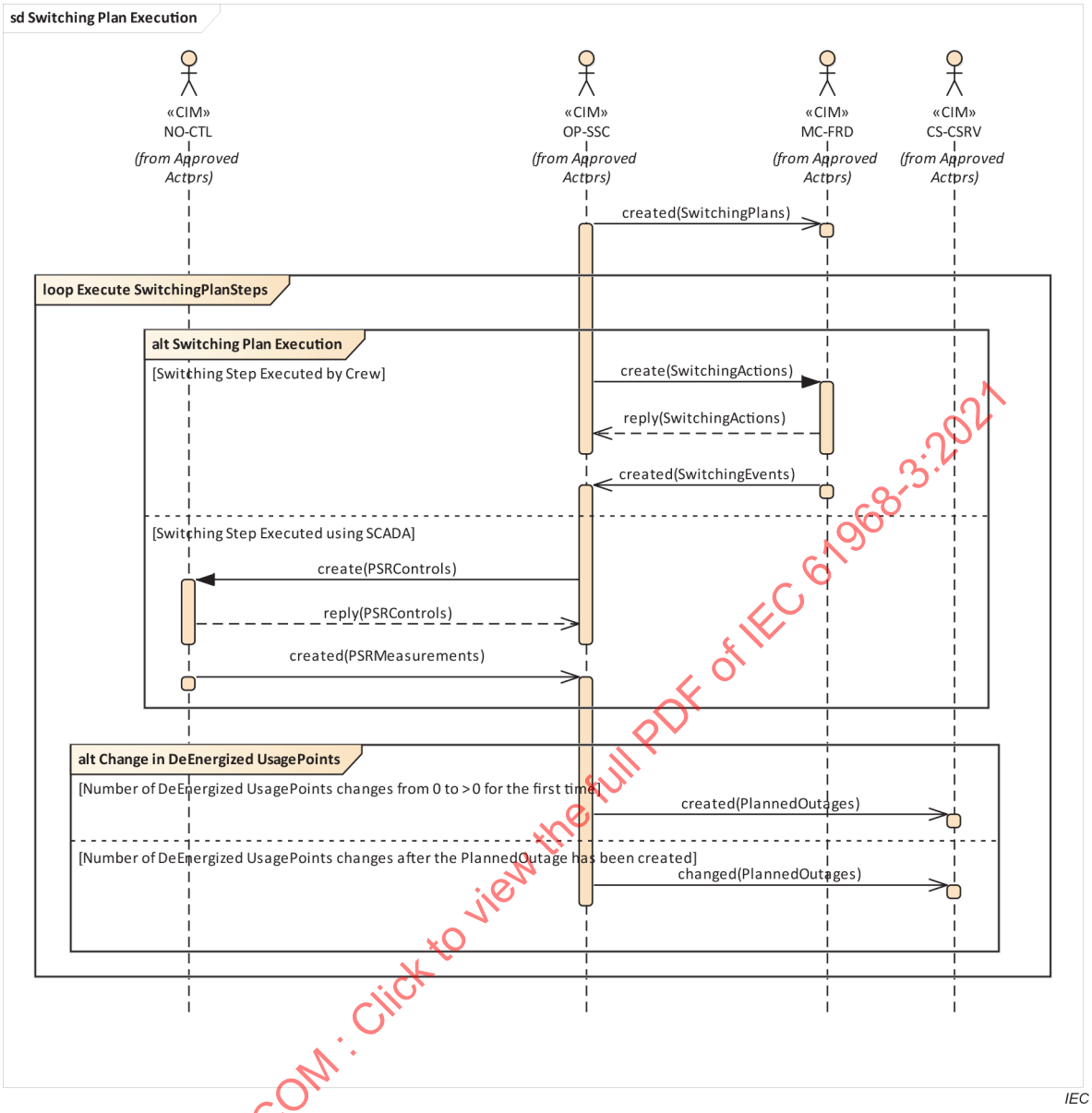


Figure 81 – PlannedOutages – sequence diagram

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PlannedOutage information may be used by different applications depending on the type and cause of the **PlannedOutage**. During the lifecycle of those **PlannedOutage**s, the outage information is updated, including changed outage state (outage is in effect, outage is completed, customers are partially or completely restored to power, etc.).

5.13.2 Message payload

The attributes for the **PlannedOutages** profile are shown in Table 52.

Table 52 – PlannedOutages Profile

PlannedOutages				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
PlannedOutages	PlannedOutage	[1..*]		
Profile Attributes				
description	String	[0..1]		Free-form text field that describes the **PlannedOutage**
mRID	String	[0..1]	GUID	**mRID** of the **PlannedOutage**
Names	Name	[0..*]	See B.56	Can be used to provide additional information such as internal outage number.
communityDescriptor	String	[0..1]		A name to denote the community – this could be a name or a code of some kind.
createdDateTime	DateTime	[0..1]		DateTime that the PlannedOutage was initially created.
customersRestored	Integer	[0..1]		Number of customers that have been restored in the area.
metersAffected	Integer	[0..1]		The updated number of meters affected by the outage as reported by the OMS within the utility. It is assumed this number will be updated repeatedly until the full outage is resolved.
originalCustomersServed	Integer	[0..1]		The total number of customers that are served in the area (both outaged and not outaged).
originalMetersAffected	Integer	[0..1]		The original number of meters that were affected as reported by the OMS within the utility. That is, this is the total number of meters that were out at the beginning of the outage.
outageKind	OutageStatusKind	[0..1]	Enumeration. See C.11	For a PlannedOutage, should only be confirmed, restored or closed.
reason	String	[0..1]		Reason for the PlannedOutage
statusKind	CrewStatusKind	[0..1]	Enumeration. See C.1	Defines the status of the crew as in dispatched or arrived, etc. If there are multiple crews assigned to the PlannedOutage at the same time, then the statusKind shall be the highest priority status as defined in Table 57. The dispatch status of individual crews is available in the FieldDispatchHistory part of the Crew payload fragment in this profile. See B.22
subject	String	[0..1]		String that describes the outage
type	String	[0..1]		String that describes the extent of the outage, e.g. customer, distribution transformer, fuse, recloser, circuit breaker, etc.

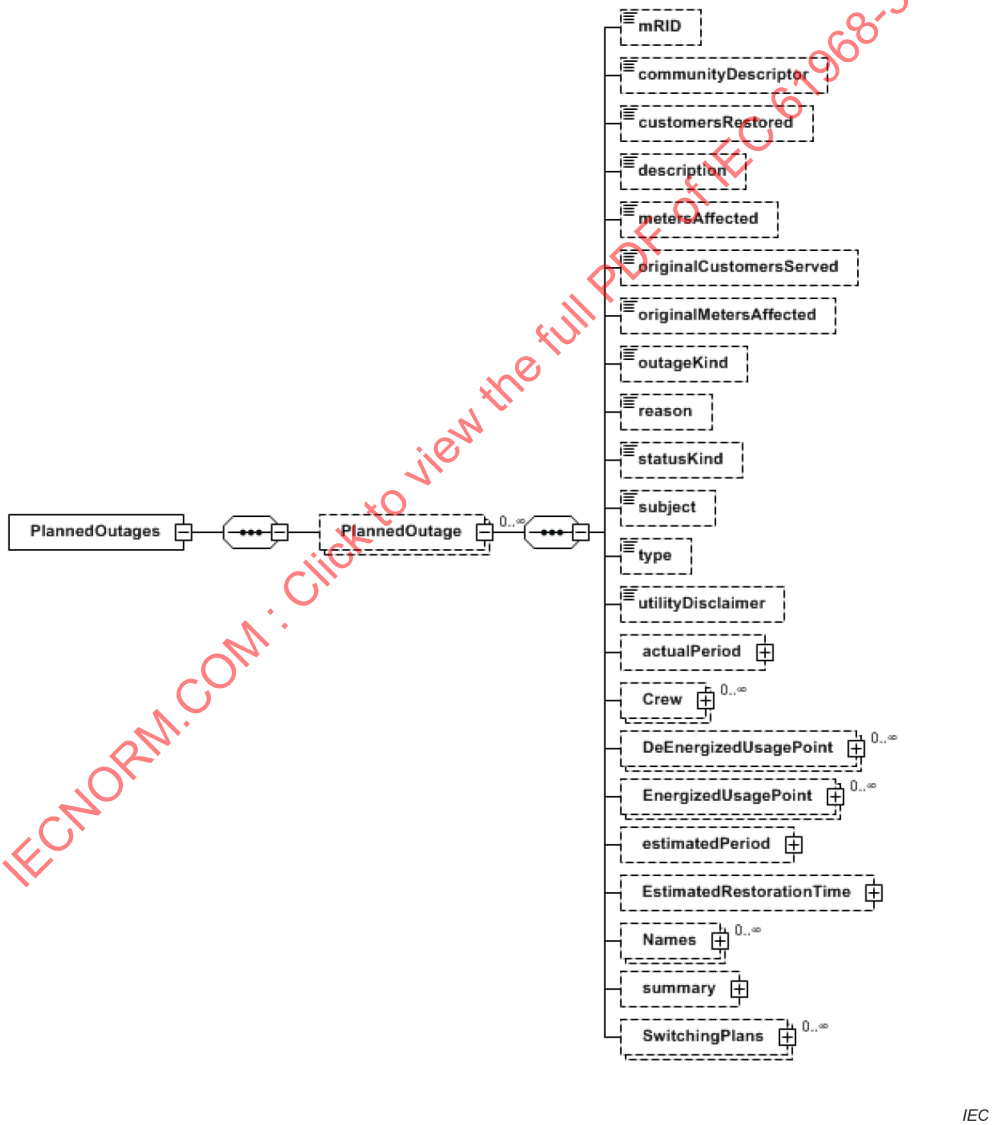
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PlannedOutages				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
utilityDisclaimer	String	[0..1]		This contains an disclaimers the utility would like to place on the data provided to any stakeholder. This may be different for different stakeholders. This should possibly be an attribute under the Organization class but it is placed here for now.
actualPeriod	DateTimeInterval	[0..1]		Actual outage period; end of the period corresponds to the actual restoration time.
Crew	Crew	[0..*]	See B.22	Crews assigned to this PlannedOutage.
DeEnergizedUsagePoint	UsagePoint	[0..*]	See B.27	List of usage points that are currently de-energized by this outage.
EnergizedUsagePoint	UsagePoint	[0..*]	See B.35	List of usage points that were previously de-energized by this outage but are now energized.
EstimatedPeriod	DateTimeInterval	[0..1]		Estimated duration of the PlannedOutage
EstimatedRestorationTime	EstimatedRestorationTime	[0..1]	See B.38	The Estimated Restoration Time for a single outage
Summary	ServicePointOutageSummary	[0..1]	See B.77	Summary of how many customers are out.
SwitchingPlans	SwitchingPlan	[0..*]	mRID, description and Names only. See 5.8.2	List of SwitchingPlans associated with this PlannedOutage.

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A **PlannedOutage** includes

- Customers affected counts
- Actual start/end time
- Crew
- Lists of usage points (energized and de-energized) – see Clauses B.27 and B.35
- Estimated start/end time
- List of incidents. Usually an incident is associated with an unplanned outage. However, this is needed in the event that a planned outage needs to be created as a result of restoring an unplanned outage.
- Reference to **SwitchingPlan**
- Summary of customers out



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Figure 82 – PlannedOutages message payload

5.13.3 Example XML

In this example, the latitude/longtitude of the planned outage is passed in the **DeEnergizedUsagePoints**. Only one **DeEnergizedUsagePoint** is shown, but in practice there will be one for each UsagePoint that is part of the planned outage. This information can be used to show the outage extent on a geographic map.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PlannedOutages xmlns:m="http://iec.ch/TC57/2019/PlannedOutages/#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PlannedOutages/# PlannedOutages.xsd ">
  <m:PlannedOutage>
    <m:mRID>0aa85c42-2cb4-46e4-ae4d-380523b8a65c</m:mRID>
    <m:customersRestored>0</m:customersRestored>
    <m:description>Planned Outage in progress for example switching plan</m:description>
    <m:metersAffected>105</m:metersAffected>
    <m:outageKind>confirmed</m:outageKind>
    <m:reason>Planned Outage</m:reason>
    <m:statusKind>arrived</m:statusKind>
    <m:subject>Planned Outage In Progress</m:subject>
    <m:type>Planned</m:type>
    <m:Crew>
      <m:Names>
        <m:name>James Smedley IV</m:name>
      </m:Names>
    </m:Crew>
    <m:DeEnergizedUsagePoint>
      <m:mRID>cf6ca9ee-44c0-4e5e-8539-806042820bf6</m:mRID>
      <m:Names>
        <m:name>UP-121-AA-54343-CAB</m:name>
      </m:Names>
      <m:UsagePointLocation>
        <m:PositionPoints>
          <m:xPosition>55.103921:xPosition</m:xPosition>
          <m:yPosition>-90.203928</m:yPosition>
        </m:PositionPoints>
      </m:UsagePointLocation>
    </m:DeEnergizedUsagePoint>
    <m:estimatedPeriod>
      <m:end>2019-06-03T12:00:00</m:end>
      <m:start>2019-06-03T10:00:00</m:start>
    </m:estimatedPeriod>
    <m:Names>
      <m:name>PO-2019-04-142</m:name>
    </m:Names>
    <m:SwitchingPlans>
      <m:mRID>6571f4c4-acce-4024-8d1f-6c4a0398e5fa</m:mRID>
      <m:description>Example switching plan </m:description>
      <m:Names>
        <m:name>Switching Plan PO-2019-04-142</m:name>
      </m:Names>
    </m:SwitchingPlans>
  </m:PlannedOutage>
</m:PlannedOutages>
```

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5.14 TroubleTickets payload

TroubleTickets are IEC 61968-8 messages that are used by this document to communicate customer reported incidents, outages and related information through the lifecycle of a trouble call. Typically Trouble Call Management (TCM) receives new outage information reported by customers. OMS and DMS may use this information for outage/fault analysis. After the outage is identified, an **UnplannedOutage** is created to track and respond to the outage. Figure 83 shows an example sequence for creating a **TroubleTicket**, changing a **TroubleTicket**, creating an **UnplannedOutage** and changing an **UnplannedOutage**. Further examples are given in Annex A.

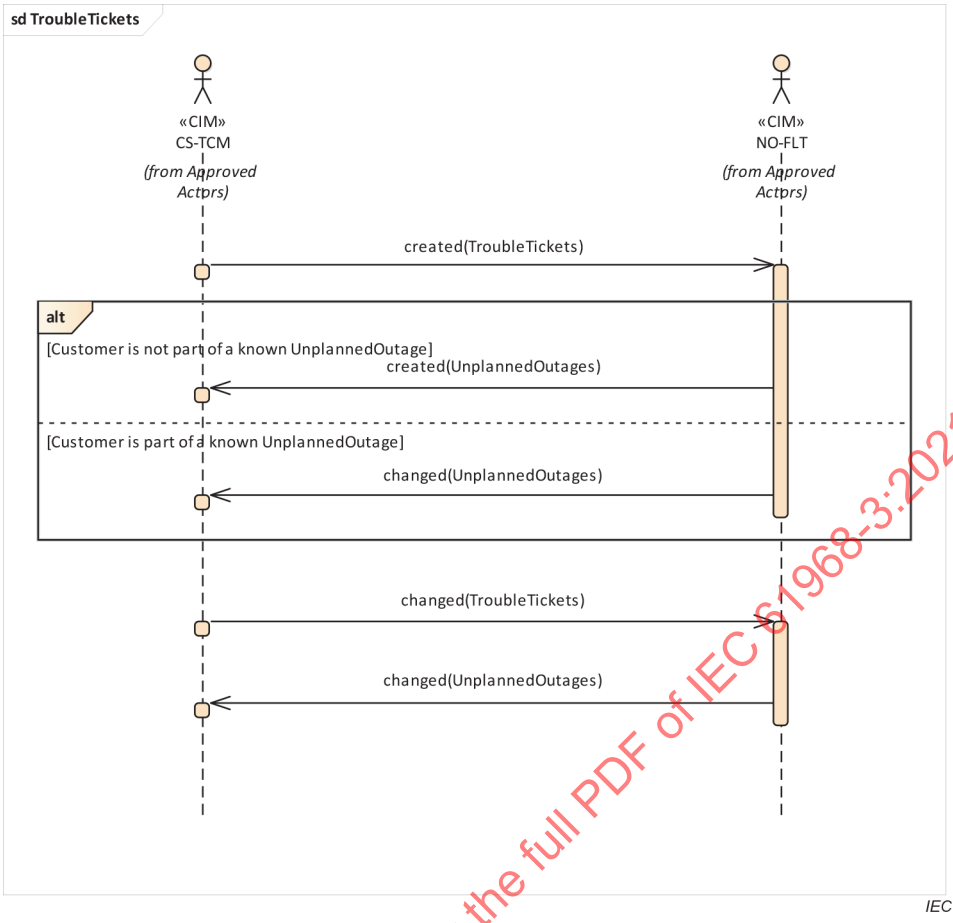


Figure 83 – TroubleTickets sequence diagram

For further details regarding the **TroubleTickets** payload, see IEC 61968-8.

5.15 Incidents payload

5.15.1 General

An **Incident** is a description of an occurrence in the field that impacts or may impact the network. An incident may be reported in a trouble ticket or come from another source. It may or may not be associated with an outage. An example of where an incident is not associated with an outage is where a wire down is reported, but it is a cable television wire and does not create an outage. An example of where an incident will be associated with an unplanned outage is if a car hits a pole and de-energizes customers.

Figure 84 is a sequence diagram that shows an example of the lifecycle of an **Incident**. In this example, Fault Management creates an **Incident** as a result of receiving a **TroubleTicket** that does not report any outage symptoms. In this example, a car hits a pole and customers, passers-by or emergency personnel call the utility's call center to report the **Incident**.

A complete description of the use case is provided in Clause A.8.

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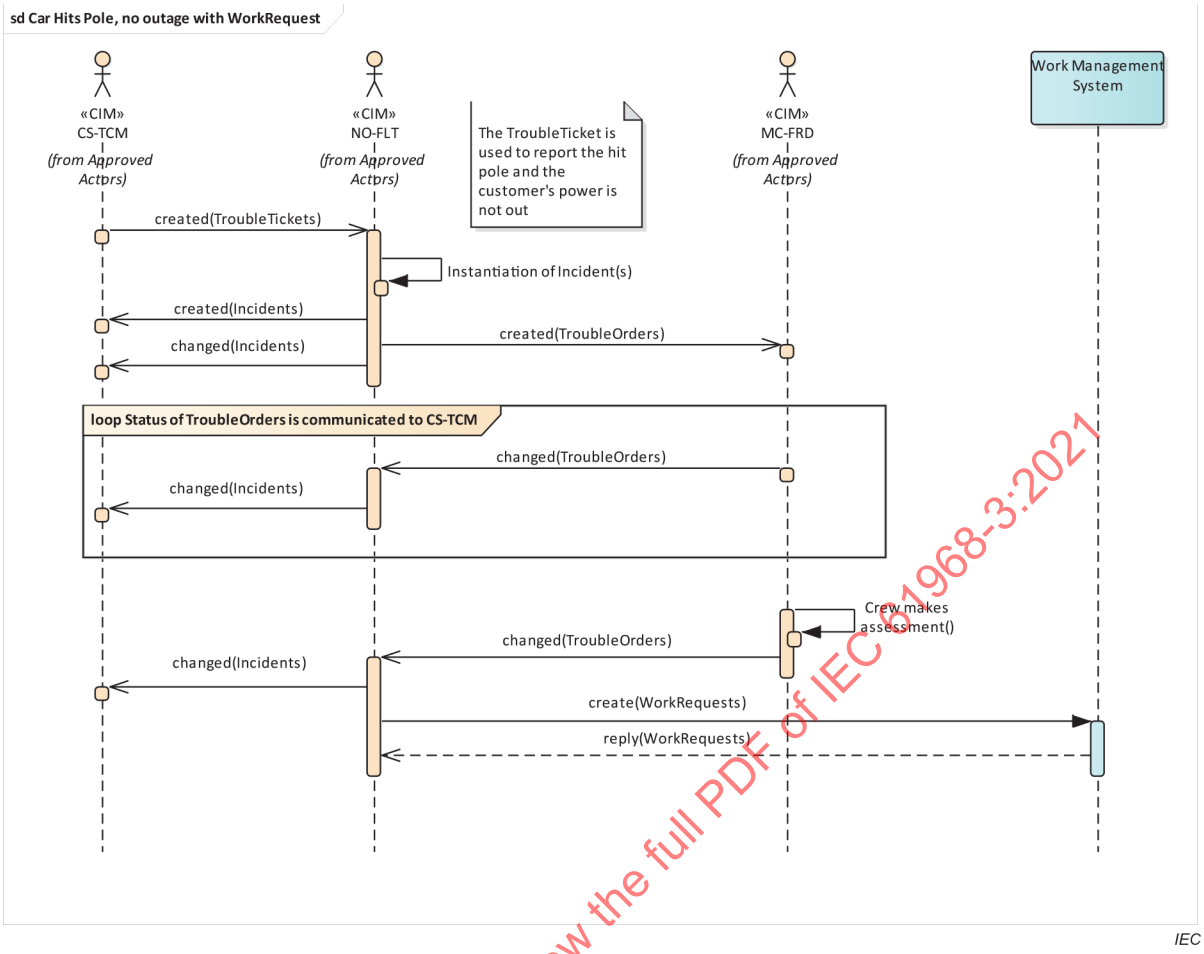


Figure 84 – Sequence diagram showing lifecycle of Incident

An **Incident** can be associated with an **UnplannedOutage** during the lifecycle of the **Incident**. This can happen for example when additional information regarding the **Incident** is received and an **UnplannedOutage** is created as a result. Subsequently, either a user or an automatic system associates the **Incident** with the **UnplannedOutage**.

An example is shown in Figure 85, where an **Incident** is initially created and there is no known outage. Then additional information is received from either another **TroubleTicket**, an **EndDeviceEvent** from AMI indicating that a meter has reported loss of power or a **PSRMeasurement** from SCADA indicating that a breaker has operated.

As a result of these inputs, NO-FLT creates an **UnplannedOutage**. Either an automated process in NO-FLT, or a user, associates the **Incident** with the **UnplannedOutage**. The result is that the **Incident** is associated with the **UnplannedOutage** and a **changed** notification for the **UnplannedOutage** is sent to CS-TCM. This exemplaray diagram does not show an explicit changed(**Incidents**) once the **Incident** has been associated with the **UnplannedOutage**, since it is assuming that the receiver will make the association on their side of the interface and track the **Incident** along with the **UnplannedOutage**.

A complete description of the use case is given in Clause A.9.

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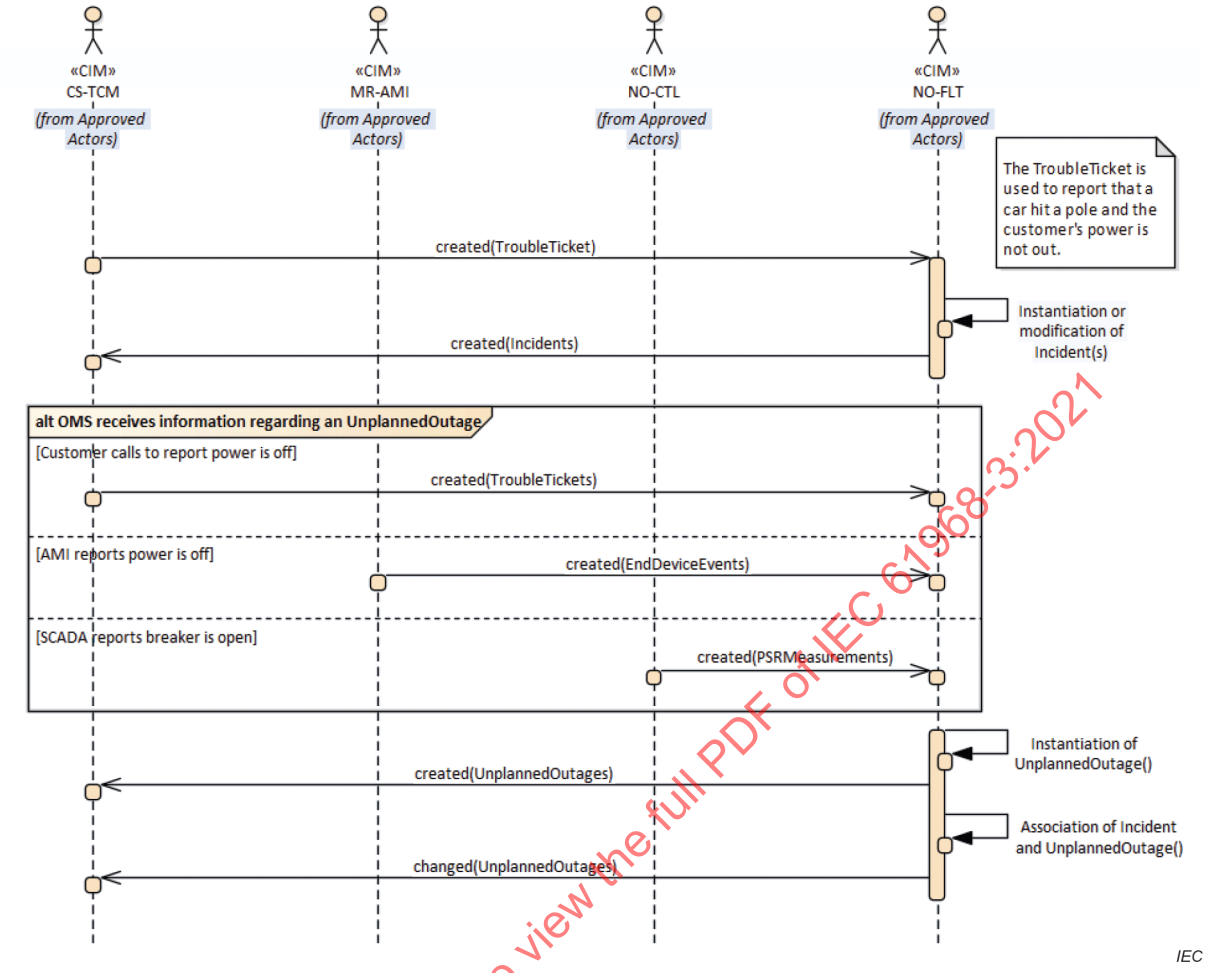


Figure 85 – Sequence diagram showing association of Incident with UnplannedOutage

5.15.2 Message payload

The message payload for **Incidents** is shown in Figure 86. An **Incident** can be associated with zero, one or many **TroubleTickets** (see subclause 5.14) and zero, one or many **Hazard** (see Subclause B.46) and zero or one **UnplannedOutage** (see Subclause 5.17.3).

The attributes of the **Incidents** profile are described in Table 53.

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Table 53 – Incidents Profile

Incidents					
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**	**Profiles Used In, in addition to this profile.**
Incidents	Incident	[1..*]			
Profile Attributes					
description	String	[0..1]		Free-form text field that describes the **Incident**.	TroubleOrders UnplannedOutages
mRID	String	[0..1]	GUID	mRID of the Incident.	TroubleOrders UnplannedOutages
Names	Name	[0..*]	See B.56	Can be used to provide additional information such as internal incident number.	TroubleOrders UnplannedOutages
cause	String	[0..1]		May not be known early in the lifecycle of the **Incident** but can be populated once the information is known.	TroubleOrders
createdDateTime	DateTime	[0..1]		DateTime that the Incident was initially created.	TroubleOrders
lastModifiedDateTime	DateTime	[0..1]		DateTime that the Incident was last changed.	TroubleOrders
Assets	Asset	[0..*]	See B.9	List of **Assets** associated with this Incident, if any. Even if there are no **Assets**, the association can be used to identify the **PowerSystemResource**(s) associated with the **Incident** and to the **Feeder** and **Substation** if required.	
Hazard	Hazard	[0..*]	See B.46	Hazardous conditions associated with this Incident, if any.	TroubleOrders UnplannedOutages
Location	Location	[0..1]	See B.52	Provides more precise geographic location information than the description alone.	
status	Status	[0..1]	See B.79	Used to indicate whether the **Incident** is open or closed.	TroubleOrders
TroubleTickets	TroubleTicket	[0..*]	See 5.14	mRID, description and Names only.	
UnplannedOutage	UnplannedOutage	[0..1]	See 5.17.3	mRID, description and Names only.	

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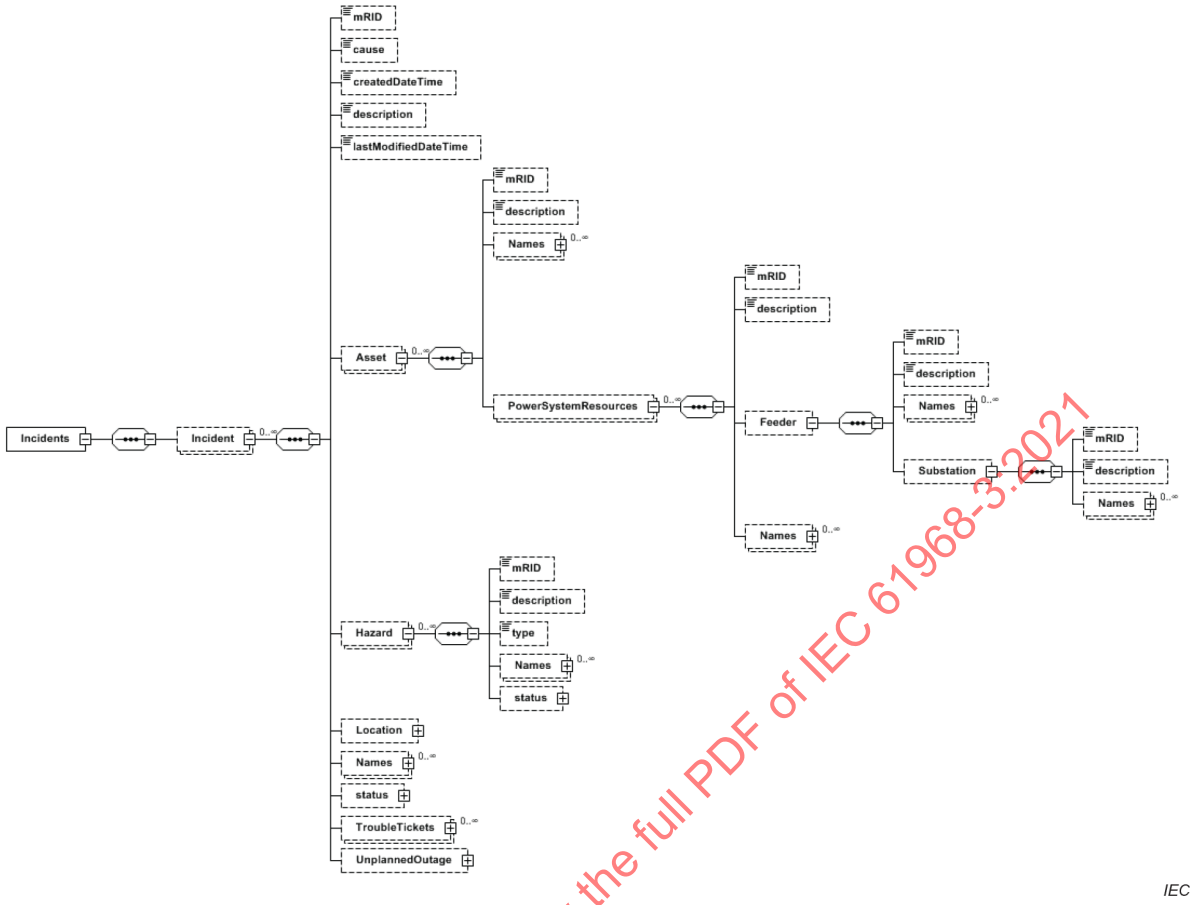


Figure 86 – Incident message payload

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5.15.3 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:Incidents xmlns:m="http://iec.ch/TC57/2019/Incidents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/Incidents# Incidents.xsd ">
  <m:Incident>
    <m:mRID>a80f0cb3-5e58-401d-8f26-1e4d6011d07a</m:mRID>
    <m:cause>Car Hit Pole</m:cause>
    <m:createdDateTime>2019-06-03T11:25:00</m:createdDateTime>
    <m:description>Car hit pole at 17 Station Road in Sidcup, South of Police
Station</m:description>
    <m:lastModifiedDateTime>2019-06-03T11:26:00</m:lastModifiedDateTime>
    <m:Hazard>
      <m:type>Car hit pole; pole burning</m:type>
      <m:status>
        <m:dateTime>2019-06-03T11:27:00</m:dateTime>
        <m:reason>New</m:reason>
        <m:value>Unresolved</m:value>
      </m:status>
    </m:Hazard>
    <m:Location>
      <m:direction>17 Station Road in Sidcup, South of Police Station</m:direction>
      <m:mainAddress>
        <m:postalCode>DA17 6BW</m:postalCode>
        <m:streetDetail>
          <m:addressGeneral>Station Road</m:addressGeneral>
          <m:number>17</m:number>
        </m:streetDetail>
        <m:townDetail>
          <m:name>Sidcup</m:name>
        </m:townDetail>
      </m:mainAddress>
    </m:Location>
    <m:Names>
      <m:name>Incident #890911</m:name>
```

```
    </m:Names>
    <m:status>
      <m:dateTime>2019-06-03T11:31:00</m:dateTime>
      <m:reason>New</m:reason>
      <m:value>Unresolved</m:value>
    </m:status>
    <m:TroubleTickets>
      <m:mRID>c95251c5-bf5f-4657-a9fb-0178fdff3f70</m:mRID>
      <m:description>Car hit pole at 17 Station Road</m:description>
      <m:Names>
        <m:name>Ticket # 4398402</m:name>
      </m:Names>
    </m:TroubleTickets>
  </m:Incident>
</m:Incidents>
```

5.16 **EquipmentFaults** payload

5.16.1 General

An **EquipmentFault** is a fault applied at the terminal, external to the equipment. This class is not used to specify faults internal to the equipment.

EquipmentFaults message payloads, shown in Figure 89, communicate the detailed fault information as part of **UnplannedOutages** messages. **EquipmentFaults** define all types of faults that occur on conducting equipment, with the exception of lines, which are covered by **LineFaults** (see 5.17). This information is added as soon the fault is located and confirmed by a crew. The equipment fault is identified by the concerned conducting equipment and may have a reference to the corresponding asset.

A sequence diagram that shows a possible way of associating an **EquipmentFault** to an **UnplannedOutage** is shown in Figure 87 (the events that trigger the instantiation and creation of the **UnplannedOutage** are omitted for the sake of brevity).

The diagram shows the creation of an **UnplannedOutages** and the subsequent creation of a **TroubleOrders** that is sent to a field crew. The field crew then identifies the root cause of the unplanned outage and this information is sent in an **EquipmentFaults** message to the control room. It is also possible to use the **EquipmentFaults** element in the **TroubleOrders**.**UnplannedOutage** payload (see 5.21.2.3) to achieve the same goal.

The diagram also shows an alternate, where a **LineFaults** is sent instead of an **EquipmentFaults** (see 5.17).

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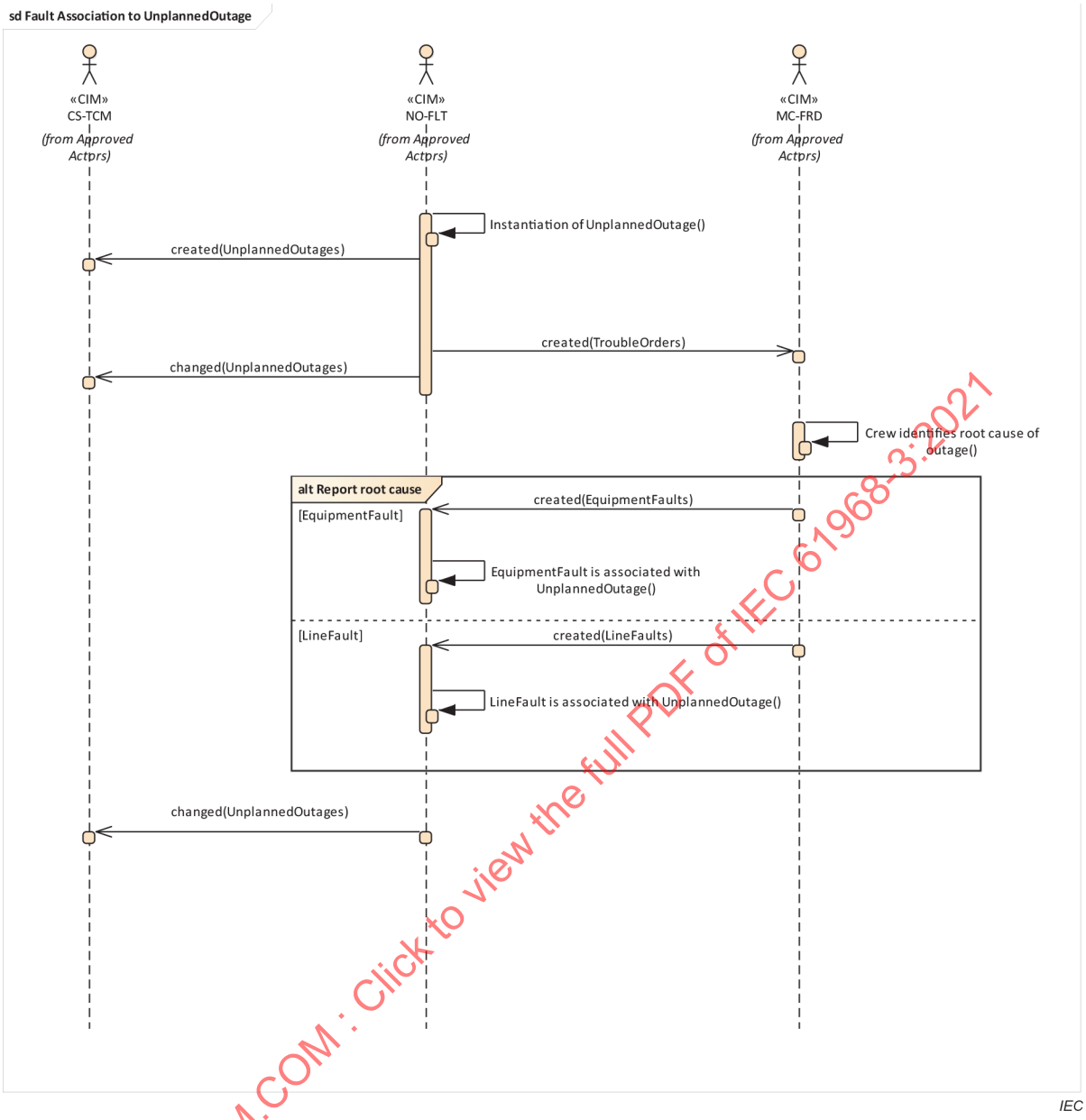


Figure 87 – Association of LineFaults/EquipmentFaults to UnplannedOutage

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EquipmentFaults messages payloads may also be used to communicate fault information, e.g. for reporting use cases.

Another example of creating an **EquipmentFault** is shown in Figure 88. This could be used in the case where the FLISR function resides in a different system to the outage management system, and the **EquipmentFault** information needs to be communicated between the two systems.

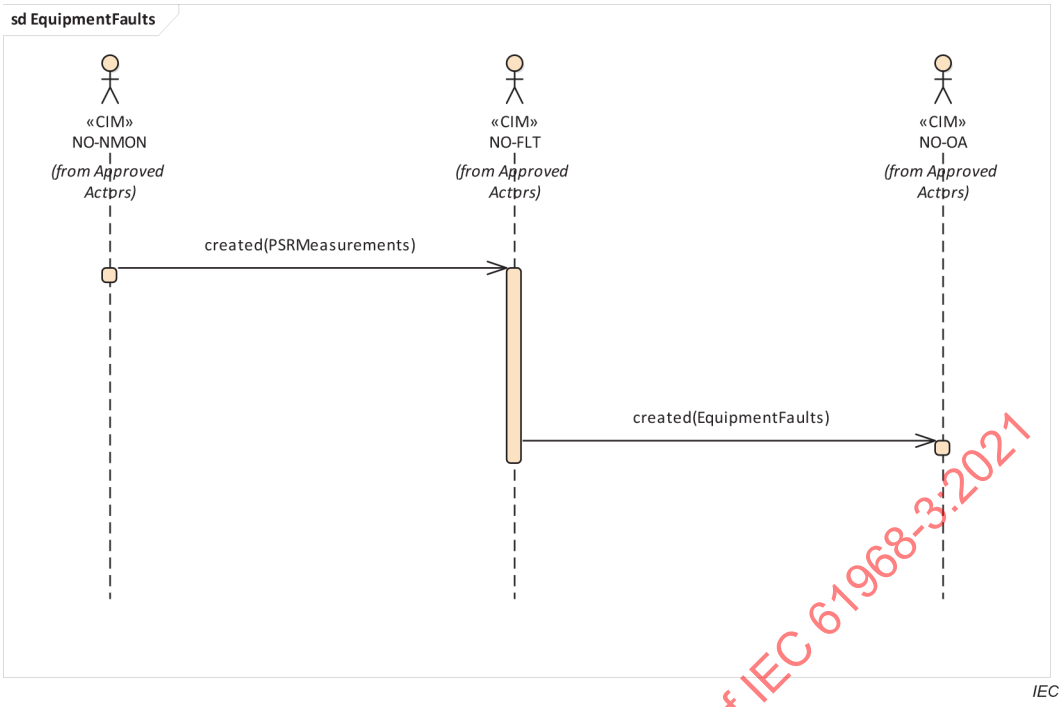


Figure 88 – EquipmentFaults sequence diagram

5.16.2 Message payload

The message payload for **EquipmentFaults** is shown in graphical form in Figure 89. The attributes are described in Table 54.

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Table 54 – EquipmentFaults payload

Faults: LineFaults				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
EquipmentFaults	EquipmentFault	[1..*]		
Profile Attributes				
description	String	[0..1]		Free-form text field that describes the **EquipmentFault.**
mRID	String	[0..1]	GUID	mRID of the EquipmentFault.
Names	Name	[0..*]	See B.56	Human-readable names for the EquipmentFault.
kind	PhaseConnectedFaultKind	[0..1]	See C.13	The kind of phase fault.
occuredDateTime	DateTime	[0..1]		The date and time at which the fault occurred.
phases	PhaseCode	[0..1]	See C.12	The phases participating in the fault. The fault connections into these phases are further specified by the type of fault.
FaultCauseTypes	FaultCauseType	[0..*]	See B.40	Type of cause of the fault. There can be zero, one or many causes of the fault, e.g. weather and an equipment failure.
FaultyEquipment	Equipment	[0..1]	See B.37	The equipment that carries the fault.
Location	Location	[0..1]	See B.52	Geographic location of the fault.
Terminal	Terminal	[0..1]	See B.90	The terminal connecting to the bus to which the fault is applied.

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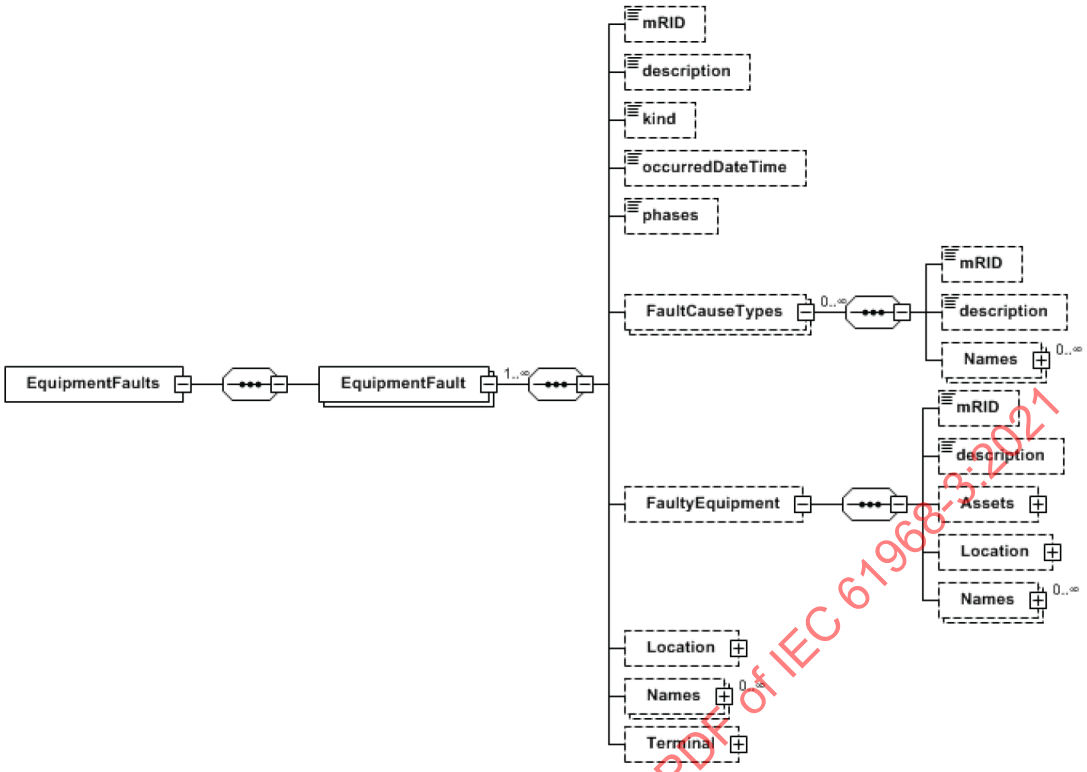


Figure 89 – EquipmentFaults message payload

5.16.3 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:EquipmentFaults xmlns:m="http://iec.ch/TC57/2019/EquipmentFaults#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/EquipmentFaults# EquipmentFaults.xsd ">
  <m:EquipmentFault>
    <m:mRID>d1e0d296-9bc5-4c3d-b383-e9bf93c20ac9</m:mRID>
    <m:occurredDateTime>2019-06-03T11:49:00</m:occurredDateTime>
    <m:phases>A</m:phases>
    <m:FaultCauseTypes>
      <m:Names>
        <m:name>Over Current</m:name>
      </m:Names>
    </m:FaultCauseTypes>
    <m:FaultyEquipment>
      <m:mRID>445ebf37-a17a-4820-b450-b939c5769a12</m:mRID>
      <m:Assets>
        <m:Names>
          <m:name>Furman 34kV F06 R-066</m:name>
        </m:Names>
      </m:Assets>
      <m:Location>
        <m:direction>At intersection of Gatehouse Drive and Dead Mouse Creek</m:direction>
        <m:mainAddress>
          <m:townDetail>
            <m:name>Thorton Heath</m:name>
            <m:stateOrProvince>Arizona</m:stateOrProvince>
          </m:townDetail>
        </m:mainAddress>
      </m:Location>
      <m:Names>
        <m:name>Furman 34kV F06 R-066</m:name>
      </m:Names>
    </m:FaultyEquipment>
  </m:EquipmentFault>
</m:EquipmentFaults>
```

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5.17 **LineFaults** payload

5.17.1 General

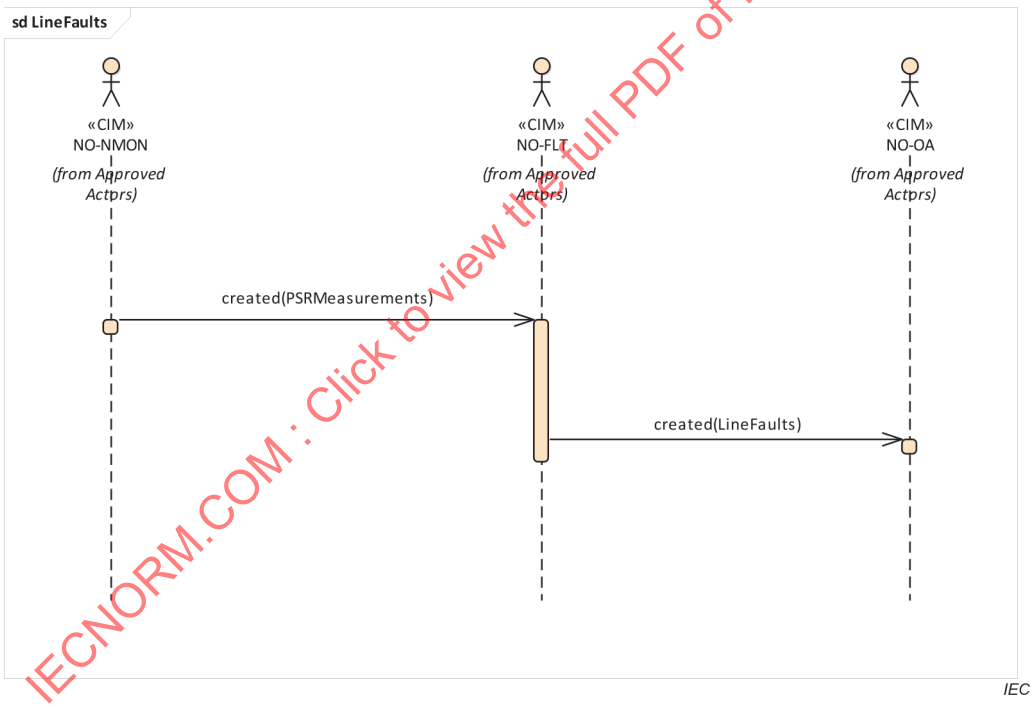
A **LineFault** is a fault that occurs on an AC line segment at some point along the length.

LineFaults messages communicate the detailed fault information as part of **UnplannedOutages** messages. **LineFaults** define all types of faults that occur on AC line segments. This information is added as soon the fault is located and confirmed by a crew. The fault is identified by the concerned AC line segment and may have a reference to the corresponding asset.

A sequence diagram that shows a possible way of associating a **LineFault** to an **UnplannedOutage** is shown in Figure 87.

LineFaults message payloads may also be used to communicate fault information, e.g. for reporting use cases.

Another example of creating a **LineFault** is shown in Figure 90. This could be used in the case where the FLISR function resides in a different system to the outage management system, and the **LineFault** information needs to be communicated between the two systems.



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Figure 90 – LineFaults sequence diagram

5.17.2 Message payload

Figure 91 shows the **LineFaults** message payload in graphical form. The details are shown in Table B.68.

Table 55 – LineFaults payload

Faults: LineFaults				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
LineFaults	LineFault	[1..*]		
Profile Attributes				
description	String	[0..1]		Free-form text field that describes the **LineFault.**
mRID	String	[0..1]	GUID	mRID of the LineFault.
Names	Name	[0..*]	See B.56	Human-readable names for the LineFault.
kind	PhaseConnectedFaultKind	[0..1]	See C.13	The kind of phase fault.
lengthFromTerminal1	Length	[0..1]		The length to the place where the fault is located starting from terminal with sequence number 1 of the faulted line segment.
occuredDateTime	DateTime	[0..1]		The date and time at which the fault occurred.
phases	PhaseCode	[0..1]	See C.12	The phases participating in the fault. The fault connections into these phases are further specified by the type of fault.
ACLineSegment	ACLineSegment	[0..1]	See B.4	ACLineSegment where the fault has occurred.
FaultCauseTypes	FaultCauseType	[0..*]	See B.40	Type of cause of the fault. There can be zero, one or many causes of the fault, e.g. weather and a wire down.
impedance	FaultImpedance	[0..1]	See B.39	Fault impedance. Its usage is described by 'kind'.
Location	Location	[0..1]	See B.52	Geographic location of the fault.

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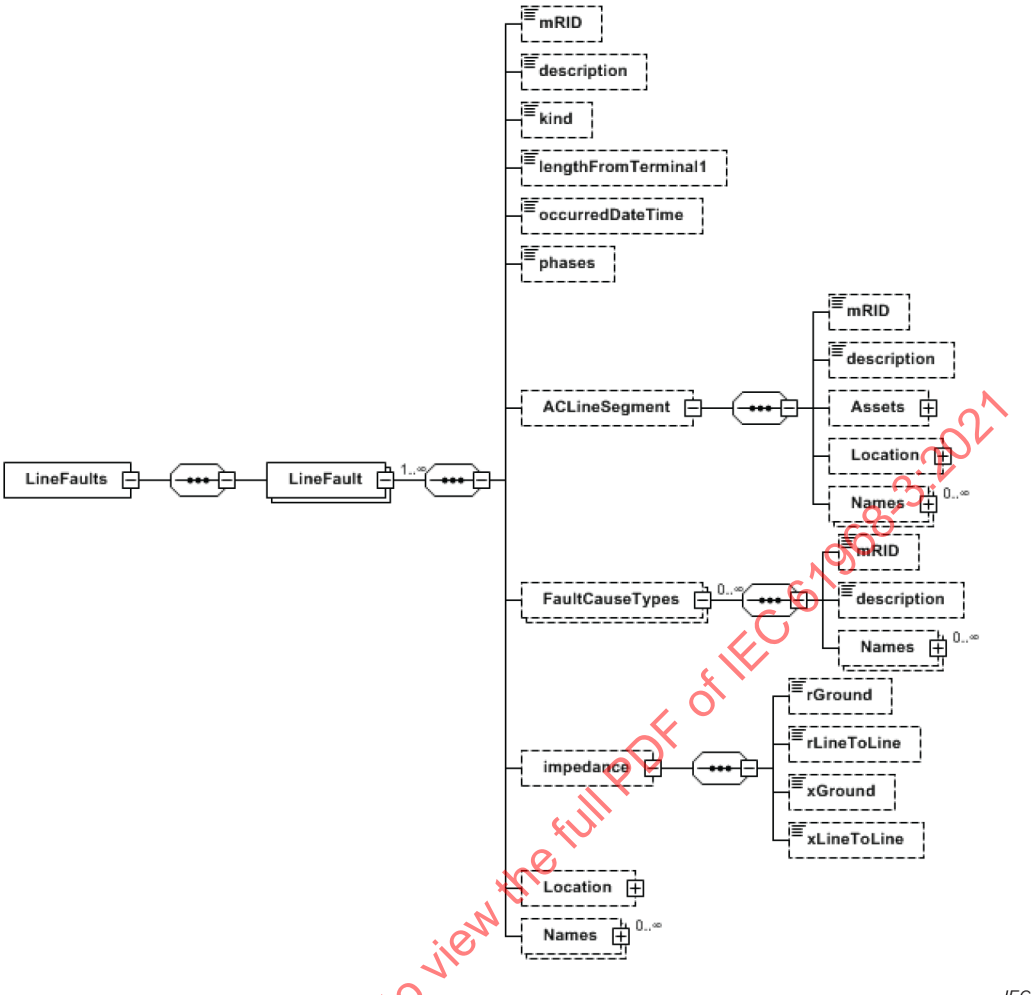


Figure 91 – LineFaults message payload

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5.17.3 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:LineFaults xmlns:m="http://iec.ch/TC57/2019/LineFaults#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/LineFaults# LineFaults.xsd ">
  <m:LineFault>
    <m:mRID>ce3f88e-7ecb-442e-8aa6-8dab3bb04795</m:mRID>
    <m:kind>lineOpen</m:kind>
    <m:lengthFromTerminal1>125.0</m:lengthFromTerminal1>
    <m:occurredDateTime>2019-06-03T12:02:00</m:occurredDateTime>
    <m:phases>A</m:phases>
    <m:ACLineSegment>
      <m:mRID>b7e3453e-63ec-4203-898e-d23b8876f1f7</m:mRID>
    </m:ACLineSegment>
    <m:Location>
      <m:PositionPoints>
        <m:xPosition>35.7718409</m:xPosition>
        <m:yPosition>-78.6801357</m:yPosition>
      </m:PositionPoints>
    </m:Location>
  </m:LineFault>
</m:LineFaults>
```

5.18 UnplannedOutages payload

5.18.1 General

An unplanned outage refers to an unexpected state where energy is not delivered.

UnplannedOutage message payloads communicate unplanned outages. An **UnplannedOutage** can be created as shown in the sequence diagram, Figure 92. **UnplannedOutage**s may occur as a result of faults such as short circuit faults and downed lines.

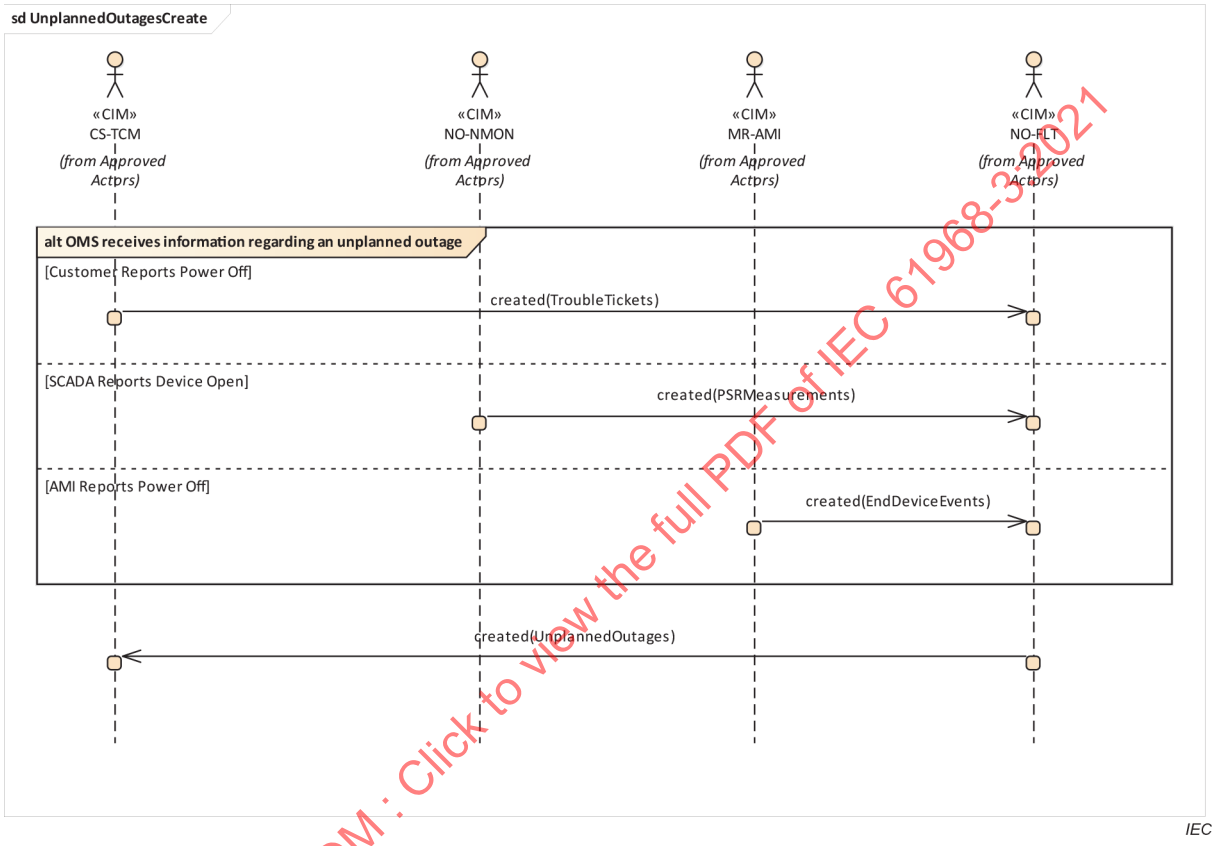


Figure 92 – UnplannedOutages sequence diagram

An **UnplannedOutage** can be created as a result of any of the following triggers:

- After an outage is detected via remote devices, for instance a device trip detected by SCADA. SCADA (NO-CTL) creates a **PSRMeasuresments** and sends it to NO-FLT, which creates the **UnplannedOutage**
- AMI detects a last-gasp power off notification from a meter. MR-AMI creates an **EndDeviceEvent** and sends it to NO-FLT, which creates the **UnplannedOutage**
- A customer reports that their power is out. Customer service (CS-TCM) creates a **TroubleTicket** and sends it to NO-FLT, which creates the **UnplannedOutage**

UnplannedOutage information may be used by different applications depending on the type and cause of the outage:

- After an **UnplannedOutage** is confirmed, Fault Management may request a switching plan for isolation and service restoration. Based on this request an application (i.e. Switch Action Scheduling) will determine the necessary steps to isolate the fault and to restore power to the healthy islands of the network. The variants may show additional information that supports the user in choosing the best alternative.

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- During the lifecycle of outages, the outage information is updated, e.g. to notify about changed outage state (expected restoration time, customers are partially or completely restored to power, etc.).

Detailed information concerning the faulted equipment or line are communicated as part of an **UnplannedOutage** as **EquipmentFault** and **LineFault**, see Subclause 5.16 for **EquipmentFault** and 5.16.3 for **LineFault** profiles. An **UnplannedOutage** may include zero (i.e. the fault is not detected yet) to many equipment and/or line faults.

5.18.2 Message payload

Figure 93 shows the payload for **UnplannedOutages** at a high level.

The attributes of the **UnplannedOutages** profile are described in Table 56.

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Table 56 – UnplannedOutages Profile

UnplannedOutages					
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**	**Profiles Used In, in addition to this profile.**
UnplannedOutages	UnplannedOutage	[1..*]			
Profile Attributes					
description	String	[0..1]		Free-form text field that describes the **UnplannedOutage**	TroubleOrders
mRID	String	[0..1]	GUID	**mRID** of the **UnplannedOutage**	TroubleOrders
Names	Name	[0..*]	See B.56	Can be used to provide additional information such as internal outage number.	TroubleOrders
cause	String	[0..1]		The cause of this outage. This is the cause that is used to present to external entities. That is, the cause is weather, equipment failure, etc. Note: At present, this is a free text; could be replaced with a separate associated class in case we have multiple causes (e.g. OutageCauseType, inheriting from IdentifiedObject). It should be noted that EquipmentFault and LineFault support multiple FaultCauseTypes, so the information can be captured there and summarized in the cause field of the message. May not be known early in the lifecycle of the **UnplannedOutage** but can be populated once the information is known.	TroubleOrders
causeKind	OutageCauseKind	[0..1]	See C.9	This enumeration describes the primary cause of the outage – planned, unplanned, etc.	TroubleOrders
comment	String	[0..1]		Operator comments associated with the outage.	TroubleOrders
communityDescriptor	String	[0..1]		A name to denote the community – this could be a name or a code of some kind.	
createdDateTime	DateTime	[0..1]		DateTime that the UnplannedOutage was initially created.	
customersRestored	Integer	[0..1]		Number of customers that have been restored in the area.	TroubleOrders
lastModifiedDateTime	DateTime	[0..1]		DateTime that the UnplannedOutage was last changed.	
metersAffected	Integer	[0..1]		The updated number of meters affected by the outage as reported by the OMS within the utility. It is assumed this number will be updated repeatedly until the full outage is resolved.	TroubleOrders

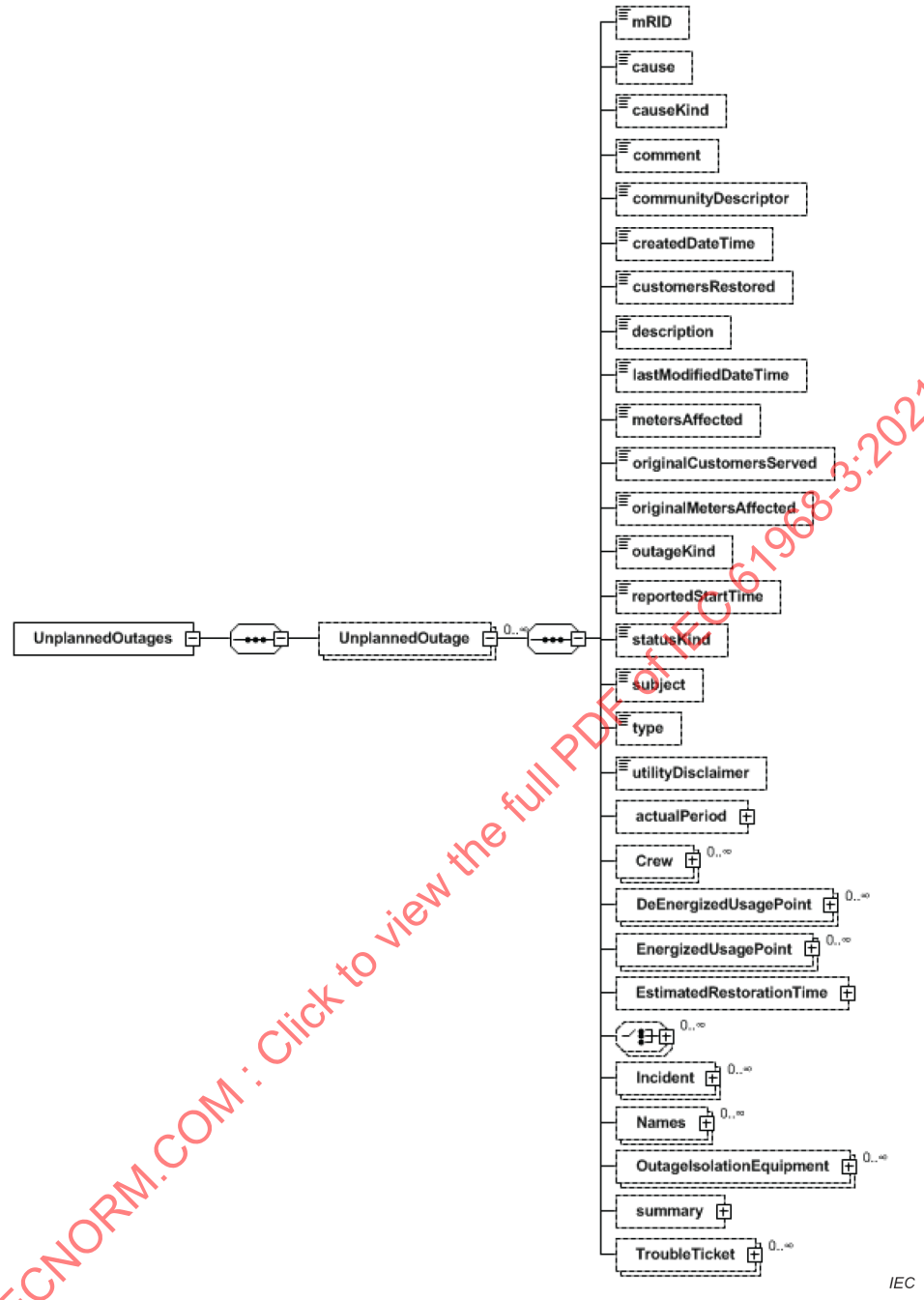
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UnplannedOutages					
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**	**Profiles Used In, in addition to this profile.**
originalCustomersServed	Integer	[0..1]		The total number of customers that are served in the area (both outaged and not outaged).	
originalMetersAffected	Integer	[0..1]		The original number of meters that were affected as reported by the OMS within the utility. That is, this is the total number of meters that were out at the beginning of the outage.	
outageKind	OutageStatusKind	[0..1]	See C.11	Defines if the outage has been verified or is only estimated	TroubleOrders
reportedStartTime	DateTime	[0..1]		DateTime of the earliest call or AMI event that created the outage	TroubleOrders
statusKind	CrewStatusKind	[0..1]	Enumeration. See C.1	Defines the status of the crew as in dispatched or arrived, etc. If there are multiple crews assigned to the UnplannedOutage at the same time, then the statusKind shall be the highest priority status as defined in Table 57. The dispatch status of individual crews is available in the FieldDispatchHistory part of the Crew payload fragment in this profile. See Annex B.22	TroubleOrders
subject	String	[0..1]		String that describes the outage	TroubleOrders
type	String	[0..1]		String that describes the extent of the outage, e.g. customer, distribution transformer, fuse, recloser, circuit breaker, etc.	TroubleOrders
utilityDisclaimer	String	[0..1]		This contains an disclaimers the utility would like to place on the data provided to any stakeholder. This may be different for different stakeholders. This should possibly be an attribute under the Organization class but it is placed here for now.	
actualPeriod	DateTimeInterval	[0..1]		Actual outage period; end of the period corresponds to the actual restoration time.	TroubleOrders
Crew	Crew	[0..*]	See B.22	Crews assigned to this UnplannedOutage.	
DeEnergizedUsagePoint	UsagePoint	[0..*]	See B.27	List of usage points that are currently de-energized by this outage.	TroubleOrders
EnergizedUsagePoint	UsagePoint	[0..*]	See B.35	List of usage points that were previously de-energized by this outage but are now energized.	TroubleOrders
EstimatedRestorationTime	EstimatedRestorationTime	[0..1]	See B.38	The Estimated Restoration Time for a single outage	TroubleOrders

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UnplannedOutages					
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**	**Profiles Used In, in addition to this profile.**
Fault	EquipmentFault or LineFault	[0..*]	EquipmentFault – see 5.16 LineFault – see 5.17	There can be multiple EquipmentFaults associated with an UnplannedOutage. Therefore each EquipmentFault has its own Location, independent of the location of the UnplannedOutage. The EquipmentFault also has a phase and a FaultyEquipment attribute that identify where the fault has been predicted. The FaultyEquipment attribute identifies names (FaultEquipment.Names) and type of the equipment (FaultyEquipment.PSRType). There can be multiple LineFaults associated with an UnplannedOutage. A LineFault can also be predicted based on the results of a short circuit analysis and as a result there could be multiple candidate locations for the predicted fault that all have the same short circuit current. Therefore each LineFault has its own Location and phase, independent of the location of the UnplannedOutage. The LineFault also has an ACLineSegment and a lengthFromTerminal1 attribute. These can be used by network-aware applications to display the LineFault in a network diagram, for example.	TroubleOrders
Incident	Incident	[0..*]	See 5.15	List of Incidents associated with this UnplannedOutage	
OutageIsolationEquipment	ConductingEquipment	[0..*]	See B.63	The OutageIsolationEquipment attribute of the payload is shown in Figure B.29 and B.63. This attribute can be used to define the boundary of the outage in the case where an UnplannedOutage has been identified and isolated by opening the switches or other conducting equipment, either automatically by a function such as FLISR, or by a crew opening switches downstream of the fault and back feeding those customers from another feeder. There can be multiple OutageIsolationEquipment and each has its own geographic Location, electrical identifier and phase, using the Terminal attribute.	TroubleOrders
Summary	ServicePointOutageSummary	[0..1]	See B.77	Summary of how many customers are out.	
TroubleTickets	TroubleTicket	[0..*]	See 5.14	List of TroubleTickets associated with this UnplannedOutage. mRID, description and Names only	

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Figure 93 – UnplannedOutages message payload top level

Figure 94 shows the **UnplannedOutages** message payload, **LineFault** detail. See subclause 5.16.3 for a description of the **LineFault** detail.

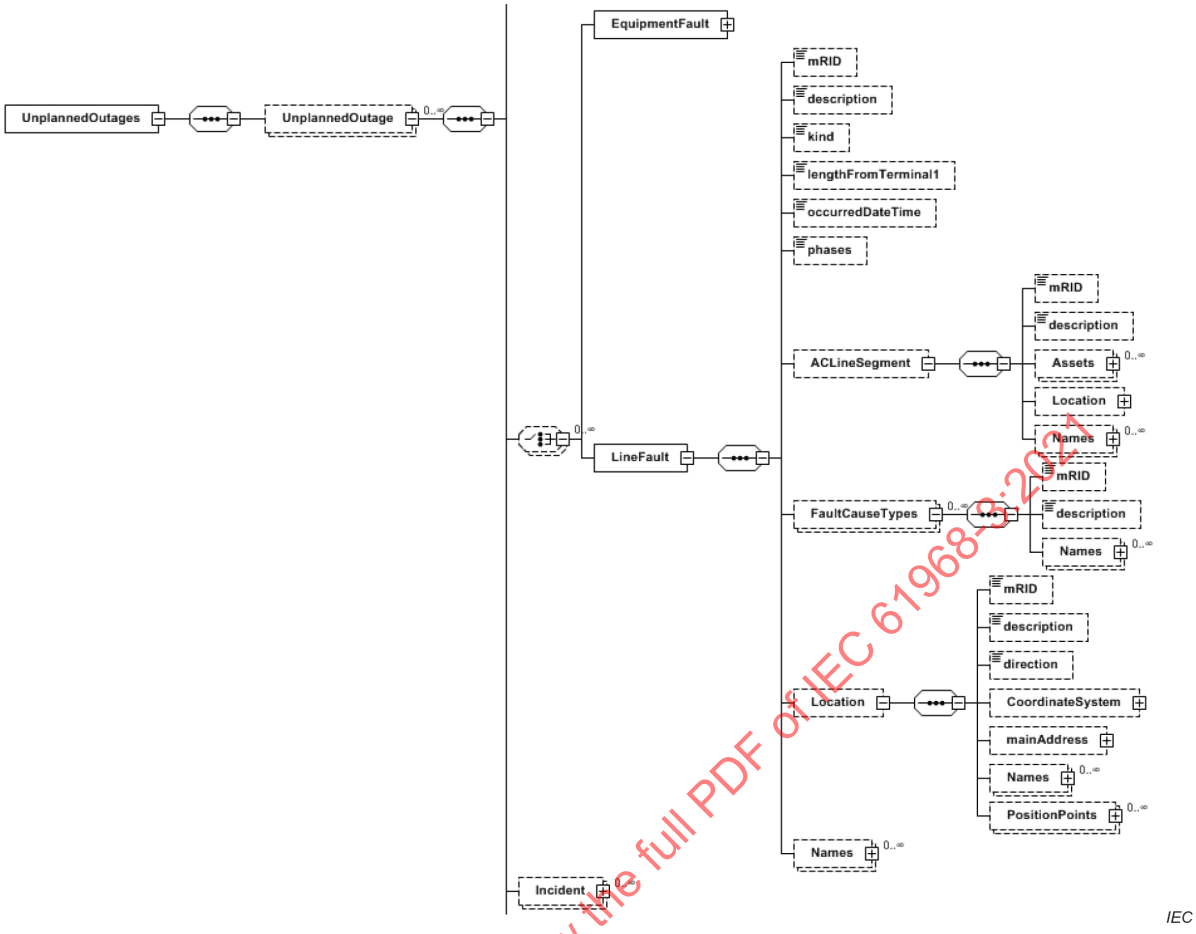


Figure 94 – UnplannedOutages message payload, LineFault detail

Figure 95 shows the payload for UnplannedOutages, **EquipmentFault** detail. Please see Subclause 5.16 for a description of the payload.

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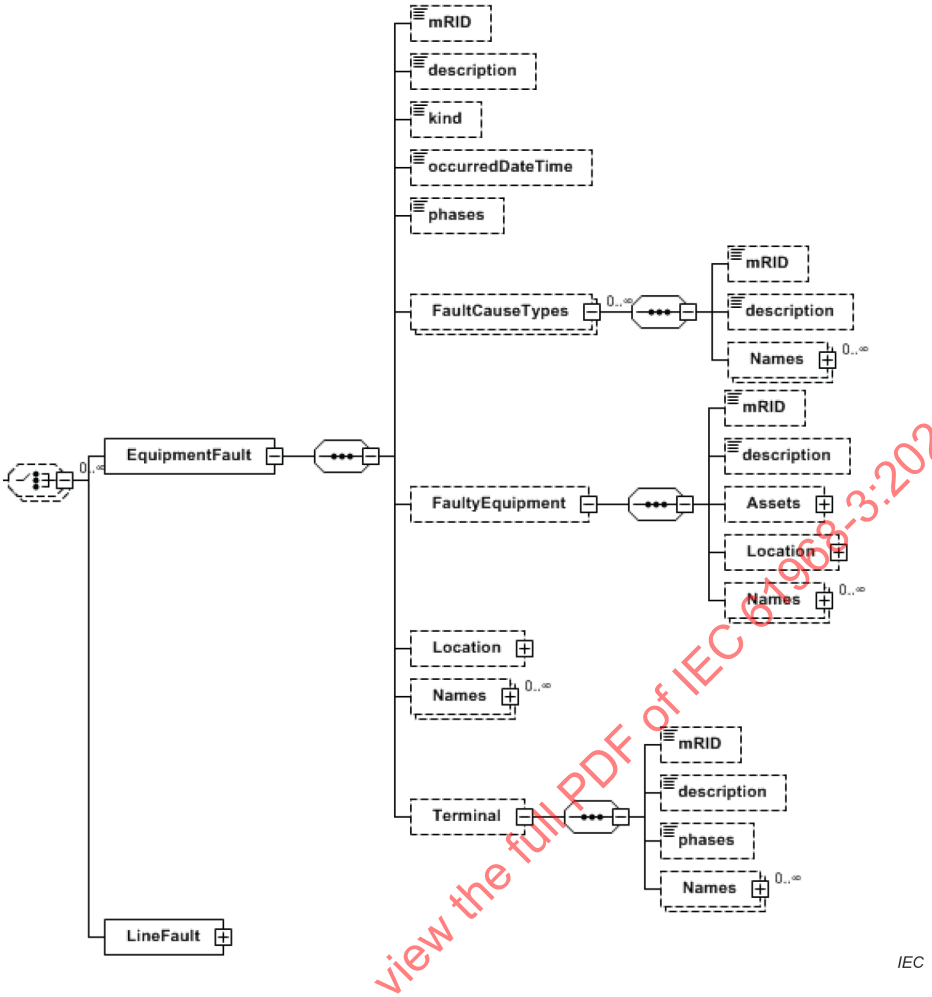


Figure 95 – UnplannedOutages message payload, EquipmentFault detail

Table 57 – Priority of statusKind when multiple crews assigned

Crew Status	Priority, 1 = highest
arrived	1
enroute	2
assigned	3
awaitingCrewAssignment	4
fieldComplete	5

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5.18.3 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:UnplannedOutages xmlns:m="http://iec.ch/TC57/2019/UnplannedOutages/#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/UnplannedOutages/# UnplannedOutages.xsd ">
  <m:UnplannedOutage>
    <m:mRID>357e3411-e68e-40d4-9b2e-fd48491fdbae</m:mRID>
    <m:cause>Weather</m:cause>
    <m:causeKind>lightningStrike</m:causeKind>
    <m:communityDescriptor>Buncome County</m:communityDescriptor>
    <m:createdDateTime>2019-06-03T12:43:00</m:createdDateTime>
    <m:customersRestored>0</m:customersRestored>
    <m:lastModifiedDateTime>2019-06-03T12:43:00</m:lastModifiedDateTime>
    <m:metersAffected>1206</m:metersAffected>
    <m:outageKind>predicted</m:outageKind>
    <m:reportedStartTime>2019-06-03T12:39:00</m:reportedStartTime>
    <m:statusKind>assigned</m:statusKind>
```

```
<m:type>Recloser</m:type>
</m:actualPeriod>
<m:Crew>
  <m:FieldDispatchHistory>
    <m:FieldDispatchStep>
      <m:dispatchStatus>assigned</m:dispatchStatus>
      <m:occurredDateTime>2019-06-03T12:45:00</m:occurredDateTime>
      <m:sequenceNumber>1</m:sequenceNumber>
    </m:FieldDispatchStep>
    <m:Names>
      <m:name>James Smedley IV</m:name>
    </m:Names>
  </m:FieldDispatchHistory>
  <m:Names>
    <m:name>James Smedley IV</m:name>
  </m:Names>
</m:Crew>
<m:DeEnergizedUsagePoint>
  <m:mRID>cf6ca9ee-44c0-4e5e-8539-806042820bf6</m:mRID>
  <m:CustomerAgreement>
    <m:Customer>
      <m:kind>commercialIndustrial</m:kind>
      <m:locale>en</m:locale>
      <m:specialNeed>iceCreamMaker</m:specialNeed>
      <m:Names>
        <m:name>Nice Ice Creams Inc.</</m:name>
      </m:Names>
      <m:Organisation>
        <m:electronicAddress>
          <m:email1>jenny@nice-ice-creams.com</m:email1>
        </m:electronicAddress>
        <m:phone1>
          <m:areaCode>919</m:areaCode>
          <m:cityCode>555</m:cityCode>
          <m:localNumber>1234</m:localNumber>
        </m:phone1>
      </m:Organisation>
    </m:Customer>
  </m:CustomerAgreement>
  <m:Meters>
    <m:Names>
      <m:name>Meter CDS-1020910234</m:name>
    </m:Names>
  </m:Meters>
  <m:UsagePointLocation>
    <m:accessMethod>Gate code 44312</m:accessMethod>
    <m:siteAccessProblem>Bad dogs</m:siteAccessProblem>>
    <m:mainAddress>
      <m:postalCode>27606</m:postalCode>
      <m:streetDetail>
        <m:name>Main Campus Drive </m:name>
        <m:number>1901</m:number>
      </m:streetDetail>
      <m:townDetail>
        <m:name>Raleigh</m:name>
        <m:stateOrProvince>NC</m:stateOrProvince>
      </m:townDetail>
    </m:mainAddress>
  </m:UsagePointLocation>
</m:DeEnergizedUsagePoint>
<m:EstimatedRestorationTime>
  <m:confidenceKind>low</m:confidenceKind>
  <m:ert>2019-06-03T14:30:00</m:ert>
  <m:ertSource>Automatic calculation</m:ertSource>
</m:EstimatedRestorationTime>
<m:LineFault>
  <m:mRID>cce3f88e-7ecb-442e-8aa6-8dab3bb04795</m:mRID>
  <m:kind>lineOpen</m:kind>
  <m:lengthFromTerminal1>125.0</m:lengthFromTerminal1>
  <m:occurredDateTime>2019-06-03T12:02:00</m:occurredDateTime>
  <m:phases>A</m:phases>
  <m:ACLineSegment>
    <m:mRID>b7e3453e-63ec-4203-898e-d23b8876f1f7</m:mRID>
  </m:ACLineSegment>
  <m:Location>
    <m:PositionPoints>
      <m:xPosition>35.7718409</m:xPosition>
      <m:yPosition>-78.6801357</m:yPosition>
```


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```
        </m:PositionPoints>
      </m:Location>
    </m:LineFault>
    <m:Names>
      <m:name>Outage #1039212</m:name>
    </m:Names>
    <m:OutageIsolationEquipment>
      <m:mRID>80304bce-c43b-4584-80cf-04b5c1daebc0</m:mRID>
      <m:description>m:description</m:description>
      <m:Assets>
        <m:Names>
          <m:name>R-0483</m:name>
        </m:Names>
      </m:Assets>
      <m:Location>
        <m:direction>2 spans west of Old Hickory Road at gas station</m:direction>
        <m:PositionPoints>
          <m:xPosition>35.019823</m:xPosition>
          <m:yPosition>-76.23092</m:yPosition>
        </m:PositionPoints>
      </m:Location>
      <m:Names>
        <m:name>R-0483</m:name>
      </m:Names>
    </m:OutageIsolationEquipment>
    <m:TroubleTickets>
      <m:mRID>c95251c5-bf5f-4657-a9fb-0178fdff3f70</m:mRID>
      <m:description>Lights out</m:description>
      <m:Names>
        <m:name>Ticket # 4398402</m:name>
      </m:Names>
    </m:TroubleTickets>
  </m:UnplannedOutage>
</m:UnplannedOutages>
```

5.19 Metering message payloads

5.19.1 EndDeviceEvents

EndDeviceEvents message payloads are designed to communicate state changes of a metering device. This information may be used by applications e.g. for outage management. A sequence diagram for **EndDeviceEvents** is shown in Figure 96.

One or multiple meters report a power down status. This information may indicate an outage in the respective area of the network.

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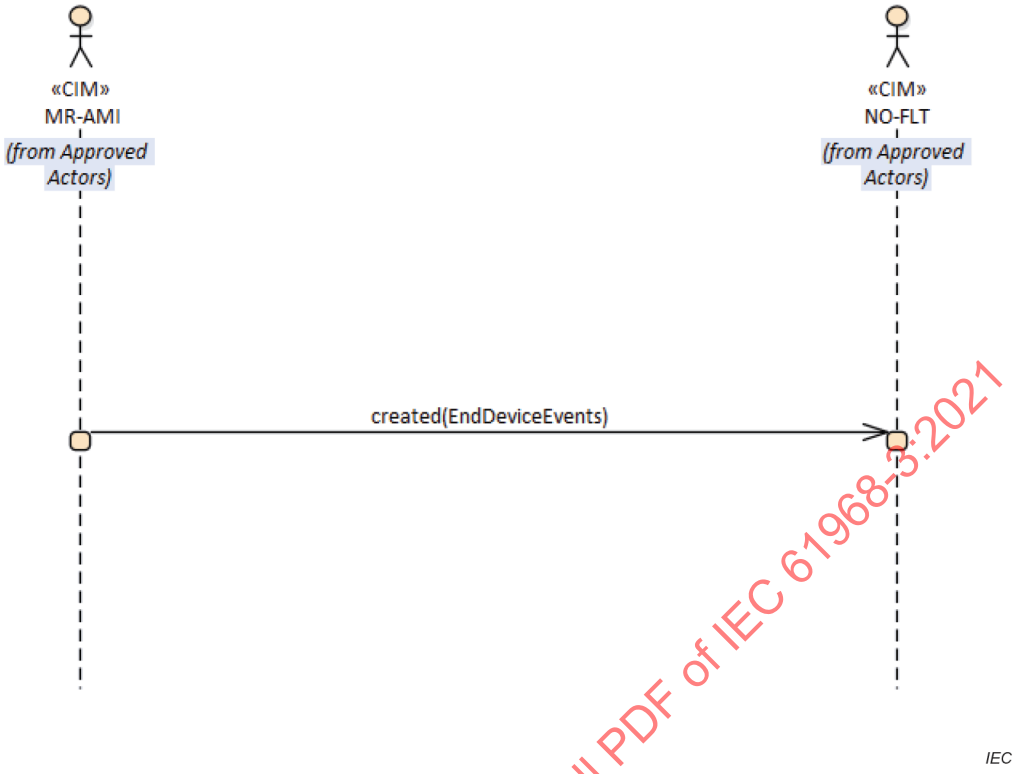


Figure 96 – EndDeviceEvents

For further details regarding **EndDeviceEvents** payload, see IEC 61968-9.

5.19.2 MeterReadings

MeterReadings message payloads are designed to read the state of one or multiple metering devices. This information may be used by applications e.g. for outage management. Figure 97 shows a typical meter reading sequence.

The state of one or multiple metering devices is requested to check if the power is restored in the respective area of the network.

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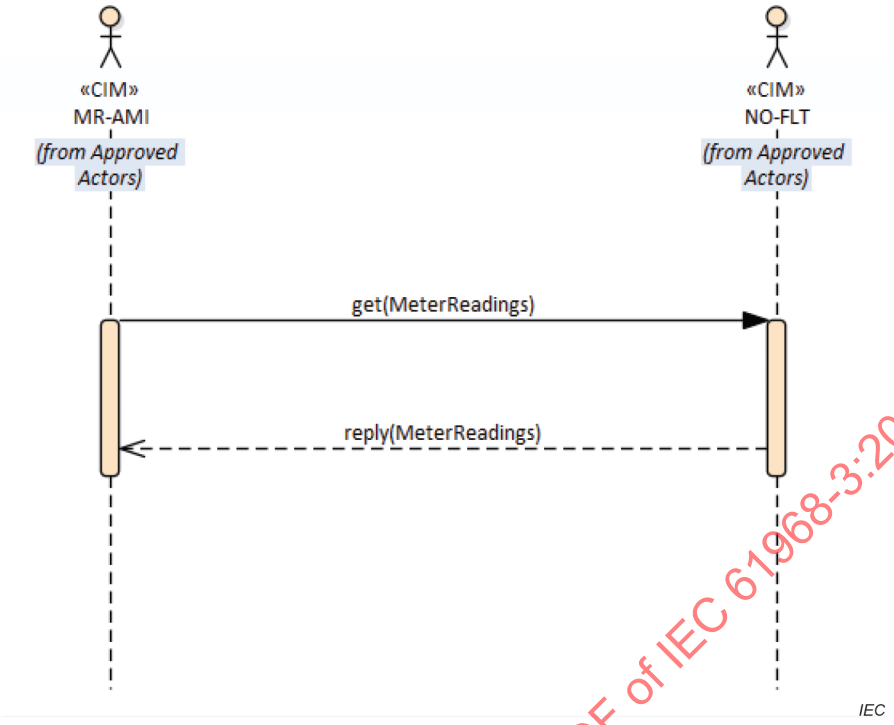


Figure 97 – MeterReadings sequence diagram

For further details regarding **MeterReadings** payload, see IEC 61968-9.

5.20 Work message payloads

5.20.1 WorkRequests payload

WorkRequests message payloads are designed to communicate requests for maintenance work including the work progress. Examples of requested work in the context of this document are:

- Request for a work request number during unplanned outage repairs. This could be used for time recording purposed, for example.
- Request to clear trees prior to performing outage restoration or to prevent future outages
- Request to perform permanent repairs after an emergency fix has been made to restore power after an unplanned outage

A **WorkRequest** may be communicated between different parties during its life cycle as shown in Figure 98:

- create (WorkRequests) – OMS->WMS
- reply (WorkRequests) – WMS->OMS
- changed (WorkRequests) – WMS->OMS (status changed or request is completed)

More detailed examples are provided in Clauses A.8 and A.9.

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Figure 98 – WorkRequests sequence diagram

For further details regarding **WorkRequests**, see IEC 61968-6.

5.21 TroubleOrders

5.21.1 General

TroubleOrders message payloads communicate requests for responding to **Incidents** and/or **UnplannedOutages** including the work progress received from the field crew. The payload also includes **TroubleTicket**s associated with the **TroubleOrder**.

- The payload is used to communicate an **Incident** and/or an **UnplannedOutage** and/or one or more **TroubleTicket**s
- The payload includes the location where the work is to be performed.
- In order to support the assignment of multiple crews to the same Incident or UnplannedOutage, the **TroubleOrder** payload contains one or more **WorkTasks.** There is one **WorkTask** per crew that is assigned to the **TroubleOrder. WorkTasks** track the progress of each crew in working the **TroubleOrder.**

As shown in the example in Figure 99, a trouble order may be communicated between different parties during its life cycle:

- A **TroubleOrder** is created to initiate the work
- A **TroubleOrder** is changed as the crews perform work and the status changes
- A **TroubleOrder** is changed if additional crews are assigned to the **TroubleOrder**
- A **TroubleOrder** is changed if additional information is received that causes the location of the **UnplannedOutage** or **Incident** to change.

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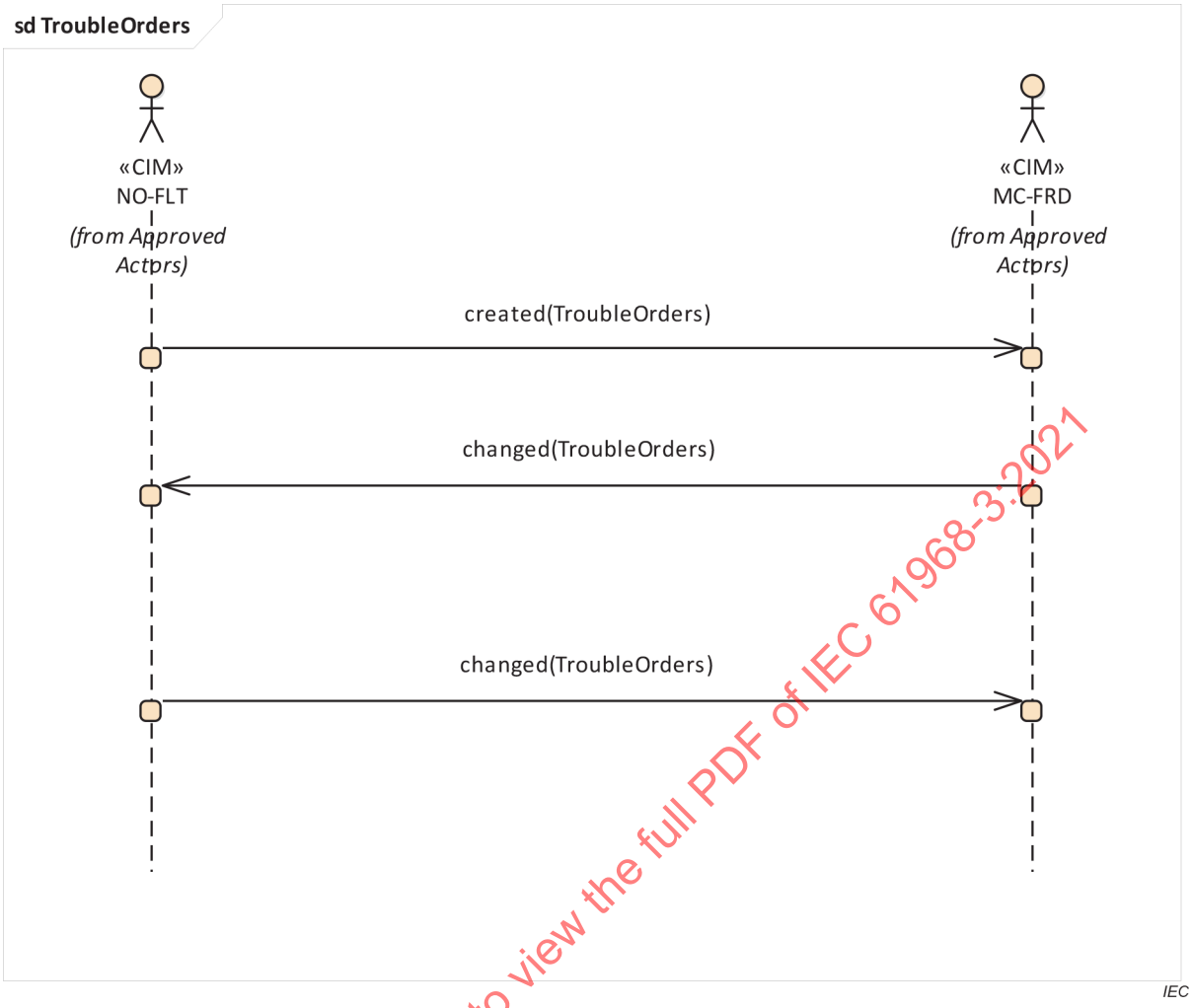


Figure 99 – TroubleOrders

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5.21.2 Message payload

5.21.2.1 General

The top level of the **TroubleOrders** payload is shown in Figure 100. At the top level, key elements of a **TroubleOrder** include an **Incident** or an **UnplannedOutage** (or both) and the list of **TroubleTickets** which have been associated with them. In addition, the predicted or confirmed **Location** of the **Incident** or **UnplannedOutage** is defined in the **WorkTask**. This is where a crew would typically be sent to start an initial investigation. Instructions to the crew can be placed in the **comments** field for the **TroubleOrder**.

There may be one or more **WorkTask**s associated with the **TroubleOrder**. When initially creating a **TroubleOrder**, there must be at least one **WorkTask**. There must be a separate **WorkTask** for each **crew** that is assigned to the **TroubleOrder**, so that estimated time to arrive (ETA) and other status associated with each crew can be tracked.

The attributes of the **TroubleOrders** profile are described in Table 58.

Table 58 – TroubleOrders Profile

Incidents				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
TroubleOrders	TroubleOrder	[1..*]		
Profile Attributes				
description	String	[0..1]		Free-form text field that describes the **TroubleOrder**
mRID	String	[0..1]	GUID	mRID of the TroubleOrder.
Names	Name	[0..*]	See B.56	Can be used to provide additional identifiers such as internal TroubleOrder number.
comment	String	[0..1]		Free-form comment associated with the TroubleOrder
createdDateTime	DateTime	[0..1]		DateTime that the TroubleOrder was initially created.
lastModifiedDateTime	DateTime	[0..1]		DateTime that the TroubleOrder was last changed.
revisionNumber	String	[0..1]		Revision number for this document.
subject	String	[0..1]		Document subject. Free-form text.
title	String	[0..1]		Document title. Free-form text.
type	String	[0..1]		Type of TroubleOrder.
Incident	Incident	[0..1]	See 5.21.2.2	Associated Incident, if any.
Issuer	Issuer	[0..1]	See B.47	Person who issued the TroubleOrder to the field crew or workforce management system.
status	Status	[0..1]	See B.79	Used to indicate whether the **TroubleOrder** is open or closed. Possible values of status.value are ‘Open’, ‘Closed’.
TroubleTicket	TroubleTicket	[0..*]	See 5.21.2.4	List of TroubleTickets that are associated with this TroubleOrder
UnplannedOutage	UnplannedOutage	[0..1]	See 5.21.2.3	The UnplannedOutage, if any, associated with this TroubleOrder
WorkTask	WorkTask	[0..*]	See 5.21.2.5	The set of WorkTasks associated with this TroubleOrder

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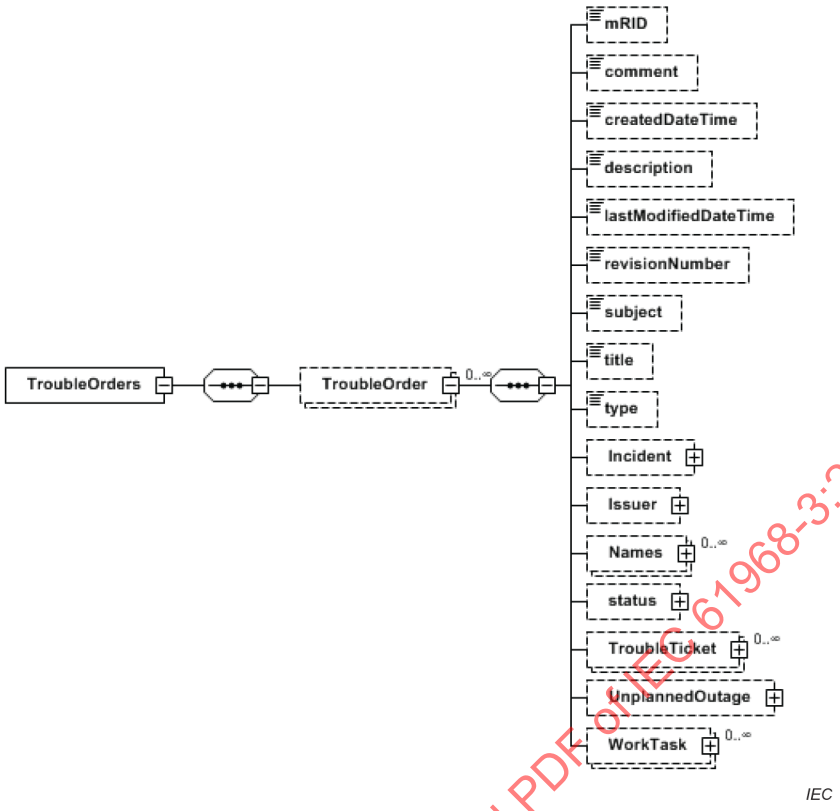


Figure 100 – TroubleOrders top level message payload

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5.21.2.2 TroubleOrders payload – Incident

The **Incident** component of **TroubleOrders** is shown in Figure 101. The purpose of this part of the payload is to describe the details of the **Hazard**.

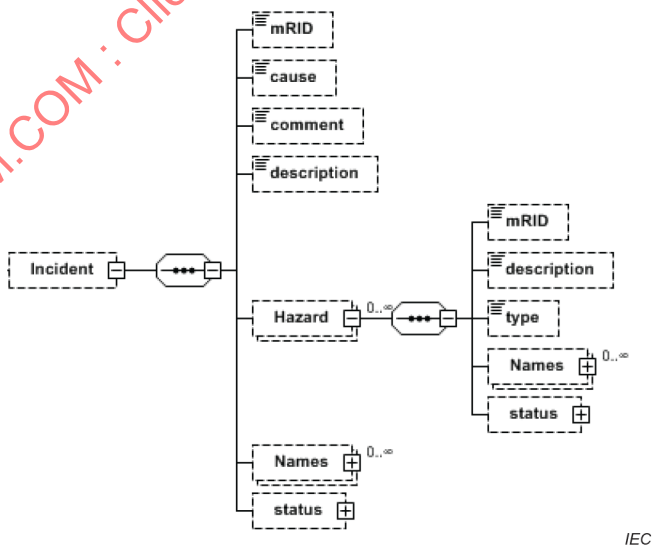


Figure 101 – TroubleOrders – Incident payload fragment

5.21.2.3 TroubleOrders payload – UnplannedOutage

The **UnplannedOutage** element of **TroubleOrders** is shown in Figure 102. The attributes of the **UnplannedOutage** appearing in the **TroubleOrders** profile are described in detail in 5.18.2.

The payload includes sufficient information to get the crew to the location of the **UnplannedOutage**. The **comment** and **description** are free-form text fields that describe the **UnplannedOutage**, while the **Location** provides more precise geographic location information. **Names** can be used to provide additional identifiers such as internal outage number.

When using this payload to dispatch a crew to an **UnplannedOutage**, the following information can be populated as described below:

- **metersAffected** – a count of how many meters are currently predicted or confirmed de-energized by this outage. Can be used to help determine restoration priority
- **reportedStartTime** – date/time when the first customer lost power
- **Names** – can be used to convey internal outage number
- **type** – string that describes the extent of the outage, e.g. customer, distribution transformer, fuse, recloser, circuit breaker, etc.
- **description** – comments regarding the outage
- **outageIsolationEquipment** – in the case of a radial network configuration, this is a single piece of equipment where the outage has been predicted or confirmed. In the case of a meshed network configuration, there may be multiple pieces of outage isolation equipment. See Clause B.63.

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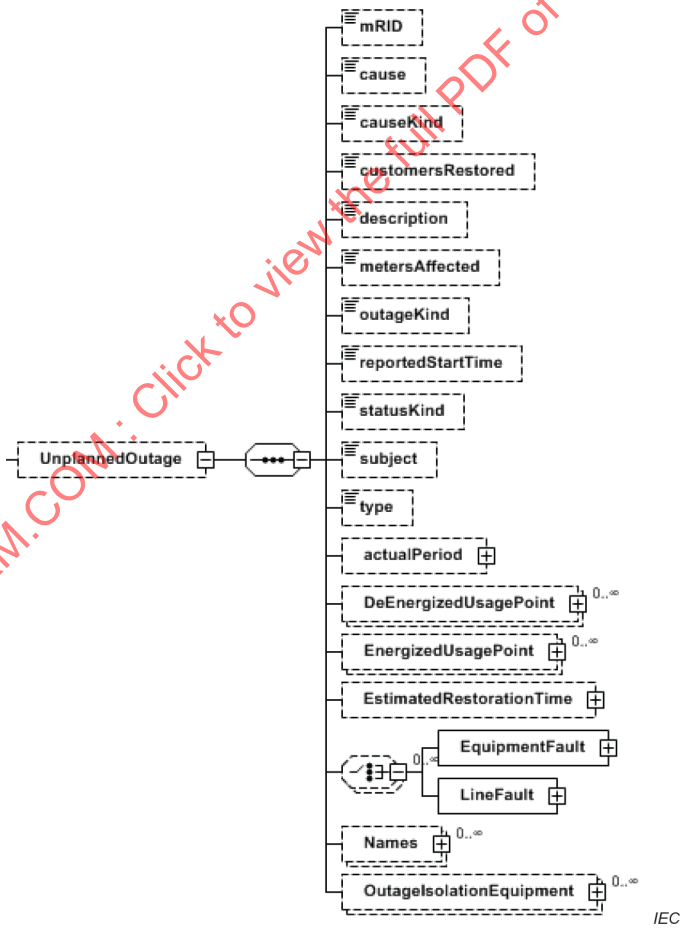


Figure 102 – TroubleOrders – UnplannedOutage payload fragment

When a field crew is dispatched to an **UnplannedOutage**, they need to know its predicted or confirmed location. The geographic location is provided in the **TroubleOrder.Location** element of the **TroubleOrder** message.

Additional location information can be provided in the payload in order to assist the crew in responding to the unplanned outage. This consists of unplanned outage location information and fault location information. Fault location is the location of the fault itself, such as a wire down. Unplanned outage location is the location of the device that operated as a result of the fault, such as a recloser or circuit breaker. This distinction is shown in Figure 103.

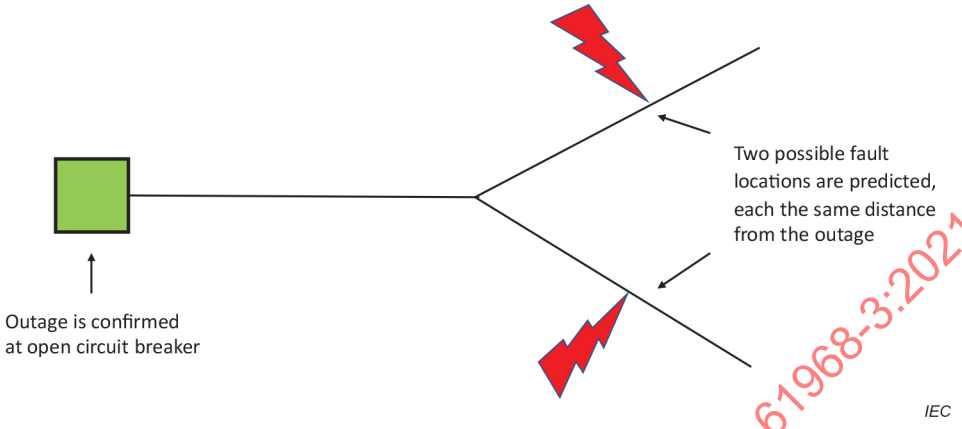


Figure 103 – Distinction between outage location and fault location

If fault location is available, **LineFault** and/or **EquipmentFault** may appear in the initial **TroubleOrders** payload when it is sent to the field crew. In addition, the field crew may identify the actual location of the fault and it is communicated back to the control room in the **LineFault** and/or **EquipmentFault** elements of the payload.

The various use cases of outage location and fault location information are shown in Table 59. The table also shows how **UnplannedOutage.type** determines where the information appears in the payload.

Table 59 – Additional outage location information

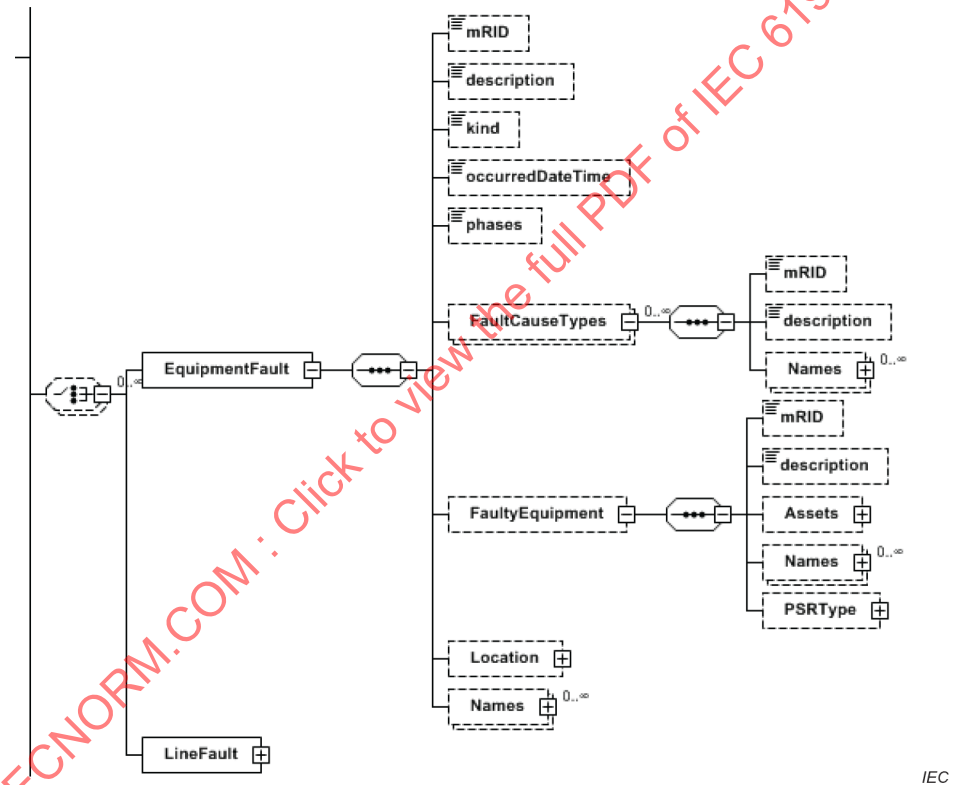
Use Case	UnplannedOutage.type	Additional outage location information	Additional fault location information
Predicted or confirmed customer outage	Customer	Location of the outage is available in **DeEnergizedUsagePoints.UsagePointLocation**. It may be necessary to know the meter number when the outage is predicted to an apartment building, for example, or there are multiple meters at the same address. Meter number is available in **DeEnergizedUsagePoints.Meters.Names**	
Predicted or confirmed service transformer outage	Service transformer	Location of the outage is available in **OutageIsolationEquipment.Location**, which specifies the location of the transformer.	
Predicted or confirmed equipment outage on radial network	Equipment	Location of the outage is available in **OutageIsolationEquipment.Location**, which specifies the location of the protective device.	
Predicted or confirmed equipment outage on meshed network	Equipment	Location of the outage is available in **OutageIsolationEquipment.Location**, which specifies the location of one or more protective devices.	

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Use Case	UnplannedOutage.type	Additional outage location information	Additional fault location information
Predicted equipment outage and fault location information is available	Equipment	Location of the outage is available in **OutageIsolationEquipment.Location**, which specifies the location of one or more protective devices.	**LineFault** and/or **EquipmentFault** identify one or more locations where the actual fault is predicted to have occurred.

The **DeEnergizedUsagePoint** part of the payload is shown in Figure B.8 and is described in Subclause B.27.

The **EquipmentFault** attribute of the payload is shown in Figure 104.



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Figure 104 – TroubleOrders, UnplannedOutage, EquipmentFault payload fragment

The **LineFault** attribute of the payload is shown in Figure 105.

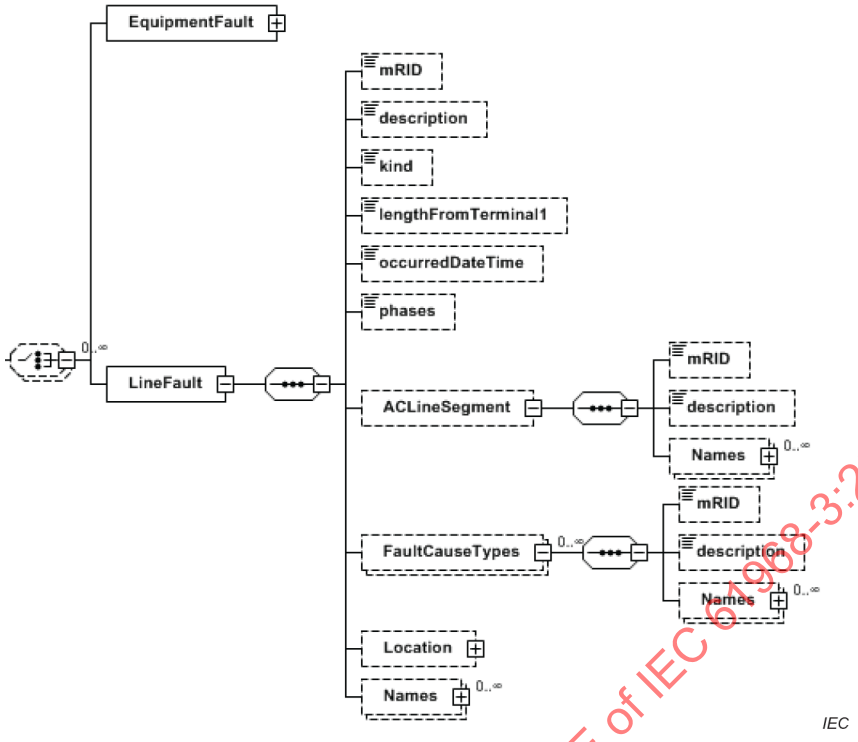


Figure 105 – TroubleOrders, UnplannedOutage, LineFault payload fragment

Other attributes for **UnplannedOutage** are:

- **outageKind** – enumeration that defines whether the outage is **closed**, **confirmed**, **partiallyRestored**, **predicted** or **restored**.
- **statusKind** – enumeration that defines the overall crew status for the **UnplannedOutage**. Values are **arrived**, **assigned**, **awaitingCrewAssignment**, **enroute** or **fieldComplete**
- **actualPeriod** – used to record the actual power off and restoration times of the **UnplannedOutage**, using the **start** and **end** attributes. See Figure 106

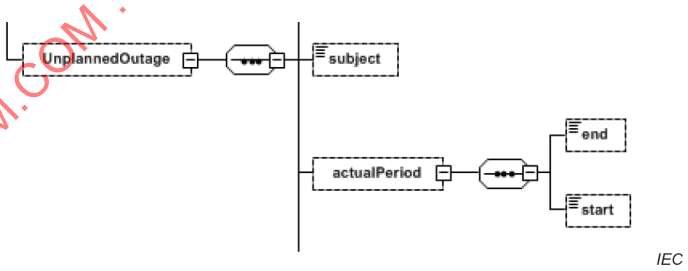


Figure 106 – TroubleOrders, UnplannedOutage – actualPeriod payload fragment

5.21.2.4 TroubleOrders payload – TroubleTicket

The **TroubleTicket** part of the payload is shown in Figure 107.

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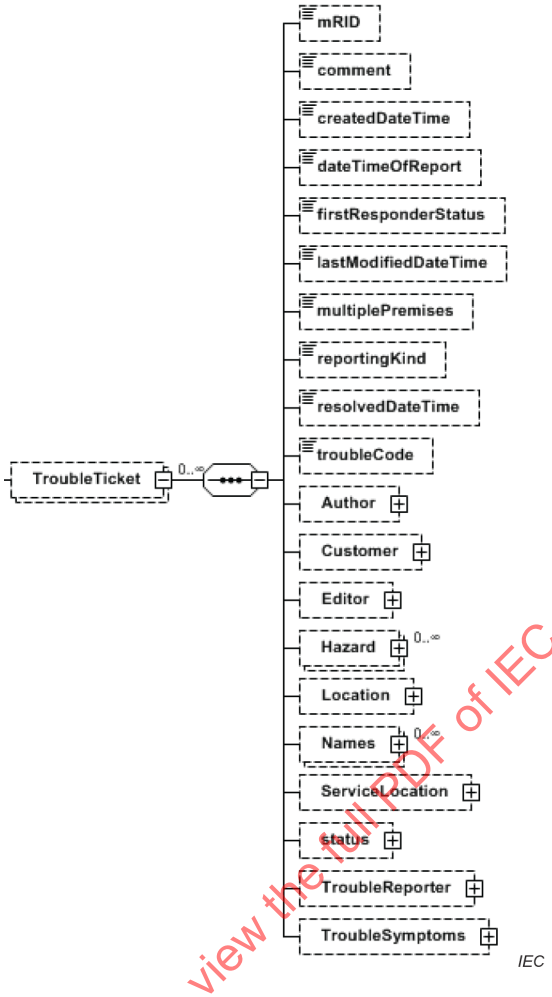


Figure 107 – TroubleOrders – TroubleTicket payload fragment

Since there may be many **TroubleTickets** associated with an **UnplannedOutage**, it may not be practical to send all of the **TroubleTickets** with the **TroubleOrder**. It is an implementation issue to determine how many and which **TroubleTickets** to send. For example, only those **TroubleTickets** that have a **Hazard**, or have a customer with **specialNeeds** could be sent. The attributes of the **TroubleTicket** fragment are shown in Table 60.

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Table 60 – TroubleTicket attributes

Customer: TroubleTicket				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	**mRID** of the TroubleTicket
description	String	[0..1]		Free form description of the TroubleTicket
Names	Name	[0..*]	See B.56	Can be used to provide additional identifiers such as internal TroubleTicket number.
comment	String			Any comments that the customer provided that might help diagnose the source of the outage
createdDateTime	DateTime	[0..1]		Date and time this activity record has been created (different from the 'status.dateTime', which is the time of a status change of the associated object, if applicable). time the TroubleTicket was created. This may be different (later) than the time that the TroubleTicket was reported. For example, an IVR might receive the information some seconds or minutes before the ticket is actually created.
dateTimeOfReport	DateTime	[0..1]		Date and time the trouble has been reported.
firstResponderStatus	String	[0..1]		Indicates whether the first responder such as police, fire department etc.has been notified and whether they are on site or en route.
lastModifiedDateTime	DateTime	[0..1]		Last time and date that the TroubleTicket was modified.
multiplePremises	Boolean	[0..1]		Set to true if the outage report indicated that other neighbors are also out of power.
reportingKind	TroubleReportingKind	[0..1]	See C.24	Indicates how the customer reported trouble. Enumeration that defines how the customer reported the ticket. Values: call, email, ivr, letter, other
resolvedDateTime	DateTime	[0..1]		Date and time this trouble ticket has been resolved.
troubleCode	String	[0..1]		Trouble code (e.g., power down, flickering lights, partial power, etc).
Author	Author	[0..1]	See B.13	Person who created the TroubleTicket, usually the customer service represenatative who entered the TroubleTicket.
Customer	Customer	[0..1]	See B.25	Defines the name of the customer; locale is the language spoken, while kind is an enumeration with values: commercialIndustrial, residential, etc. specialNeed is used to indicate life support, etc.
Editor	Editor	[0..1]	See B.31	Person who last made changes to the TroubleTicket.
Hazard	Hazard	[0..*]	See B.46	Defines whether there is a hazardous condition associated with the TroubleTicket. There can be zero, one or many.
Location	Location	[0..1]	See B.52	Defines the location of the trouble identified by the **TroubleTicket** when it refers to trouble that is not associated with a **ServiceLocation**, such as a car hit pole.

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Customer: TroubleTicket				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
ServiceLocation	ServiceLocation	[0..1]	See B.76	A **ServiceLocation** is a real estate location, commonly referred to as premises.
status	Status	[0..1]	See B.79	Can be used to log changes to the status of the TroubleTicket
TroubleReporter	TroubleReporter	[0..1]	See B.94	Person reporting the trouble.
TroubleSymptoms	TroubleSymptoms	[0..1]	See B.94	Set of symptoms that define the type of trouble being reported.

5.21.2.5 **TroubleOrders** payload – WorkTask

The top level of the **WorkTask** part of the payload is shown in Figure 108 and Figure 109. On the initial assignment, there could be only one **WorkTask** for the **TroubleOrder** and a small sub-set of the attributes would be set, such as:

- **comment**, **subject**, **title**: free form text indicating any information regarding the work to be performed
- **kind** (enumeration, values include: inspection, maintenance, repair, other)
- **statusKind** (enumeration indicating status of task; values include: **approved**, **canceled**, **closed**)
- **crews** information. See the description of crew information below.
- **priority** defines the relative priority of the **WorkTask** and is a compound. The **rank** part of the compound is an integer that defines the priority order.
- **workLocation**, which could be different to the location of the overall **TroubleOrder**, as defined by the various locations in the **UnplannedOutage**, **TroubleTicket** and **Incident** elements of the payload.

Detailed attributes for **WorkTask** are described in Table 61.

Table 61 – WorkTask attributes

Work: WorkTask				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the WorkTask
description	String	[0..1]		Free form description of the WorkTask.
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the WorkTask
comment	String	[0..1]		Free-form text string associated with the WorkTask
completedDateTime	DateTime	[0..1]		Date and time work task was completed.
contractorCost	Money	[0..1]		Total contractor costs associated with the work task.
createdDateTime	DateTime	[0..1]		Date and time WorkTask was created.
crewETA	DateTime	[0..1]		Estimated time of arrival, so that customer or police/fire department can be informed when the crew will arrive.
estimatedCompletionTime	DateTime	[0..1]		Estimated date/time that the WorkTask will be completed.

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Work: WorkTask				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
kind	WorkKind	[0..1]	See C.34	Kind of work.
laborCost	Money	[0..1]		Total labor costs associated with the work task.
laborHours	Hours	[0..1]		Hours of labor expended under work task.
lastModifiedDateTime	DateTime	[0..1]		Date and time WorkTask was last modified.
materialCost	Money	[0..1]		Total material costs associated with the work task.
startedDateTime	DateTime	[0..1]		Date and time work task was started.
statusKind	WorkStatusKind	[0..1]	See C.35	Kind of status, specific to work.
subject	String	[0..1]		Free-form text
taskKind	WorkTaskKind	[0..1]	See C.36	Kind of work.
title	String	[0..1]		Free-form text
Assets	Assets	[0..*]	See B.9	Defines the assets that are involved in the WorkTask, if any.
Crews	Crew	[0..1]	See B.22	Crew type requested for this WorkTask or crew assigned to this WorkTask.
priority	Priority	[0..1]	See B.69	Priority definition.
SwitchingPlan	SwitchingPlan	[0..1]	See 5.8.2	mRID, description and Names only.
WorkActivityRecords	WorkActivityRecord	[0..*]	See B.102	Records information about the status of work or work task at a point in time.
WorkLocation	WorkLocation	[0..1]	See B.52	This inherits from Location and has the same attributes.

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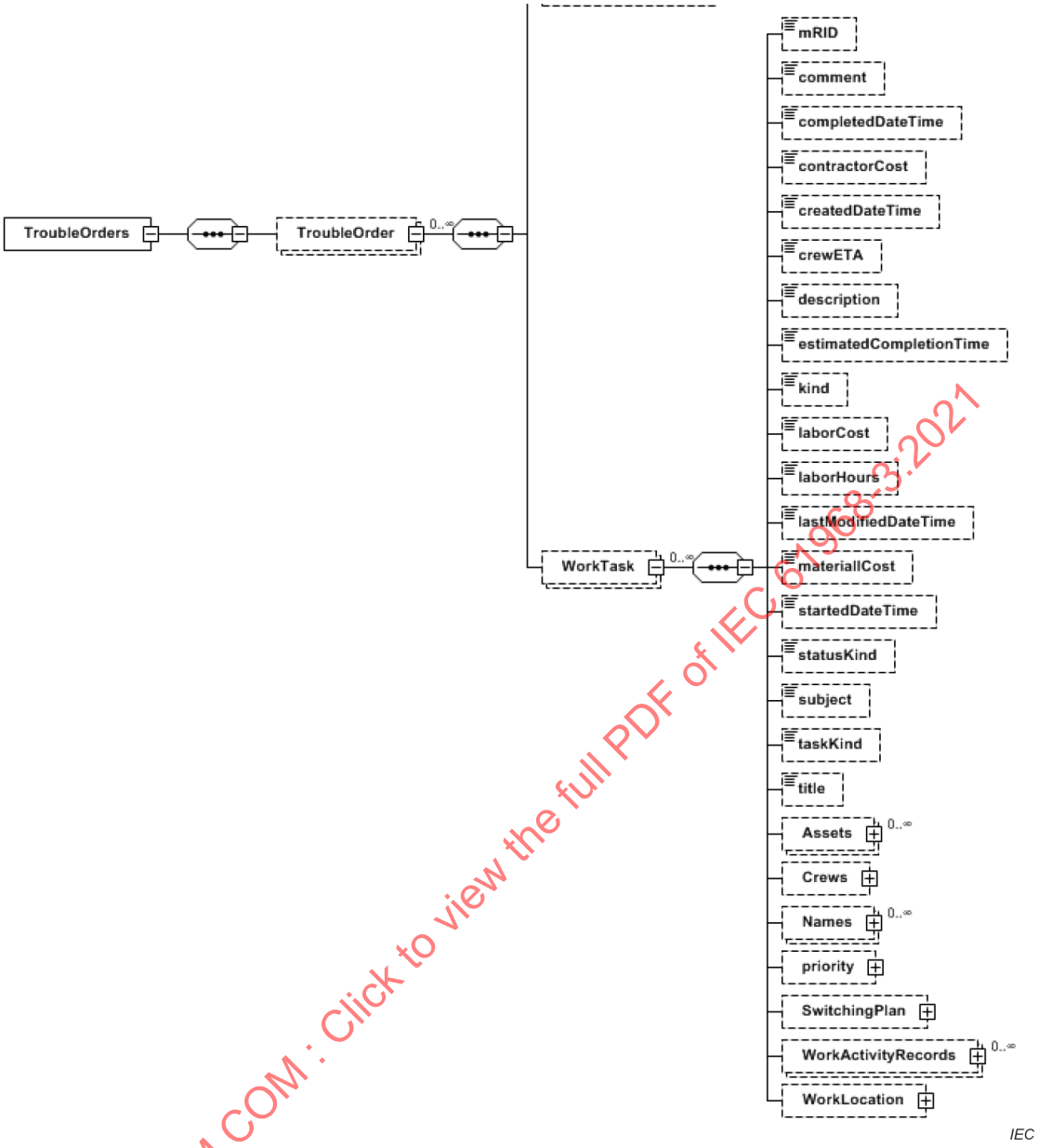


Figure 108 – TroubleOrders – WorkTask payload fragment (1)

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Crews information for the **WorkTask** is shown in Figure B.5. The payload can be used in two different ways, depending on where the crew assignment function is being performed. Crew assignment means determining the best crew to perform the work at the location defined by **WorkLocation** and with the skillset defined by **CrewType**. For example, crew assignment could be performed either in an OMS or in a mobile workforce management system.

WorkLocation is a class that inherits from **Location** and in this message payload it has the same attributes as the **Location** class.

If the crew assignment function is being performed by the business function that initiates the **TroubleOrder**, then the **TroubleOrder** payload identifies the specific **Crew**, **CrewType** and/or **CrewMembers**. Otherwise if the assignment is being performed by the business function that receives the **TroubleOrder**, then the **CrewType** can be populated, leaving the **Crew** and/or **CrewMembers** blank.

The **FieldDispatchHistory** element is used to track crew dispatch status changes related to this **WorkTask** and would typically be filled out as the field worker works through the steps in the lifecycle of the **WorkTask**. Each time the crew dispatch status changes, a new **FieldDispatchStep** is added to the payload.

Figure 109 shows the **priority**, **SwitchingPlan** and **WorkLocation** elements of the **WorkTask** payload. **Priority** and **WorkLocation** have already been described. **SwitchingPlan** is a reference to a **SwitchingPlan** that is being used to coordinate switching for the work identified by the **TroubleOrder**.

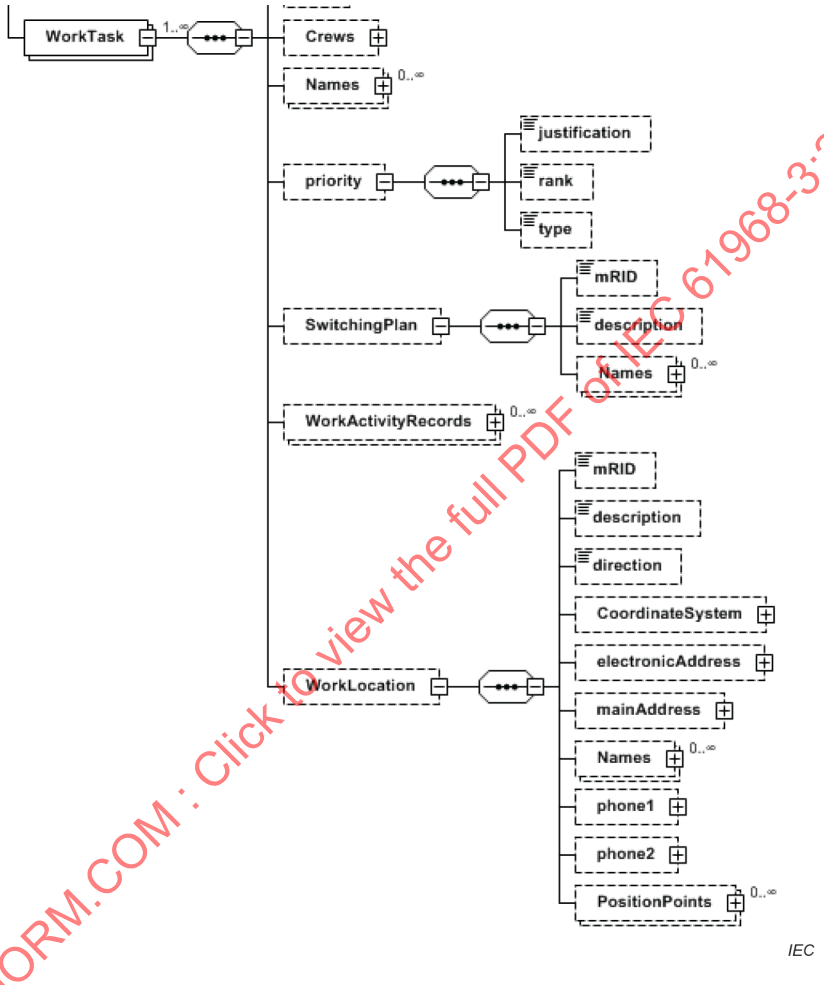


Figure 109 – TroubleOrders – WorkTask payload fragment (2)

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The **WorkActivityRecords** part of the payload is shown in Figure 110. This is used to record any activities performed by the field crew. See Clause B.102 for a description of the elements.

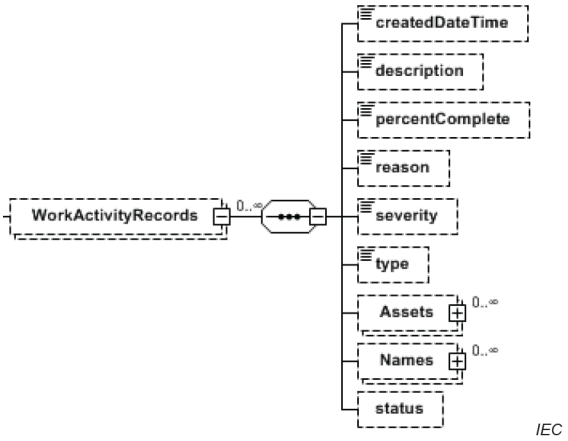


Figure 110 – TroubleOrders – WorkTask WorkActivityRecords payload fragment

The **Assets** part of the **WorkActivityRecords** is shown in Figure 111. See Clause B.102 for a description of **WorkActivityRecord**. Attributes include:

- **AssetContainer** – container of the **Asset**, such as a **Cabinet**, **Ductbank**, **Pole**, **Tower** or **UndergroundStructure**
- **AssetInfo** – type data such as conductor type or device type
- **Ownerships** – who owns the asset, such as a pole that is shared
- **PowerSystemResources** – asset as it pertains to the electrical network

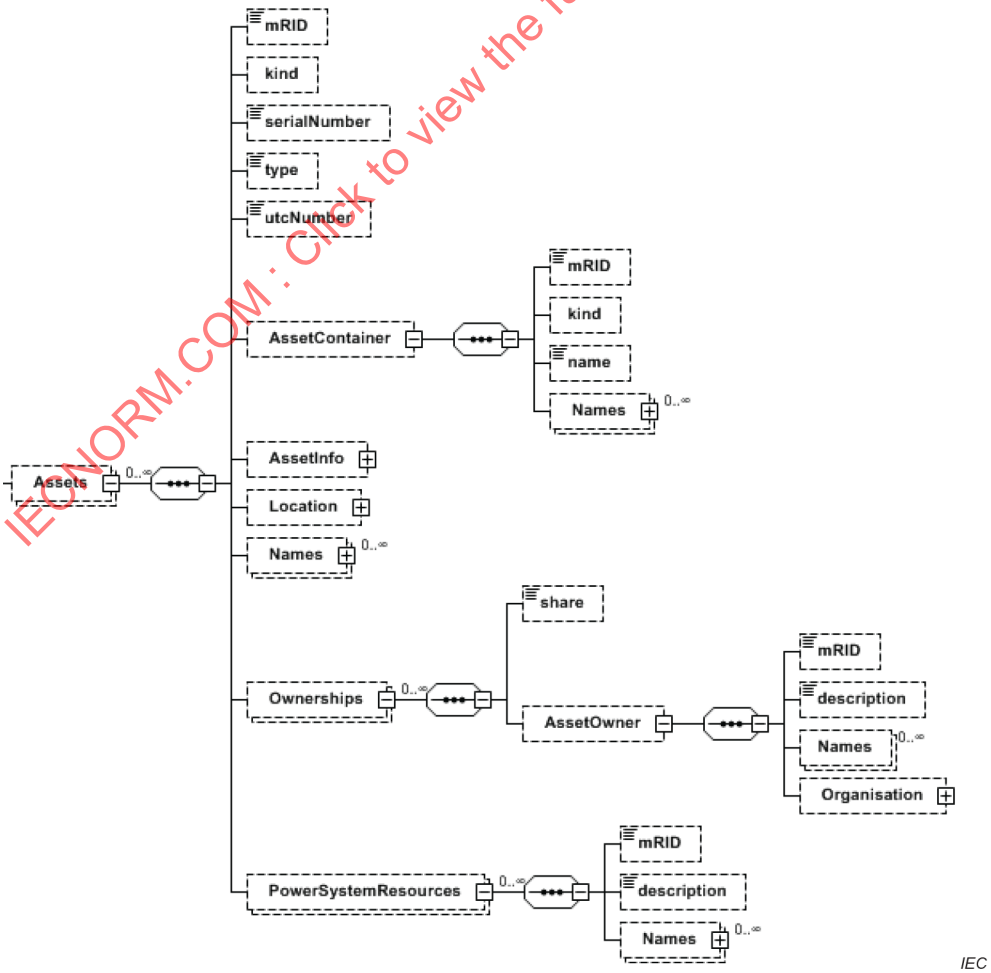


Figure 111 – TroubleOrders – WorkTask, WorkActivityRecords, Assets payload

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5.21.3 Example XML for an **Incident TroubleOrder**

The example XML below shows a **TroubleOrder** message that has an **Incident** associated with it. This is used to communicate a request for a trouble shooter to be dispatched to an **Incident**. This is indicated in the crew part of the payload that has a blank crew but a crew type of “Trouble Shooter”.

The **Incident** was reported from a single **TroubleTicket** that is also part of this message, but the **Incident** details are in the **Incident** itself. The **Incident** is referenced by the **TroubleTicket**.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:TroubleOrders xmlns:m="http://iec.ch/TC57/2019/TroubleOrders#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/TroubleOrders# TroubleOrders.xsd ">
  <m:TroubleOrder>
    <m:mRID>812b9002-c245-401b-bd32-467c1dce81aa</m:mRID>
    <m:comment>Car hit pole incident</m:comment>
    <m:createdDateTime>2019-05-31T08:03:00</m:createdDateTime>
    <m:description>Car hit pole at Jackson and Spear in Ontario</m:description>
    <m:lastModifiedDateTime>2019-05-31T08:03:00</m:lastModifiedDateTime>
    <m:subject>Trouble Order</m:subject>
    <m:title>TroubleOrder 19201 for Incident 23153</m:title>
    <m:type>TroubleOrder for Incident</m:type>
    <m:Incident>
      <m:mRID>33870e3d-4777-45c3-b12c-fc8bfb80ac26</m:mRID>
      <m:cause>Car hit pole</m:cause>
      <m:comment>Car hit a pole at Jackson and Spear. No power reported out.</m:comment>
      <m:description>Wire is down</m:description>
      <m:Hazard>
        <m:type>Electric</m:type>
        <m:Names>
          <m:name>Hazard 32125</m:name>
        </m:Names>
        <m:status>
          <m:dateTime>2019-05-31T07:54:00</m:dateTime>
          <m:value>Unsafe condition</m:value>
        </m:status>
      </m:Hazard>
      <m:Location>
        <m:direction>Intersection of Jackson St and Spear Ave</m:direction>
      </m:Location>
      <m:Names>
        <m:name>Incident 23153</m:name>
      </m:Names>
      <m:status>
        <m:dateTime>2019-05-31T08:11:00</m:dateTime>
        <m:value>Associated with Trouble Order 19201</m:value>
      </m:status>
    </m:Incident>
    <m:Issuer>
      <m:Names>
        <m:name>Officer Forest Gump</m:name>
      </m:Names>
    </m:Issuer>
    <m:Names>
      <m:name>Trouble Order 19201 </m:name>
    </m:Names>
    <m:status>
      <m:dateTime>2019-05-31T08:11:00</m:dateTime>
      <m:value>Pending trouble shooter assignment</m:value>
    </m:status>
    <m:WorkTask>
      <m:mRID>02422dec-fb36-4471-8760-e75242422bd5</m:mRID>
      <m:comment>Request for a trouble shooter to investigate Incident 23153</m:comment>
      <m:createdDateTime>2019-05-31T08:26:00</m:createdDateTime>
      <m:kind>inspect</m:kind>
      <m:lastModifiedDateTime>2019-05-31T08:31:00</m:lastModifiedDateTime>
      <m:statusKind>waitingToBeScheduled</m:statusKind>
      <m:Crew>
        <m:CrewType>
          <m:Names>
            <m:name>Trouble Shooter</m:name>
          </m:Names>
        </m:CrewType>
      </m:Crew>
```

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```
      <m:priority>
        <m:rank>99</m:rank>
        <m:type>Hazardous Incident</m:type>
      </m:priority>
    </m:WorkTask>
    <m:TroubleTicket>
      <m:mRID> f369fda9-cccd-4bec-9951-dbc041a72c05</m:mRID>
      <m:comment>Caller (police) reports that a car has hit a pole at Jackson and
Spear</m:comment>
      <m:createdDateTime>2019-05-31T07:22:00</m:createdDateTime>
      <m:dateTimeOfReport>2019-05-31T07:22:00</m:dateTimeOfReport>
      <m:firstResponderStatus>Police are on the scene</m:firstResponderStatus>
      <m:lastModifiedDateTime>2019-05-31T08:09:00</m:lastModifiedDateTime>
      <m:reportingKind>call</m:reportingKind>
      <m:troubleCode>Wire down</m:troubleCode>
      <m:Author>
        <m:Names>
          <m:name>Johnny Peters</m:name>
        </m:Names>
      </m:Author>
      <m:Customer>
        <m:Names>
          <m:name>Officer Forest Gump</m:name>
        </m:Names>
        <m:Organisation>
          <m:phone1>
            <m:areaCode>919</m:areaCode>
            <m:cityCode>555</m:cityCode>
            <m:localNumber>3142</m:localNumber>
          </m:phone1>
        </m:Organisation>
      </m:Customer>
      <m:Editor>
        <m:Names>
          <m:name>James Johnson</m:name>
        </m:Names>
      </m:Editor>
      <m:Hazard>
        <m:type>Wire down</m:type>
        <m:Names>
          <m:name>Incident Hazard 32125</m:name>
        </m:Names>
        <m:status>
          <m:dateTime>2019-05-31T08:01:00</m:dateTime>
          <m:value>Open</m:value>
        </m:status>
      </m:Hazard>
      <m:Names>
        <m:name>Trouble Ticket 1232111</m:name>
      </m:Names>
      <m:status>
        <m:dateTime>2019-05-31T07:36:00</m:dateTime>
        <m:value>Open</m:value>
      </m:status>
    </m:TroubleTicket>
  </m:TroubleOrder>
</m:TroubleOrders>
```

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6 Document Conventions

6.1 Message payload definitions

6.1.1 General

Message payload diagrams and tables contained in the body of this document are to be considered as normative.

Use cases and sequence diagrams presented in this document are for informative purposes only, and represent usage examples for the normative message payloads.

6.1.2 Mandatory versus Optional

The message payloads described within this standard were derived from use cases in Annex A which satisfy an underlying business need for a specific information exchange. Each use case provides a given context for the use of the CIM. Message payload diagrams describe the elements which are passed. The elements depicted in dashed-line boxes are to be considered optional in a given context. The elements depicted in solid boxes are to be considered mandatory in a given context. If a diagram should depict an entire class as mandatory or optional, the reader should interpret this to mean that the use of the class is either mandatory or optional, but not that every element within the class is now mandatory or optional. The reader shall refer to the normative definition of the class to determine this.

6.2 Synchronous versus Asynchronous Messages

The use of asynchronous or synchronous messages in the sequence diagrams in this document is for illustrative purposes only and is not prescriptive.

6.3 Message exchanges

6.3.1 General

Refer to IEC 61968-100 for further information on message exchanges.

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Annex A
(informative)

Use cases

A.1 General

This annex provides examples of network operations use cases associated with network outage detection and response. It is important to note that the use cases and sequence diagrams provided in this part of IEC 61968 are informative in nature, and are intended to provide examples of usage for the normative messages payloads. There is no intent in this part of IEC 61968 to standardize specific business processes.

The FLISR use cases describe the workflow necessary for informing operational systems of an outage and fault location, and for responding with fault isolation and restoration of healthy islands of network. FLISR stands for Fault Location, Isolation, and Service Restoration. When an outage is detected by SCADA or predicted by outage analysis, typically the best information is association of outage with a protective device that has tripped. Fault location refers to the additional observations, signals, and analysis necessary to identify the true cause of the outage, typically a line fault downstream of the protective device. Isolation is the process of switching and cutting that allows the fault location to be safely isolated for repaires. The process of restoring power to healthy islands of network around the isolated area is referred to as service restoration. There are two FLISR use cases, one for automatic closed loop control and one where crews perform the switching manually.

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A.2 FLISR for SCADA-detected outage, SCADA switching

A.2.1 Description of the use case

A.2.1.1 Name of use case

use case identification		
ID	**Domain(s)**	**Name of use case**
	Outage Management, Work Management, Distribution Management	FLISR for SCADA-detected outage, SCADA switching

A.2.1.2 Version Management

Version management changes / Version	Date (dd/mm/yyyy)	Name author(s) or committee	Area of expertise / domain / role	Title	Approval status draft, for comments, for voting, final
1	30/04/2019	WG14 Part 3 Team	Outage Management, Distribution Management and Work Management		Draft

A.2.1.3 Scope and objectives of use case

Scope and objectives of use case	
Related business case	FLISR based on centralised control, IEC 61850-90-6
Scope	This use case covers the receipt of a breaker open event and the automatic generation and execution of a switching plan to isolate the fault and restore the healthy part of the feeder by feeding the downstream part of the feeder from another feeder.

A.2.1.4 Narrative of use case

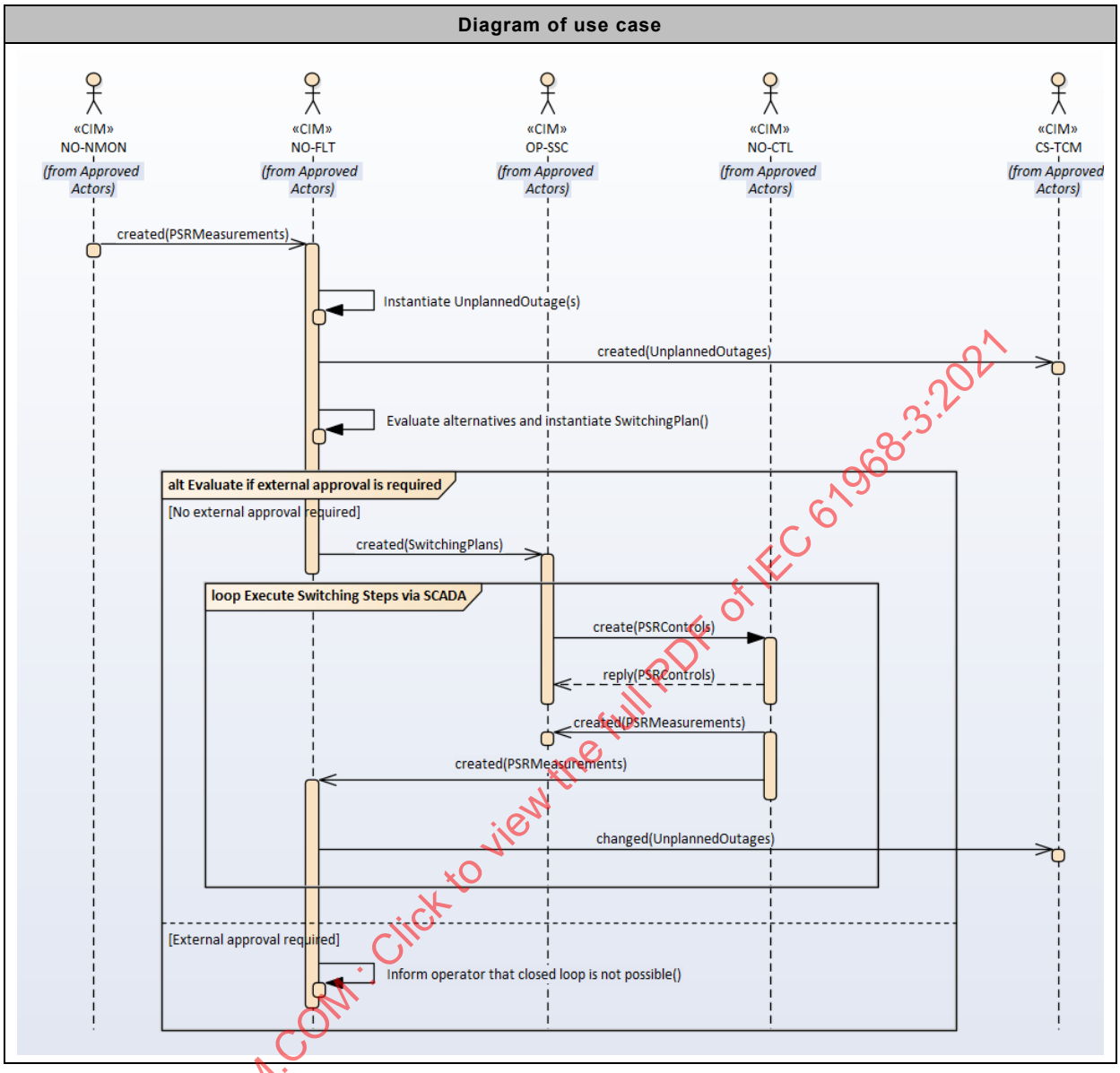
Narrative of use case
Short description – max 3 sentences
This FLISR workflow assumes a self-healing network, with all monitoring and control of the system provided by SCADA and automatic outage response directed by the Fault Management function of a DMS. The message flow is shown in the sequence diagram in Figure A.1, along with a description of the message flow in the table in A.2.4.2. The use case considers the situation where a DSO may require approval from a TSO prior to transferring load, such as when transferring more than a certain number of MVA between different substations
Complete description
This FLISR workflow assumes a self-healing network, with all monitoring and control of the system provided by SCADA and automatic outage response directed by the Fault Management function of a DMS. The message flow is shown in the sequence diagram in Figure A.1, along with a description of the message flow in the table in A.2.4.2. The use case considers the situation where a DSO may require approval from a TSO prior to transferring load, such as when transferring more than a certain number of MVA between different substations. When Network Monitoring (NO-MON, aka SCADA) detects an unexpected change in status of a protective device, it will report the change in status to Fault Management (NO-FLT, aka OMS). NO-FLT creates an **UnplannedOutage** and sends the information to Customer Operations (CS-TCM). At this point, Customer Operations might be notifying Fault Management of trouble tickets. Fault Management can correlate tickets to the outage and inform Customer Operations of the incident used for management of the problem. Fault Management will evalulate different alternatives and create a switching plan to isolate the problem and restore power to healthy islands of network. Fault Mangement will evaluate one or more switching plan variations for this purpose, and it will chose the one that provides the most optimal balance of reserve current in neighboring circuits. Fault Management will then evaluate whether external approval of the switching plan is required. If external approval is required, the operator will be notified and no switching plan will be executed. It is possible that after the operator has gained approval to execute the plan, then the switching plan can be executed under operator control a later time. This is not included in the scope of this use case. If external approval is not required, then Fault Management will send the **SwitchingPlan** to Switch Action Scheduling (OP-SSC). Switch Action Scheduling will direct Network Control to execute each step of the selected switching plan. With the execution of each step, Fault Management will receive notification of changes to the network due to switching, as well as operational safety tags for specific devices. Fault Management will inform Customer Operations when customers who are out of power become restored to power during the process.

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A.2.1.5 General remarks

General remarks

A.2.2 Use case diagrams



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A.2.3 Technical details

A.2.3.1 Actors: People, systems, applications, databases, the power system, and other stakeholders

This use case is written using the following actors:

Actors			
Grouping (Community)		**Group description**	
Network Operations (NO) Customer Service (CS)		IEC 61968-1 Interface Reference Model (IRM) Business Function	
Actor name **see Actor list**	**Actor type** **see Actor list**	**Actor description** **see Actor list**	**Further information specific to this use case**
NO-NMON	System	Network Operations – Network Monitoring. Receives changes in measurement values from the field.	
NO-FLT	System	Network Operations – Fault Management. Analyses incoming data from a variety of sources and creates and manages unplanned outages to track customers out of power.	
OP-SSC	System	Network Operations – Switch Order Scheduling.	
NO-CTL	System	The business function within SCADA that sends remote commands to field devices.	
CS-TCM	System	Customer Service – Trouble Call Management. Receives calls from customers and reports status of unplanned outages to customers.	

A.2.3.2 Preconditions, assumptions, post condition, events

Use case conditions			
Actor/System/Information/Contract	**Triggering event**	**Pre-conditions**	**Assumption**
	A breaker trips due to a fault		Although the FLISR function may process multiple measurements from different fault sensing devices, only a single PSRMeasurements is shown in this use case.

A.2.3.3 References / issues

References						
No.	**References type**	**Reference**	**Status**	**Impact on use case**	**Originator / Organisation**	**Link**
	Standards	IEC 61968-3, IEC-61968-8		Use case is being used to validate these standards.		

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A.2.3.4 Further information to the use case for classification / mapping

Classification information
Relation to other use cases
IEC 16850-90-6 details the interaction between field devices and the FLISR function. This use case is concerned with the interactions between FLISR, switching plans and customer service.
Level of depth
System level use case that illustrates and guides system implementation.
Prioritisation
Generic, regional or national relation
View
Further keywords for classification

A.2.4 Step by step analysis of use case

A.2.4.1 Preconditions

Scenario conditions					
No.	**Scenario name**	**Primary actor**	**Triggering event**	**Pre-condition**	**Post-condition**
A.2.4.2	FLISR for SCADA-detected outage, SCADA switching	NO-NMON	A breaker opens due to a downstream fault		The fault location is identified and automatic switching is performed to isolate the fault and minimize the number of customers out.

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A.2.4.2 Steps

Scenario							
Scenario name:		FLISR for SCADA-detected outage, SCADA switching					
Step No.	**Event**	**Name of process/activity**	**Description of process/ activity**	**Service**	**Information producer (Actor)**	**Information receiver (Actor)**	**Information exchanged**
1	A fault occurs on the network and a breaker trips.	Protection equipment operation	Notification of change in status of a protective device due to an outage.	created	NO-NMON	NO-FLT	**PSRMeasurements**
2	Fault analysis	FLISR	Based on fault current information, NO-FLT notifies of an outage with location of wire down fault downstream of tripped protective device. At this point, outage device and fault location are confirmed.	created	NO-FLT	CS-TCM	**UnplannedOutages**
3	Creation of switching plan	FLISR	Notification of new switching plan to isolate the outage and restore power to healthy islands of network.	created	NO-FLT	OP-SSC	**SwitchingPlans**
4	Execution of switching plan	FLISR	Request for SCADA-commanded operation of a switch for execution of switching plan.	create	OP-SSC	NO-CTL	**PSRControls**
5	Execution of switching step	SCADA	Confirmation that **PSRControls** has been received and is being processed.	reply	NO-CTL	OP-SSC	**PSRControls**
6	Confirmation of switching step execution	SCADA	Notification of change in status of a switch due to switching operation. Switch Order scheduling uses this to execute the next step in the sequence.	created	NO-CTL	OP-SSC	**PSRMeasurements**
7	Confirmation of switching step execution	SCADA	Notification of change in status of a switch due to switching operation. Outage analysis uses this to determine the change in customer count for the UnplannedOutage, if any.	created	NO-CTL	NO-FLT	**PSRMeasurements**
8	Communication of change in customer count	Outage Analysis	Notification of restoration of customers that are associated with the **UnplannedOutage**	changed	NO-FLT	CS-TCM	**UnplannedOutages**

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A.2.5 Information exchanged

Information exchanged		
Name of information exchanged	**Description of information exchanged**	**Requirements to information data R-ID**
PSRMeasurements	Discrete and analog value changes from the field.	
PSRControls	Commands to open and close switches.	
SwitchingPlans	Sequence of open and close commands to isolate a fault and restore the maximum number of customers.	
UnplannedOutages	Affected customer counts and list of de-energized usage points.	

A.2.6 Common terms and definitions

Common terms and definitions	
Term	**Definition**

A.3 FLISR for trouble call and AMI outage, crew switching

A.3.1 Description of the use case

A.3.1.1 Name of use case

Use case identification		
ID	**Domain(s)**	**Name of use case**
	Outage Management, Work Management, Distribution Management	FLISR for trouble call and AMI outage, crew switching

A.3.1.2 Version management

Version management changes / Version	Date (dd/mm/yyyy)	Name author(s) or committee	Area of expertise / Domain / Role	Title	Approval status draft, for comments, for voting, final
1	24/05/2019	WG14 Part 3 Team	Outage Management, Distribution Management and Work Management		Draft

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A.3.1.3 Scope and objectives of use case

Scope and objectives of use case	
Related business case	FLISR based on centralised control, IEC 61850-90-6
Scope	This use case covers the receipt of a breaker open event and the dispatch of a crew to determine the location of the fault. It covers the manual or automatic generation of a switching plan to isolate the fault and restore the healthy part of the feeder by feeding the downstream part of the feeder from another feeder. The switching is performed manually by a field crew or a control room operator sending control commands from the switch order.

A.3.1.4 Narrative of use case

Narrative of use case
Short description – max 3 sentences
This FLISR workflow assumes a network with no ability to automatically detect a fault and no automatic outage response. All investigation and switching activities are performed by a field crew. The use case considers the situation where a DSO may require approval from a TSO prior to transferring load, such as when transferring more than a certain number of MVA between different substations
Complete description
An unplanned outage can be created as a result of receiving any combination of TroubleTickets from CIS or EndDeviceEvents from AMI. This results in a crew being dispatched to the predicted location of the unplanned outage to determine the location of the fault. Once the crew has located the fault, they communicate this back to the control room and a switching plan is written that will isolate the fault and energize customers both downstream and upstream of the fault, if possible. Fault Management will then evaluate whether external approval of the switching plan is required. If external approval is required, the operator will be notified and no switching plan will be executed. If external approval is not required, Network Operations provides the selected switching plan to Workforce Management. A field crew will execute each step of the selected switching plan. Workforce Management will keep Network Operations informed of the progress of the switching plan. With the execution of each step, Network Operations will notify Fault Management of changes to the network due to switching, jumpers, and cuts, as well as operational safety tags for specific devices. Some or all of the switching steps can be executed using SCADA commands, instead of the field crew performing them. To verify restoration of customers, Fault Management may ping Metering. Fault Management will inform Customer Operations of customers it believes have become restored to power. If callbacks to customers by Customer Operations reveal that a customer is still out of power, Customer Operations will submit a new trouble ticket to Fault Management.

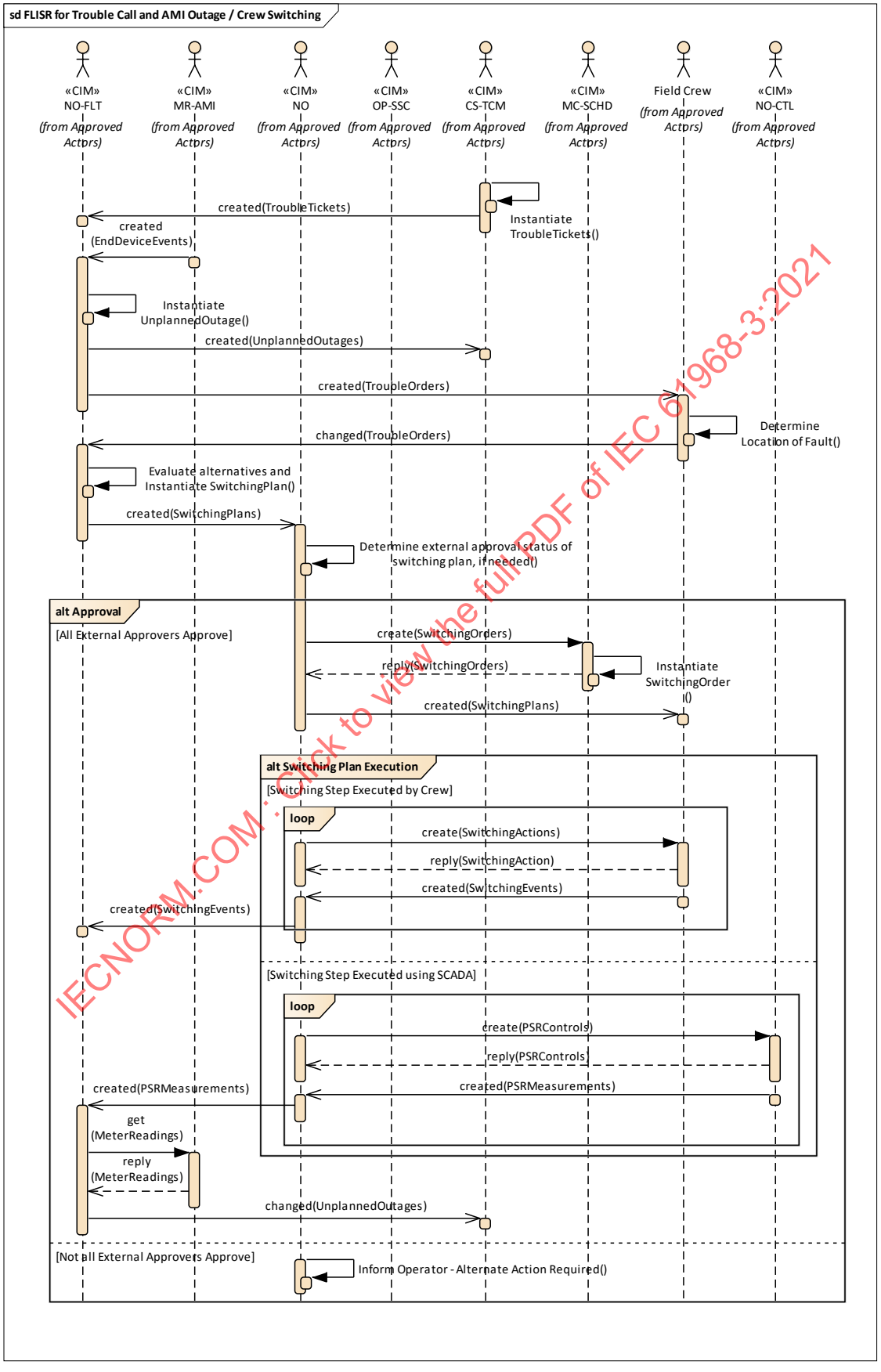
A.3.1.5 General remarks

General remarks

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A.3.2 Use case diagrams

Diagram of use case



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A.3.3 Technical details

A.3.3.1 Actors: People, systems, applications, databases, the power system, and other stakeholders

This use case is written using the following actors

Actors			
Grouping (Community)		**Group description**	
Network Operations (NO) Customer Service (CS) Maintenance and Construction (MC) Meter Reading (MR)		IEC 61968-1 Interface Reference Model (IRM) Business Function	
Actor name **see Actor list**	**Actor type** **see Actor list**	**Actor description** **see Actor list**	**Further information specific to this use case**
NO-NMON	System	Network Operations – Network Monitoring. Receives changes in measurement values from the field.	
NO-FLT	System	Network Operations – Fault Management. Analyses incoming data from a variety of sources and creates and manages unplanned outages to track customers out of power.	
OP-SSC	System	Network Operations – Switch Order Scheduling.	
NO-CTL	System	The business function within SCADA that sends remote commands to field devices.	
CS-TCM	System	Customer Service – Trouble Call Management. Receives calls from customers and reports status of unplanned outages to customers.	
MR-AMI	System	Advanced Metering Infrastructure	
MC-SCHD	System		

A.3.3.2 Preconditions, assumptions, post condition, events

Use case conditions			
Actor/System/Information/Contract	**Triggering event**	**Pre-conditions**	**Assumption**
	A breaker trips due to a fault		

A.3.3.3 References / issues

References						
No.	**References type**	**Reference**	**Status**	**Impact on use case**	**Originator / Organisation**	**Link**
	Standards	IEC 61968-3, IEC 61968-6, IEC-61968-8, IEC-61968-9		Use case is being used to validate these standards.		

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A.3.3.4 Further Information to the use case for classification / mapping

Classification information
Relation to other use cases
IEC 16850-90-6 details the interaction between field devices and the FLISR function. This use case is concerned with the interactions between manual fault location, field crews, switching plans and customer service.
Level of depth
System level use case that illustrates and guides system implementation.
Prioritisation
Generic, regional or national relation
View
Further keywords for classification

A.3.4 Step by step analysis of use case

A.3.4.1 Preconditions

Scenario conditions					
No.	**Scenario name**	**Primary actor**	**Triggering event**	**Pre-condition**	**Post-condition**
A.3.4.2	FLISR for trouble call and AMI outage, crew switching	NO-FLT	A breaker opens due to a downstream fault		The fault location is identified and manual switching is performed to isolate the fault and minimize the number of customers out.

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A.3.4.2 Steps

Scenario							
Scenario name:		FLISR for trouble call and AMI outage, crew switching					
Step No.	**Event**	**Name of process/activity**	**Description of process/ activity**	**Service**	**Information producer (Actor)**	**Information receiver (Actor)**	**Information exchanged**
1 alt a	Customer Loses power	Trouble Call Entry	Customer calls utility. Customer service representative creates a TroubleTicket and it is sent to NO-FLT	created	Customer Service Representative (CSR)	NO-FLT	**TroubleTickets**
1 alt b	A fault occurs that triggers system protection to open and one or more AMI meters are de-energized.	AMI	Metering receives the last gasp notification from a meter and creates and EndDeviceEvents.	created	MR-AMI	NO-FLT	**EndDeviceEvents**
2	OMS creates an unplanned outage	Outage Analysis	An unplanned outage is created.	created	NO-FLT	CS-TCM	**UnplannedOutages**
3	OMS dispatches the outage to a crew.	Crew dispatch	The known information regarding the unplanned outage is sent to a field crew	created	NO-FLT	MC-FRD	**TroubleOrders**
4	Field crew locates the fault	Manual fault location	The field crew receives the information regarding the unplanned outage and patrols the feeder in order to determine the location of the fault.				
5	Field crew reports fault location to OMS	Manual fault location reporting	The field crew communicates the location of the fault to the OMS	changed	MC-FLD	NO-FLT	**TroubleOrders**
6	OMS determines optimal switching plan	Fault isolation and restoration	NO-FLT receives the fault location and either an operator or an automated process determines the best combination of switches to operate in order to isolate the areas upstream and downstream of the fault and to restore power to customers who are not part of the fault zone.	created	NO-FLT	NO	**SwitchingPlans**

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Scenario							
Scenario name:		FLISR for trouble call and AMI outage, crew switching					
Step No.	**Event**	**Name of process/activity**	**Description of process/ activity**	**Service**	**Information producer (Actor)**	**Information receiver (Actor)**	**Information exchanged**
7	A switching plan is created and its impact must be evaluated.	Evaluation of switching plan	The switching plan is evaluated to determine whether external approval is needed, e.g. if a TSO needs to approve switching that will be performed by a DSO that involves a load transfer between substations of more than a certain threshold.	Manual process			
8 alt a	External approval for switching plan is required and the switching request is rejected.	External rejection of switching plan	Notify operator that switching is not permitted and terminate the use case.	Manual process			
8 alt b	External approval for switching plan is either not required, or the switching request is approved.	Schedule a resource to execute the switching plan	NO sends a request to crew scheduling to get a crew assigned to the SwitchingPlan	created	NO	MC-SCHD	**SwitchingOrders**
9	Scheduling request is fulfilled	Scheduling function	Scheduling function has assigned crew(s) to work on the SwitchingPlan	reply	MC-SCHD	NO	**SwitchingOrders**
10	SwitchingPlan is communicated to field crew	Network operations	The SwitchingPlan is sent to the crew(s) so that they can begin executing it.	created	NO	MC-FRD	**SwitchingPlans**
11	SwitchingPlan is executed						
11 alt 1a	Switching Step Executed by Crew	Manual step execution	Switch order scheduling requests the field crew to execute one or more steps. If there are multiple field crews assigned to the SwitchingPlan, only the crew assigned to the step is sent the switching action.	create	OP-SSC	MC-SCHD	**SwitchingActions**. SwitchingPlan reference, SwitchingStepGroup number, SwitchingStep number and appropriate action.
11 alt 1b		Manual step execution	The field crew responds that they have received the request	reply	MC-SCHD	OP-SSC	SwitchingActions
11 alt 1c		Manual step execution	The field crew confirms that they have executed the step (or they could not execute the step)	created	MC-SCHD	OP-SSC	SwitchingEvents

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Scenario							
Scenario name:		FLISR for trouble call and AMI outage, crew switching					
Step No.	**Event**	**Name of process/activity**	**Description of process/ activity**	**Service**	**Information producer (Actor)**	**Information receiver (Actor)**	**Information exchanged**
11 alt 1 d		Step notification	The change in network state is communicated to NO-FLT	created	NO	NO-FLT	SwitchingEvents
11 alt 2a	Switching Step executed by SCADA	Automatic step execution	Switch order scheduling requests SCADA to execute one step	create	OP-SSC	NO-CTL	PSRControls
11 alt 2b		Automatic step execution	SCADA confirms that the control request has been received and is in progress	reply	NO-CTL	OP-SSC	PSRControls
11 alt 2c		Automatic step execution	SCADA confirms that the value has changed	created	NO-CTL	OP-SSC	PSRMeasurements
11 alt 2d		Step notification	The change in network state is communicated to NO-FLT	created	NO	NO-FLT	PSRMeasurements
12 alt 1a	Customer count changes and there is AMI	Outage analysis	Outage analysis receives SwitchingEvents and PSRMeasurements and determines that some usage points that are associated with the unplanned outage have changed their energization status. This initiates a meter ping sequence to confirm restoration.				
12 alt 1b	Meters are pinged	Outage analysis	Outage analysis pings meters that it believes are now energized.	get	NO-FLT	MR-AMI	MeterReadings
12 alt 1c	Meters reply	Outage analysis	Energized meters respond	reply	MR-AMI	NO-FLT	MeterReadings
12 alt 1d	Customers are confirmed energized	Outage analysis	Usage point energization status and customer counts for the UnplannedOutage are updated.	changed	NO-FLT	CS-TCM	UnplannedOutages
12 alt 2	Customer count changes and there is no AMI	Outage analysis	Outage analysis receives SwitchingEvents and PSRMeasurements and determines that some usage points that are associated with the unplanned outage have changed their energization status. Outage restoration is assumed for the customers in the energized zone.	changed	NO-FLT	CS-TCM	UnplannedOutages

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A.3.5 Information exchanged

Information exchanged		
Name of information exchanged	**Description of information exchanged**	**Requirements to information data R-ID**
MeterReadings	Request/reply to determine the energization status of a meter	
PSRMeasurements	Discrete and analog value changes from the field.	
PSRControls	Commands to open and close switches.	
SwitchingActions	Request to execute a switching plan step. Includes operation to be performed and the network component to perform it on.	
SwitchingEvents	Notification of a change in the state of the network. Includes operation performed and the network component that it was performed on.	
SwitchingOrders	Request to schedule crews to a SwitchingPlan	
SwitchingPlans	Sequence of open and close commands to isolate a fault and restore the maximum number of customers.	
TroubleOrders	Request to schedule a crew to an UnplannedOutage. Confirmed fault location of UnplannedOutage	
TroubleTickets	Customer report of an outage. Includes customer identification and usage point impacted.	
UnplannedOutages	Affected customer counts and list of de-energized usage points.	

A.3.6 Common terms and definitions

Common terms and definitions	
Term	**Definition**

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A.4 Planned outage for maintenance – Manual process

The sequence shown in Figure A.3 is based on the business process of a large European utility. The current process includes very little interoperability between systems, but instead manual interactions. Also this sequence assumes that all switches are not telemetered and require manual operation.

When planned work requires isolation of an area for maintenance, a work manager first submits a work request to the work management system (in this case SAP). The work manager then separately makes a request to a control room operator via email for a switching plan to isolate the work area. The operator creates “switching schedules”, which are essentially a work order and switching plan combined (perhaps the closest concept in CIM would be a SwitchingPlan). One switching plan contains all steps for isolation, service restoration, and return to normal state. After the necessary approvals, the operator emails the switching schedules to the work manager.

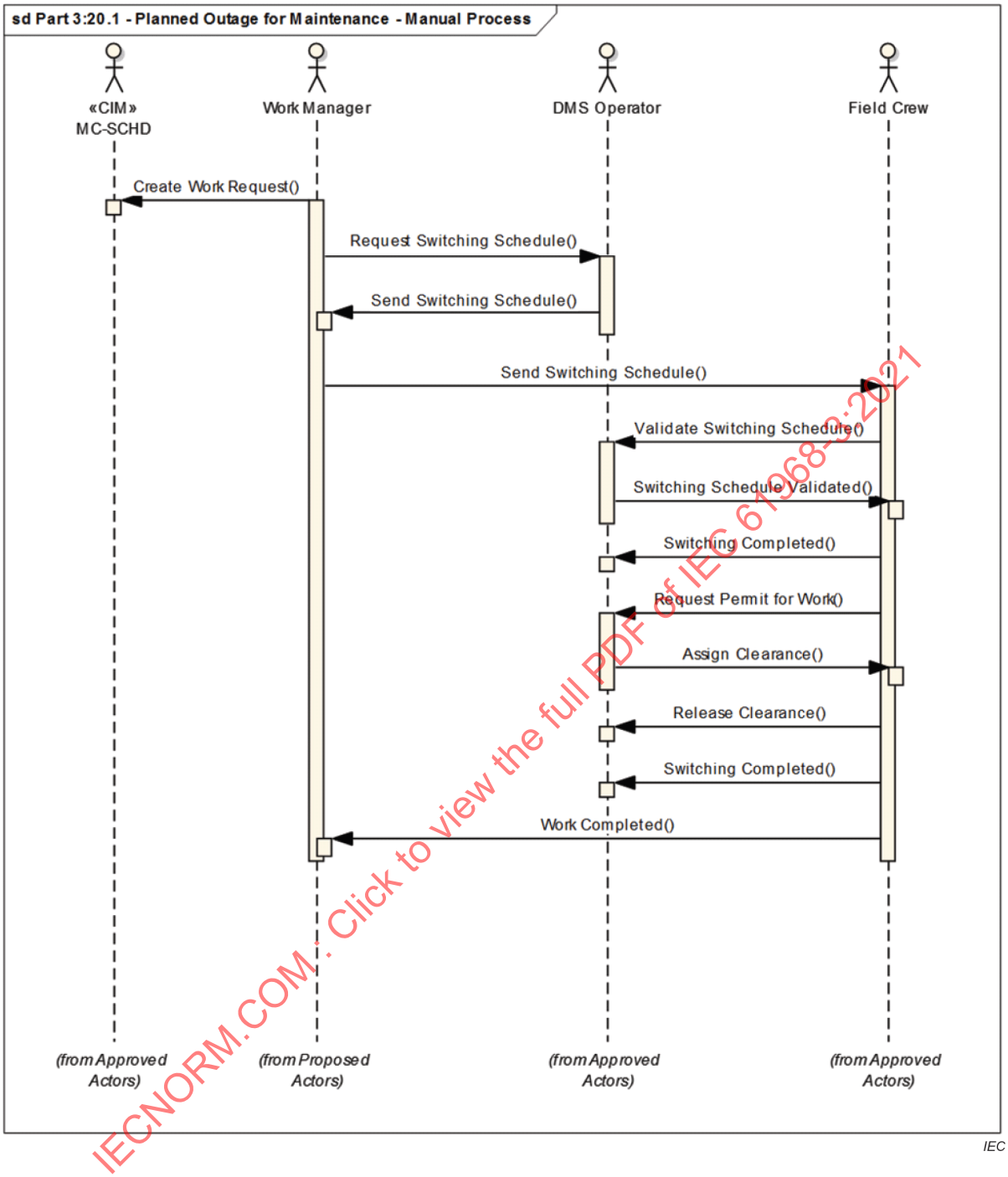
The work manager now assigns the switching schedules to a field crew, and assigns individual switching steps to crew members based on qualifications. For example, only some of the crew members may be able to perform switching and grounding. The work manager either emails the switching schedules to the crew leader, or just prints it out and hands it to him.

The field crew travels to the work area. Upon arrival, the crew leader contacts the operator to say they are ready for work. The operator validates that the switching schedule is still valid in the current state of the network. Now the crew is free to execute all isolation and service restoration steps in the switching schedule, and informs the operator when this switching is complete. The operator updates the DMS to reflect the changes.

The work area is now de-energized. The maintenance crew contacts the operator to request a “permit for work”, also known as a clearance. The crew lead receives and owns the permit to work during the maintenance. Note that only one person can receive the permit to work, typically the crew lead. This person cannot reassign the permit to work to another crew member – only the operator can do this.

After completion of the maintenance work, the crew lead contacts the operator to return the permit to work. Then the crew continues execution of the switching schedule to return the network to normal state and informs the operator.

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Figure A.1 – Planned outage for maintenance – Manual process

A.5 Planned outage for maintenance

A.5.1 General

This use case describes how a planned outage is requested, a switching plan is created and the switching plan is executed. It follows the manual process described in Clause A.4, but in this case the majority of the steps are automated. It was developed using the IEC use case template.

A.5.2 Description of the use case

A.5.2.1 Name of use case

Use case identification		
ID	**Domain(s)**	**Name of use case**
	Customer Support, Outage Management, Work Management	Request, creation and execution of a planned outage.

A.5.2.2 Version management

Version management changes / Version	Date (dd/mm/yyyy)	Name author(s) or committee	Area of expertise / Domain / Role	Title	Approval status draft, for comments, for voting, final
1	24/04/2019	WG14 Part Teams Focus Community	Customer Information Systems, Outage Management and Work Management		Draft

A.5.2.3 Scope and objectives of use case

Scope and objectives of use case	
Related business case	
Scope	This use case covers the request, creation and execution of a planned outage.

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A.5.2.4 Narrative of use case

Narrative of use case
Short description – max 3 sentences
A switching plan is requested by work management, which is then written by operations personnel. The switching plan is then scheduled for execution and customers who will be impacted are notified. Once the execution has started, customer service is notified of when customers are de-energized and then re-energized.
Complete description
The sequence starts with a SwitchingPlanRequest, which is used to convey a request from work management (or other business function) to network operations that switching needs to be performed. This could be a request to isolate part of the network in order for maintenance or construction work to be performed. The payload includes the type of work to be performed and when it should start. The typical outcome of a SwitchingPlanRequest is the creation of a SwitchingPlan. A SwitchingPlan is a sequence of pre-defined steps that typically perform operations to change the state of the network, such as a sequence of switch open and close operations. Switch Action Scheduling (OP-SSC) acknowledges receipt of the request with a reply message. The SwitchingPlan is then developed by creating steps, either manually or automatically. The SwitchingPlan goes through various review and approval processes within the Switch Action Scheduling function. Upon completion of the development of an approved SwitchingPlan, Switch Action Scheduling makes a request to Work Scheduling and Dispatching (MC-SCHD) to create a SwitchingOrder using the SwitchingOrders message. The SwitchingPlan is not yet communicated outside of the Switch Action Scheduling function. The SwitchingOrder is scheduled within Work Scheduling and Dispatching. Once it has been scheduled, Work Scheduling and Dispatching replies with a SwitchingOrders message, to indicate that the SwitchingOrder has been scheduled. Finally, Customer Service is notified of the planned outage via a PlannedOutageNotification message, which is used to notify customers about the planned outage. It is possible to reschedule or cancel a switching order. This request typically originates from network operations due to a change in the network configuration or a weather event. The request to reschedule goes to maintenance and construction to provide resources for the revised date/time. The new date/time is then communicated to customer support via a PlannedOutageNotification message. The actual operational steps for a SwitchingPlan are defined using the SwitchingPlan profile. Operational steps can comprise different SwitchingActions that determine what operation is to be performed and on what network component. At the time that the SwitchingPlan is executed, different profiles are used to coordinate the execution between the control room, field crews and SCADA. It is possible for a SwitchingPlan to consist solely of operational steps that are performed by a field crew or solely operational steps that are performed automatically via SCADA, or a combination of the two. The trigger that starts the execution of the SwitchingPlan is when OP-SSC sends a SwitchingPlans message to MC-FRD, which has the latest approved version of the SwitchingPlan to be executed. This is shown in Figure A.4. The sequence diagram then shows how a switching step is sent from the control room to a field crew by using a SwitchingActions message. Even though the field crew may already have a complete copy of the SwitchingPlan, this message is used to request the field crew to execute the specific step referenced in the message. The reply indicates that the field crew has received the instruction to execute a switching step. The SwitchingEvents message is a confirmation that the switching step has been executed. The sequence diagram also shows how a ControlAction step is coordinated by a sequence of PSRControls, reply and PSRMeasurements when the step is executed using SCADA commands. The sequence diagram also shows how customers support is notified when a SwitchingStep is executed that causes customers to be de-energized and whenever the customer count changes. These notifications are done using the PlannedOutages message.

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A.5.2.5 General remarks

General remarks
The tracking of switch orders is a key to safely operating the electric network. Coordinating switch order execution electronically between the control room and field crews can reduce ambiguity in switching and reduce switching errors.

A.5.3 Use case diagrams

There are several sequence diagrams associated with this use case. The sequence diagrams are shown along with each step in the use case.

Diagram of use case
Figure A.2 is a diagram that shows the creation of a switching plan.
Figure A.3 shows changes being made to a switching plan
Figure A.4 shows the execution of a switching plan

A.5.4 Technical details

A.5.4.1 Actors: People, systems, applications, databases, the power system, and other stakeholders

This use case is written using the following actors

Actors			
Grouping (community)		**Group description**	
Network Operations (NO) Customer Service (CS) Maintenance and Construction (MC)		IEC 61968-1 Interface Reference Model (IRM) Business Function	
Actor Name **see Actor List**	**Actor Type** **see Actor List**	**Actor Description** **see Actor List**	**Further information specific to this Use Case**
CS-CSRV	System	The customer service actor provides information to customers regarding their electric service.	
MC-SCHD	System	Maintenance and construction scheduling.	
OP-SSC	System	Network Operations – Switch Order Scheduling.	
NO-CTL	System	The business function within SCADA that sends remote commands to field devices.	
MC-FRD	System	Maintenance and Construction – field resource dispatch.	

A.5.4.2 Preconditions, assumptions, post condition, events

Use case conditions			
Actor/System/Information/Contract	**Triggering event**	**Pre-conditions**	**Assumption**
	A request for switching is created		All planned outages require a switching plan to be written and used to track its execution.

A.5.4.3 References / issues

References						
No.	**References type**	**Reference**	**Status**	**Impact on use case**	**Originator / Organisation**	**Link**
	Standards	IEC 61968-3 IEC 61968-6 IEC-61968-8		Use case is being used to validate these three standards.		

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A.5.4.4 Further information on the use case for classification / mapping

Classification information
Relation to other use cases
Level of depth
System level use case that illustrates and guides system implementation.
Prioritisation
Generic, regional or national relation
View
Further keywords for classification

A.5.5 Step by step analysis of use case

A.5.5.1 Preconditions

Scenario conditions					
No.	**Scenario name**	**Primary actor**	**Triggering event**	**Pre-condition**	**Post-condition**
A.5.5.2	Creation of switching plan	MC-SCHD	A request is made for a switching plan to be created		A switching plan is created and impacted customers are notified.
A.5.5.3	Switching order is updated	OP-SSC	The start time/date of a switching order needs to be changed, e.g. due to bad weather.	A switching plan exists	The switching order is updated and impacted customers are notified.
A.5.5.4	Execution of switching plan	OP-SSC	The due time/date for a switching plan arrives.	A switching plan exists and resources are available to execute it.	The switching plan is executed.

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A.5.5.2 Steps – SwitchingPlan is created

Scenario							
Scenario name:		Creation of switching plan					
Step No.	**Event**	**Name of process/Activity**	**Description of process/ Activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
1	Work management is planning a new construction or maintenance project that requires part of the network to be isolated.	Maintenance and construction planning	A SwitchingPlanRequest is sent to network operations.	create	MC-SCHD	OP-SSC	**SwitchingPlanRequests**, which includes when the work is required, where it is required and what is to be done.
2	OP-SSC replies, indicating that it has received the request.	Switch order scheduling		reply	OP-SSC	MC-SCHD	**SwitchingPlanRequests**
3	The switching plan is written and is approved	Switch order writing	A person reviews the information in the request and creates a sequence of switching steps, capturing them in the switching plan. The switching plan goes through a review and approval cycle. Once it is approved, a request is made to maintenance and construction to schedule resources to perform the switching.	create	OP-SSC	MC-SCHD	**SwitchingOrders**. Contains location of work, skill sets and quantity required and date/time.
4	The switching work is scheduled.	Switch order scheduling	Maintenance and construction determines which crews will be assigned to work on the switch order	created	MC-SCHD	OP-SSC	**SwitchingOrders**. Contains the crews who have been assigned
5	Customers are notified about the planned outage	Customer communication	Switch order scheduling determines which customers will be affected and sends a notification to customer service, who will contact customers.	created	OP-SSC	CS-CSRV	**PlannedOutageNotifications**. Contains list of customers, reason for the outage and the date/time the planned outage will start and end.

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Figure A.2 shows the creation of a **SwitchingPlan**.

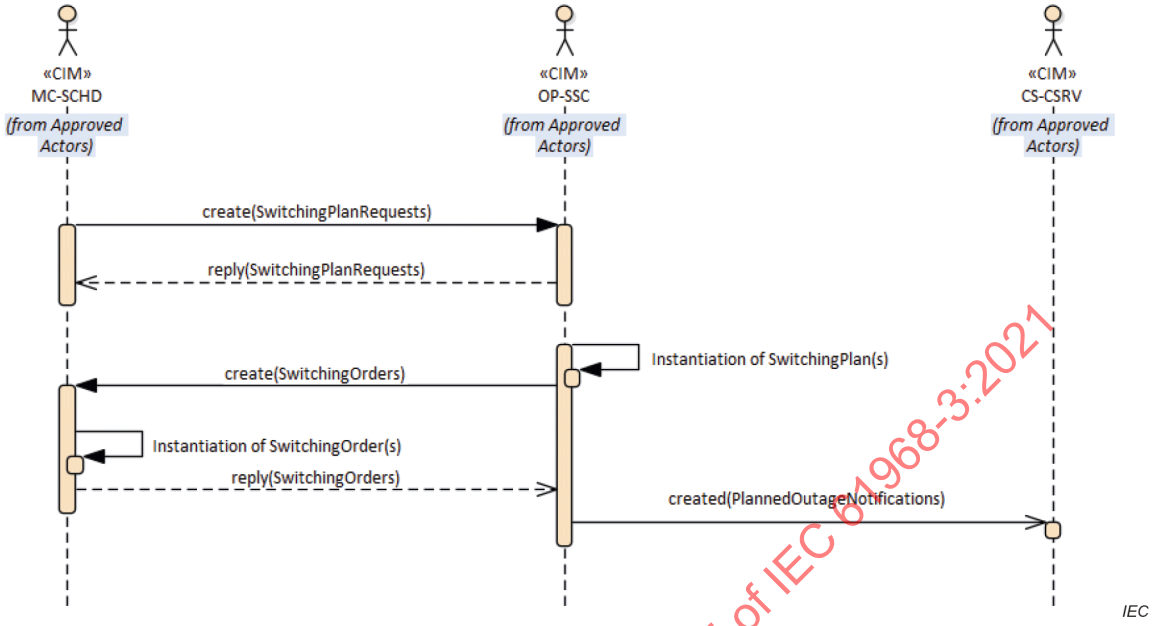


Figure A.2 – SwitchingPlan creation

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A.5.5.3 Steps – SwitchingOrder changes

Scenario							
Scenario name:		Switching order is updated					
Step No.	**Event**	**Name of process/Activity**	**Description of process/ Activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
1	Network or weather conditions change such that an approved switching order must be modified.	External event	OP-SSC notifies MC-SCHD that the date/time of a switching order must be changed.	change	OP-SSC	MC-SCHD	**SwitchingOrders**. New start/end date/time.
2	The switching order is rescheduled	Crew scheduling	Resources are assigned for the new date/time				
3	The new date/time is communicated to network operations	Crew scheduling		reply	MC-SCHD	OP-SSC	**SwitchingOrders** with new start/end date/time
4	Customer service is notified of the change	Customer communication		changed	OP-SSC	CS-CSRV	**PlannedOutageNotifications** with new start/end date/time

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Figure A.3 shows the updates during the lifecycle of a SwitchingOrder. The same process can be repeated if several changes are required to be made over time. It is also possible to cancel the SwitchingOrder completely.

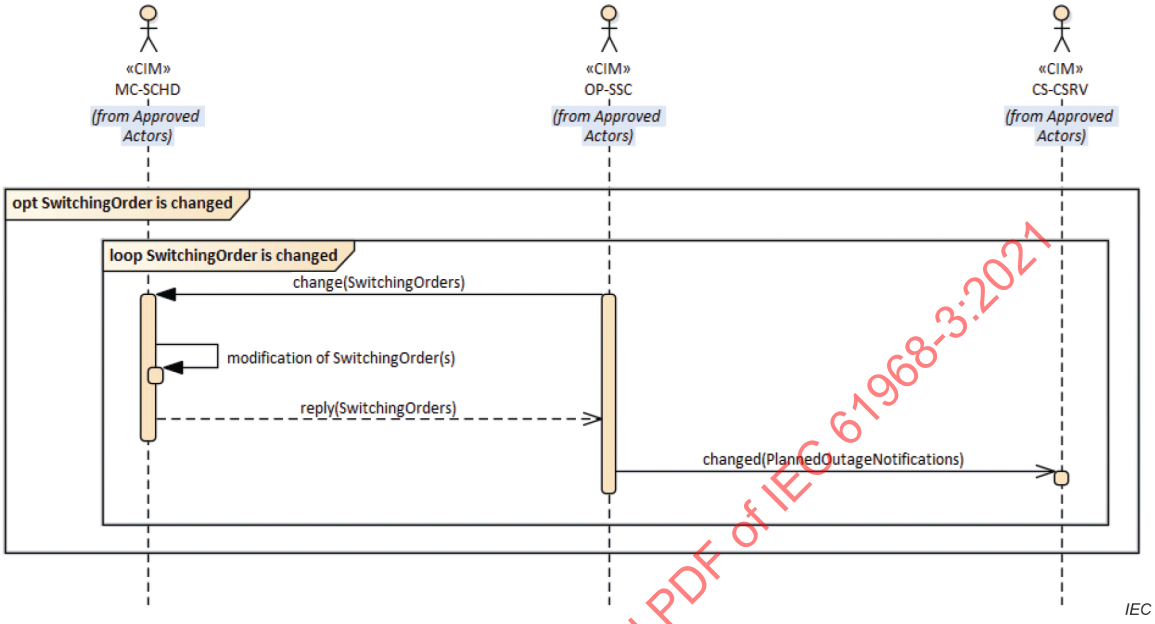


Figure A.3 – SwitchingOrder changes

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A.5.5.4 Steps – SwitchingPlan is executed

Scenario							
Scenario name		Switching plan is executed					
Step No.	**Event**	**Name of process/Activity**	**Description of process/Activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
1	The date/time to execute a switching plan arrives	Field Crew and Control Room manual interaction	On the day that a switching plan is scheduled to be executed, the crews will contact the control room to confirm that the switching plan is still to be executed (outside of the scope of this use case). The control room will confirm execution by sending the approved switching plan to all of the field crews involved in the switching	created	OP-SSC	MC-FRD	**SwitchingPlans**. The complete SwitchingPlan, including scheduled start/end time and detailed switching steps.
2	Steps are executed	Switching step coordination	In this use case, all switching steps are coordinated by the control room (OP-SSC) but it is also possible that steps could be coordinated by a field supervisor and the sequence of steps would be the same. Steps can either be executed by a field crew or remotely via SCADA, depending on the device in each step. The sequence diagram in Figure A.4 shows steps being executed in a loop.				
3 alt 1a	Switching Step Executed by Crew	Manual step execution	Switch order scheduling requests the field crew to execute one or more steps. If there are multiple field crews assigned to the SwitchingPlan, only the crew assigned to the step is sent the switching action.	create	OP-SSC	MC-SCHD	**SwitchingActions**. SwitchingPlan reference, SwitchingStepGroup number, SwitchingStep number and appropriate action.
3 alt 1b		Manual step execution	The field crew responds that they have received the request	reply	MC-SCHD	OP-SSC	**SwitchingActions**
3 alt 1c		Manual step execution	The field crew confirms that they have executed the step (or they could not execute the step)	created	MC-SCHD	OP-SSC	**SwitchingEvents**
3 alt 2a	Switching Step executed by SCADA	Automatic step execution	Switch order scheduling requests SCADA to execute one step	create	OP-SSC	NO-CTL	**PSRControls**

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Scenario							
Scenario name		Switching plan is executed					
Step No.	**Event**	**Name of process/Activity**	**Description of process/Activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
3 alt 2b		Automatic step execution	SCADA confirms that the control request has been received and is in progress	reply	NO-CTL	OP-SSC	**PSRControls**
3 alt 2c		Automatic step execution	SCADA confirms that the value has changed	created	NO-CTL	OP-SSC	**PSRMeasurements**
4	The first customer is de-energized	Customer Communication	When the first customer becomes de-energized as the result of executing a switching step, customer service is notified.	created	OP-SSC	CS-CSRV	**PlannedOutages**
5	The number of impacted customers changes	Customer Communication	Whenever the number of impacted customers changes after the first customer is de-energized, customer service is notified	changed	OP-SSC	CS-CSVR	**PlannedOutages**

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Figure A.4 shows the execution of a switching plan.

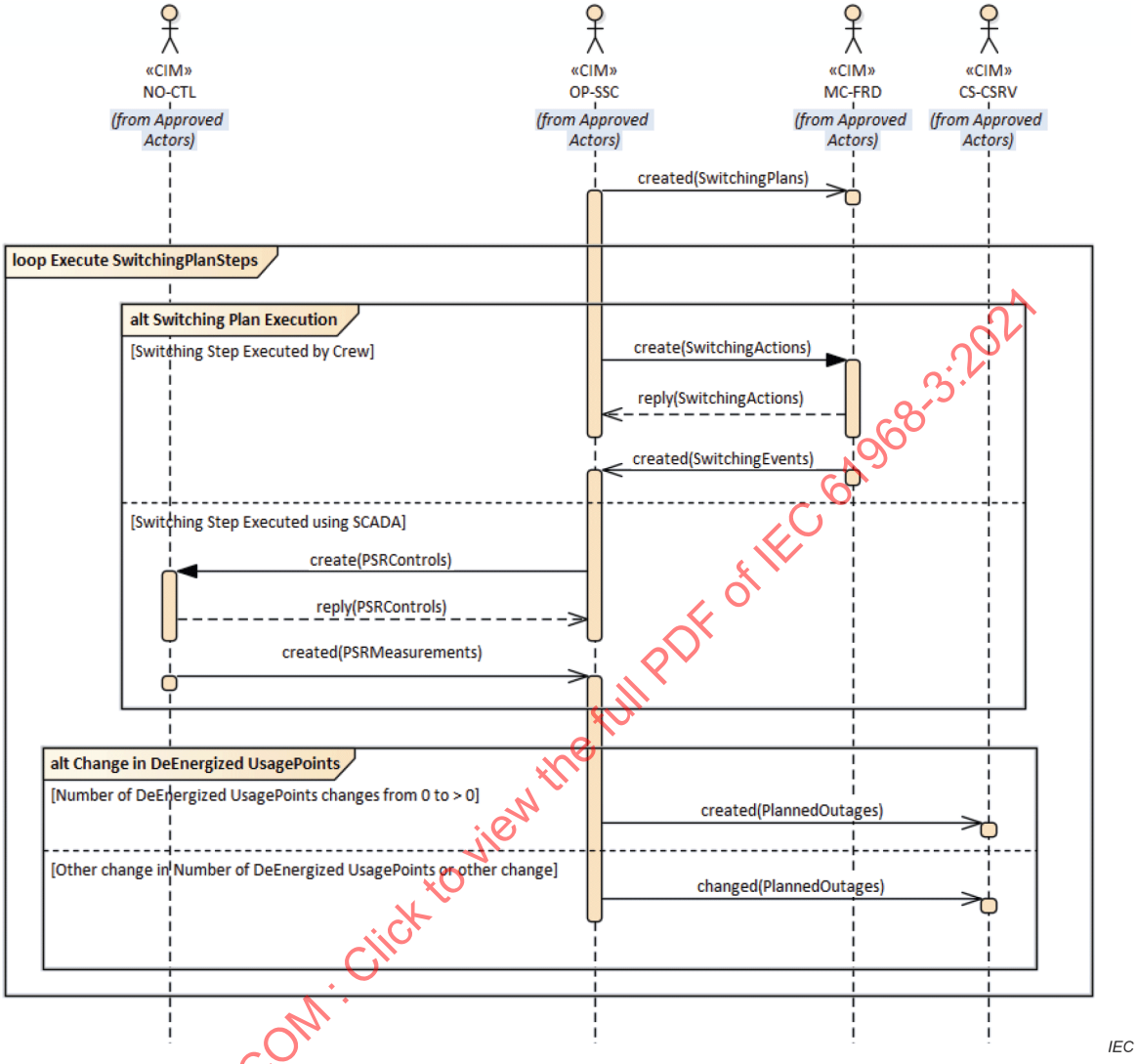


Figure A.4 – SwitchingPlan execution

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A.5.6 Information exchanged

Information exchanged		
Name of information exchanged	**Description of information exchanged**	**Requirements to information data R-ID**

A.5.7 Common terms and definitions

Common terms and definitions	
Term	**Definition**

A.6 TroubleTicket creation

A.6.1 Description of the use case

A.6.1.1 Name of use case

Use case identification		
ID	**Domain(s)**	**Name of use case**
		Outage trouble call entry into CIS and creation of trouble ticket

A.6.1.2 Version management

Version management						
Version management changes / version	**Date (dd/mm/yyyy)**	**Name author(s) or committee**	**Domain expert**	**Area of expertise / Domain / Role**	**Title**	**Approval status draft, for comments, for voting, final**
1	24/04/2019	WG14 Part Teams Focus Community		Customer Information Systems, Outage Management		Draft

A.6.1.3 Scope and objectives of use case

Scope and objectives of use case	
Related business case	Customer Information System interaction with Outage Management System
Scope	This use case includes customer interaction with a customer service representative as well as an automated call taking system such as a interactive voice response system.

A.6.1.4 Narrative of use case

Narrative of use case
Short description – max 3 sentences
A customer experiences power out and calls the utility to report their power is out. The call taker collects information about the problem and records it in the CIS, which sends the trouble call information to the OMS. The OMS returns information about the outage if available.
Complete description
A customer experiences power out and calls the utility to report their power is out. The call taker collects information about the problem and records it in the CIS, which sends the trouble call information to the OMS. The OMS performs analysis to determine whether this is a new or existing outage and returns status and estimated restoration time for the outage if available.

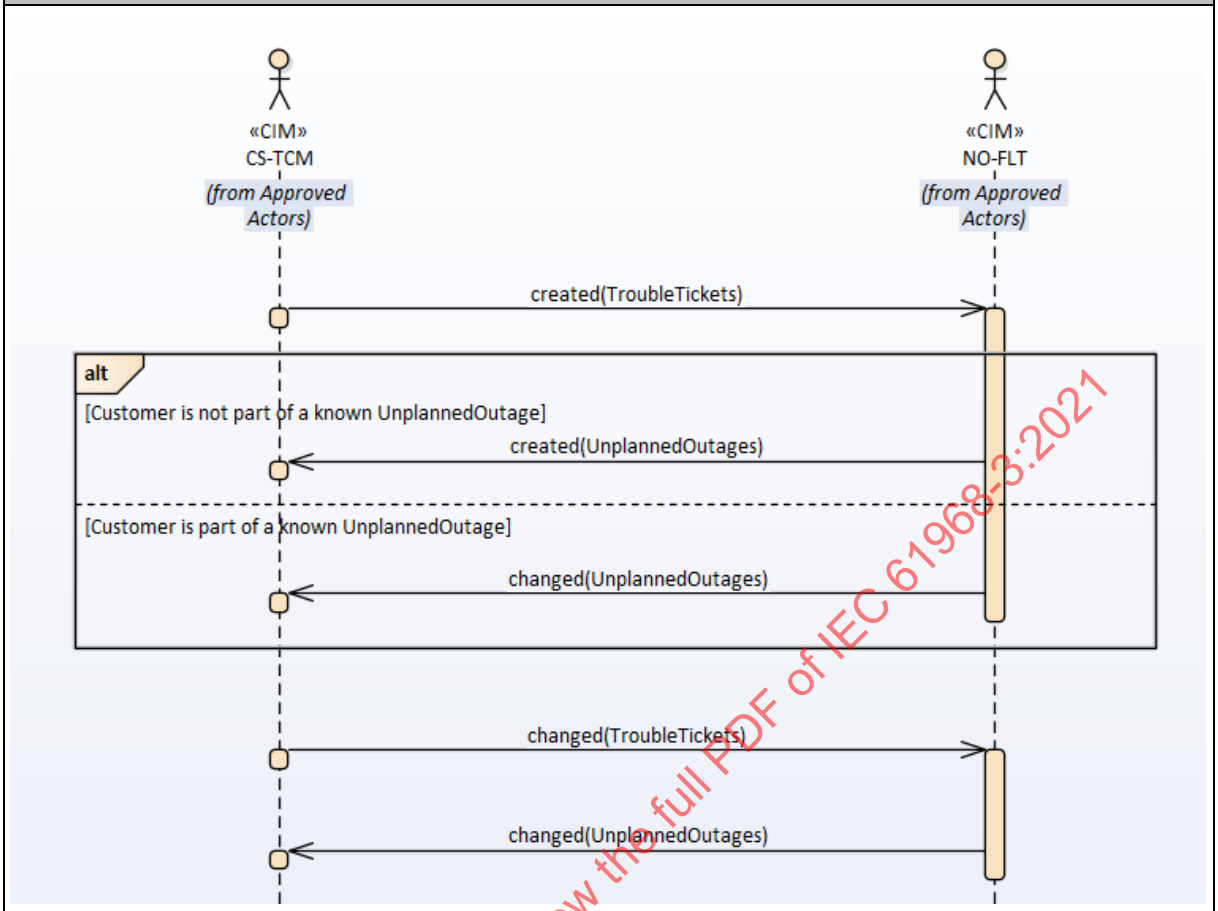
A.6.1.5 General remarks

General remarks

A.6.2 Use case diagrams

The activity diagram shows the main activities from the main actors and the key deliverables.

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Diagram of use case


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A.6.3 Technical details

A.6.3.1 Actors: People, systems, applications, databases, the power system, and other stakeholders

This use case is written using the following actors

Actors			
Grouping (community)		**Group description**	
Network Operations (NO)		IEC 61968-1 Interface Reference Model (IRM) Business Function	
Actor name see actor list	**Actor type see actor list**	**Actor description see actor list**	**Further information specific to this use case**
Customer Information System (CIS)	System	A Customer Information System (CIS) is a computer system that stores customer information for a utility and manages interactions between the customer and the utility.	
Outage Management System (OMS)	System	An Outage Management System (OMS) is a computer system that keeps track of customers who are out of power and maintains electric system reliability indices.	
Customer Service Representative (CSR)	Person	A Customer Service Representative is a person at a utility who communicates with utility customers, usually via telephone.	
Customer	Person	A customer is a person who is supplied energy by the utility.	

A.6.3.2 Preconditions, assumptions, post condition, events

Use case conditions			
Actor/System/Information/Contract	**Triggering event**	**Pre-conditions**	**Assumption**
	A customer experiences a power outage	Customer had power.	

A.6.3.3 References / issues

References						
No.	**References type**	**Reference**	**Status**	**Impact on use case**	**Originator / Organisation**	**Link**
	Standards	IEC 61968-3, IEC 61968-8		Use case is being used to validate these two standards.		

A.6.3.4 Further Information to the use case for classification / mapping

Classification information
Relation to other use cases
Level of depth
System level use case
Prioritisation
Generic, regional or national relation
View
Further keywords for classification

A.6.4 Step by step analysis of use case

A.6.4.1 Preconditions

Scenario conditions					
No.	**Scenario name**	**Primary actor**	**Triggering event**	**Pre-condition**	**Post-condition**
4.1	Customer calls who is not part of a known outage	Customer Service Representative	Customer experiences a power outage who is not part of a known outage	Customer had power	A new UnplannedOutage is created in OMS
4.2	Customer calls who is part of a known outage and CIS cannot make this determination	Customer Service Representative	Customer experiences a power outage who is part of a known outage	Customer had power	A new UnplannedOutage is created in OMS
4.3	Customer calls who is part of a known outage and CIS can make this determination	Customer Service Representative	Customer experiences a power outage who is part of a known outage	Customer had power	A new UnplannedOutage is created in OMS

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A.6.4.2 Steps – Normal

Scenario							
Scenario name:		Customer calls who is not part of a known outage					
Step No.	**Event**	**Name of process/Activity**	**Description of process/Activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
1	Customer Loses power	Trouble Call Entry	Customer calls utility	N/A	Customer	Customer Service Representative (CSR)	Verbal – identification of service affected, outage symptoms
2	CSR enters outage information	Trouble Call Entry	CSR looks up customer in CIS and CIS retrieves customer information such as usage point and customer name. CSR enters callback information, outage symptoms. CIS creates a TroubleTicket [Each time a customer calls, a new TroubleTicket is created in CIS].	create	CSR	Customer Information System (CS-TCM)	TroubleTicket
3	CIS sends TroubleTicket to OMS	Trouble Call Entry		created	CIS (CS-TCM)	Outage Management System (NO-FLT)	TroubleTicket
4	OMS analyzes TroubleTicket	Outage Analysis	OMS checks to see if the customer is part of a known outage. If the customer is not part of a known outage, a new UnplannedOutage is created.	created	OMS (NO-FLT)	CIS (CS-TCM)	UnplannedOutage

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A.6.4.3 Alternative 1 – Customer calls who is part of known outage but cis is not aware of this

NOTE This is identical to the normal case, so the messages are the same.

Scenario							
Scenario name:		Customer calls who is part of a known outage but CIS cannot make this determination					
Step No.	**Event**	**Name of process/Activity**	**Description of process/Activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
2 alt	CSR enters outage information	Trouble Call Entry	CSR looks up customer in CIS and CIS retrieves customer information such as usage point and customer name. CSR enters callback information, outage symptoms. Each time a customer calls, a new TroubleTicket is created in CIS.	create	CSR	Customer Information System (CS-TCM)	TroubleTicket
3 alt	CIS sends TroubleTicket to OMS	Trouble Call Entry		created	CIS (CS-TCM)	Outage Management System (NO-FLT)	TroubleTicket
4 alt	OMS analyzes TroubleTicket	Outage Analysis	OMS checks to see if the customer is part of a known outage. If the customer is part of a known outage, the UnplannedOutage information is returned to CIS.	changed	OMS (NO-FLT)	CIS (CS-TCM)	UnplannedOutage

A.6.4.4 Alternative 2 – Customer calls who is part of known outage and cis is aware of this

Scenario							
Scenario name:		If the CIS is able to associate the trouble call with a known outage then it may decide not to send the trouble call to the OMS					
Step No.	**Event**	**Name of process/Activity**	**Description of process/Activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
2 alt	CSR enters outage information	Trouble Call Entry	CSR looks up customer in CIS and CIS retrieves customer information such as usage point and customer name. CSR enters callback information, outage symptoms. CIS determines that the customer is part of a known outage and there is no need to send TroubleTicket to OMS.	create	CSR	Customer Information System (CS-TCM)	TroubleTicket

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A.6.5 Information exchanged

Information exchanged		
Name of information exchanged	**Description of information exchanged**	**Requirements to information data R-ID**
TroubleTicket	Location of the problem, nature of the problem, whether there is a hazard (e.g. wire down), name of customer, notification information	
UnplannedOutage	Location, related outage information including estimated time of restoration, status, hazard information.	

A.6.6 Common terms and definitions

Common terms and definitions	
Term	**Definition**

A.7 CIS and OMS interactions during an unplanned outage

A.7.1 General

This use case describes Customer Information system interactions with OMS when an unplanned outage is created or its status changes. It was developed using the IEC use case template.

A.7.2 Description of the use case

A.7.2.1 Name of use case

Use case identification		
ID	**Domain(s)**	**Name of use case**
	Customer Support, Outage Management	Customer Information system interactions with OMS when an unplanned outage is created or its status changes

A.7.2.2 Version management

Version management changes / Version	Date (dd/mm/yyyy)	Name author(s) or committee	Area of expertise / Domain / Role	Title	Approval status draft, for comments, for voting, final
1	24/04/2019	WG14 Part Teams Focus Community	Customer Information Systems and Outage Management		Draft

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A.7.2.3 Scope and objectives of use case

Scope and objectives of use case	
Related business case	Customer Information System interaction with Outage Management System
Scope	This use case covers unplanned outage creation or status changes in OMS that need to be communicated to CIS. Planned outages are not included in this use case.

A.7.2.4 Narrative of use case

Narrative of use case
Short description – max. 3 sentences
An unplanned outage is created or the status of an unplanned outage changes such that customers who are part of the outage need to be notified or their status needs to be updated in CIS. This is needed so that customers can be provided with accurate information if they call the utility. In addition the CIS may maintain a history of outages for each customer.
Complete description
Various triggers can cause the status of an unplanned outage to change. These include crew status changes (assigned, enroute, arrived), estimated restoration time changes, the cause of the outage has been determined and the outage has been restored. Also, changes in the list of affected customers for the outage need to be communicated to the CIS. These changes are communicated to the CIS so that the CIS can update its TroubleTickets, outage history and/or notify the customers affected.

A.7.2.5 General remarks

General remarks
The reporting of the status of UnplannedOutages to customers is a key business process in a utility that can improve customer satisfaction.

A.7.3 Use case diagrams

The sequence diagram in Figure A.5 shows the main activities from the main actors. The remaining sequence diagrams are shown along with each step in the use case.

Diagram of use case
Figure A.5 is an overview diagram that shows the main steps of the use case.
Figure A.6 shows the creation of an Unplanned Outage.
Figure A.7 shows various updates during the lifecycle of an Unplanned Outage
Figure A.8 shows two outages being combined during outage prediction
Figure A.9 shows an outage being split into two outages during outage prediction.
Figure A.10 shows the restoration of an Unplanned Outage

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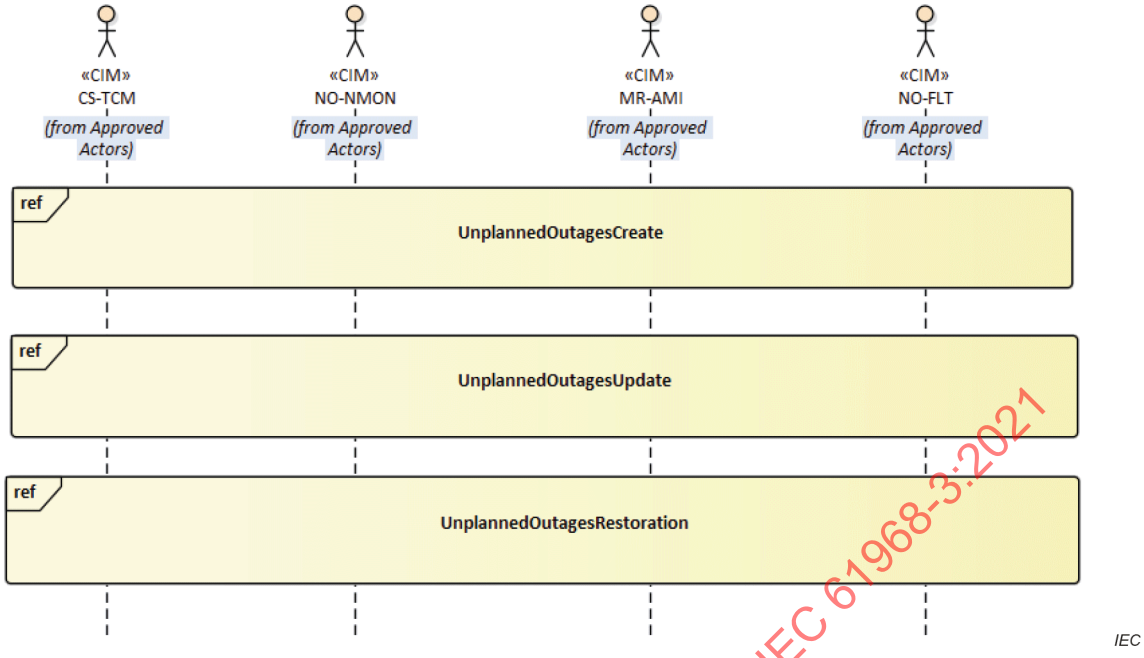


Figure A.5 – UnplannedOutages overview

A.7.4 Technical details

A.7.4.1 Actors: People, systems, applications, databases, the power system, and other stakeholders

This use case is written using the following actors:

Actors			
Grouping (community)		**Group description**	
Network Operations (NO)		IEC 61968-1 Interface Reference Model (IRM) Business Function	
Actor Name see actor list	**Actor type see actor list**	**Actor description see actor list**	**Further information specific to this use case**
Customer Information System (CS-TCM)	System	A Customer Information System (CIS) is a computer system that stores customer information for a utility and manages interactions between the customer and the utility.	It is shown as CS-TCM in the diagrams.
Outage Management System (NO-FLT)	System	An Outage Management System (OMS) is a computer system that keeps track of customers who are out of power and maintains electric system reliability indices.	It is shown as NO-FLT in the diagrams.
Customer Service Representative (CSR)	Person	A Customer Service Representative is a person at a utility who communicates with utility customers, usually via telephone.	
Customer	Person	A customer is a person who is supplied energy by the utility.	
SCADA	System	Supervisory Control and Data Acquisition – a computer system that monitors the state of the electric network through remote sensor and can change the state of the network through commands to remote actuators.	It is shown as NO-NMON in the diagrams.
AMI	System	An AMI (Advanced Metering Infrastructure) is a system that sends and receives data from meters that can provide remote reading and other capabilities.	It is shown as MR-AMI in the diagrams.

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A.7.4.2 Preconditions, assumptions, post condition, events

Use case conditions			
Actor/System/Information/Contract	**Triggering event**	**Pre-conditions**	**Assumption**
	An Unplanned Outage is created.		

A.7.4.3 References / issues

References						
No.	**References type**	**Reference**	**Status**	**Impact on use case**	**Originator / Organisation**	**Link**
	Standards	IEC 61968-3, IEC 61968-8		Use case is being used to validate these two standards.		

A.7.4.4 Further Information to the use case for classification / mapping

Classification information
Relation to other use cases
Level of depth
System level use case that illustrates and guides system implementation.
Prioritisation
Generic, regional or national relation
View
Further keywords for classification

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A.7.5 Step by step analysis of use case

A.7.5.1 Preconditions

Scenario conditions					
No.	**Scenario name**	**Primary actor**	**Triggering event**	**Pre-condition**	**Post-condition**
A.7.5.2 alt 1	Unplanned outage created from SCADA event	SCADA	A fault occurs that triggers system protection to open.		
A.7.5.2 alt 2	Unplanned outage created from metering event	AMI	A fault occurs that triggers system protection to open and one or more AMI meters are de-energized. Metering reports an EndDeviceEvent to OMS.		
A.7.5.2 alt 3	Unplanned outage created from customer call	CIS	A fault occurs that triggers system protection to open and one or more customers are de-energized. A customer calls the utility to report an outage.		
A.7.5.3	Unplanned outage status changes	Outage Management System	Any change to an outage, such estimated restoration time change, outage cause added/changed, switching operation impacting the outage, outages being combined, outage being split.	Unplanned outages exist in the system.	
A.7.5.3	Unplanned outage crew status changes	Outage Management System	The crew status of an outage changes.	Unplanned outages exist in the system.	
A.7.5.4	Unplanned outage is restored	Outage Management System	Outage is restored.		

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A.7.5.2 Steps – Unplanned outage is created

Scenario							
Scenario name:		OMS receives information regarding an unplanned outage					
Step No.	**Event**	**Name of process/Activity**	**Description of process/Activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
1 alt a	OMS receives indication of system protection automatically operating.	SCADA	A digital measurement in SCADA changes from closed to open.	created	NO-NMON (SCADA)	NO-FLT (OMS)	PSRMeasurements indicating that a breaker or other interrupting device has opened.
1 alt b	A fault occurs that triggers system protection to open and one or more AMI meters are de-energized.	AMI	Metering receives the last gasp notification from a meter and creates and EndDeviceEvents.	created	MR-AMI	NO-FLT (OMS)	EndDeviceEvents
1 alt c	OMS receives TroubleTicket from a customer outage call	Trouble Call Entry					
2	OMS creates an unplanned outage	Outage Analysis	An unplanned outage is created.	created	NO-FLT (OMS)	CS-TCM (CIS)	UnplannedOutages
3	CIS receives UnplannedOutage message	Outage Analysis	CIS adds customers that are de-energized to its list of de-energized customers so that it can provide information regarding the Unplanned Outage when the customer calls. It can also use this information for filtering subsequent trouble calls.	N/A			

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Figure A.6 shows the creation of an unplanned outage.

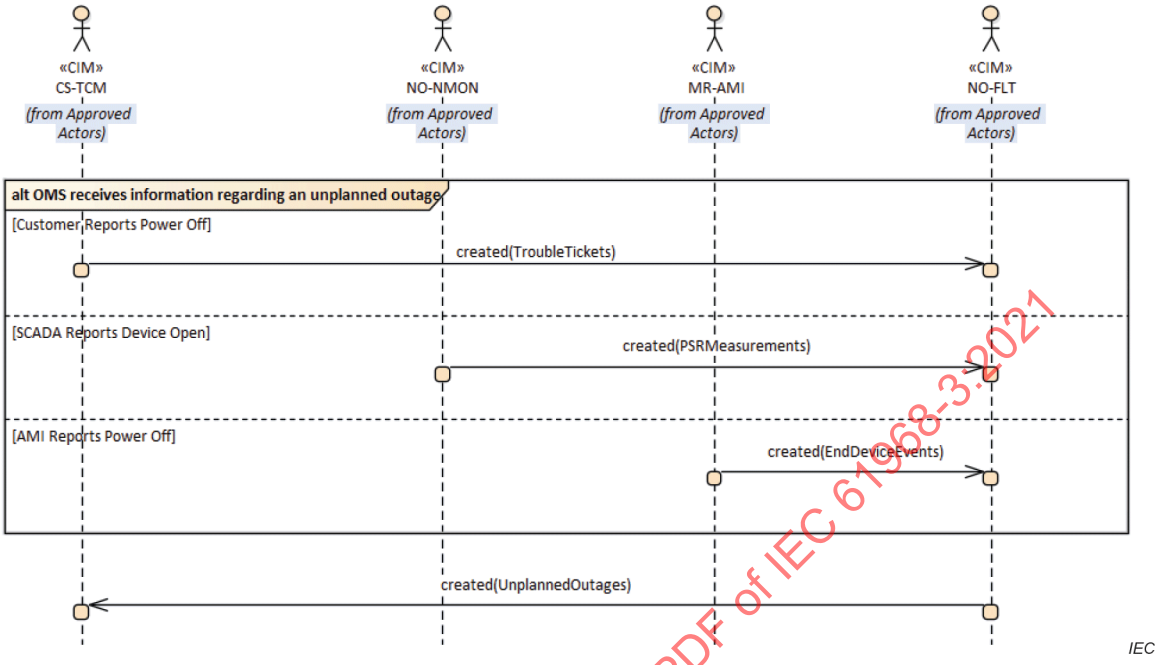


Figure A.6 – UnplannedOutage creation

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A.7.5.3 Steps – Unplanned outage changes status

Scenario							
Scenario name:		OMS receives updated information regarding an unplanned outage					
Step No.	**Event**	**Name of process/Activity**	**Description of process/Activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
1 alt 1	Crew status changes	Field Crew Work	Crew is assigned, goes enroute, arrives or completes.	changed	NO-FLT (OMS)	CS-TCM (CIS)	UnplannedOutages
1 alt 2	Estimated restoration time change	Field Crew Work		changed	NO-FLT (OMS)	CS-TCM (CIS)	UnplannedOutages
1 alt 3	Outage cause added/changed	Field Crew Work		changed	NO-FLT (OMS)	CS-TCM (CIS)	UnplannedOutages
1 alt 4	Switching operation that changes the customers (usage points) affected	Outage Analysis		changed	NO-FLT (OMS)	CS-TCM (CIS)	UnplannedOutages
1 alt 5a	Outages (outage A and outage B) being combined; original outages closed and new outage (outage C) created	Outage Analysis		changed (outage A) changed (outage B) created (outage C)	NO-FLT (OMS) NO-FLT (OMS) NO-FLT (OMS)	CS-TCM (CIS) CS-TCM (CIS) CS-TCM (CIS)	UnplannedOutages UnplannedOutages UnplannedOutages
1 alt 5b	Outages being combined (outage A and outage B); one of the original outages (outage A) closed and merged into remaining original outage (outage B).	Outage Analysis		changed (outage A) changed (outage B)	NO-FLT (OMS) NO-FLT (OMS)	CS-TCM (CIS) CS-TCM (CIS)	UnplannedOutages UnplannedOutages
1 alt 6a	Outage (outage A) being split into two outages – one existing and one new (outage A, outage B)	Outage Analysis		changed (outage A) created (outage B)	NO-FLT (OMS) NO-FLT (OMS)	CS-TCM (CIS) CS-TCM (CIS)	UnplannedOutages UnplannedOutages
1 alt 6b	Outage (outage A) being split into two outages – closing the existing outage (outage A) and creating two new outages (outage B, outage C)	Outage Analysis		changed (outage A) created (outage B) created (outage C)	NO-FLT (OMS) NO-FLT (OMS) NO-FLT (OMS)	CS-TCM (CIS) CS-TCM (CIS) CS-TCM (CIS)	UnplannedOutages UnplannedOutages UnplannedOutages

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Figure A.7 shows various updates during the lifecycle of an unplanned outage.

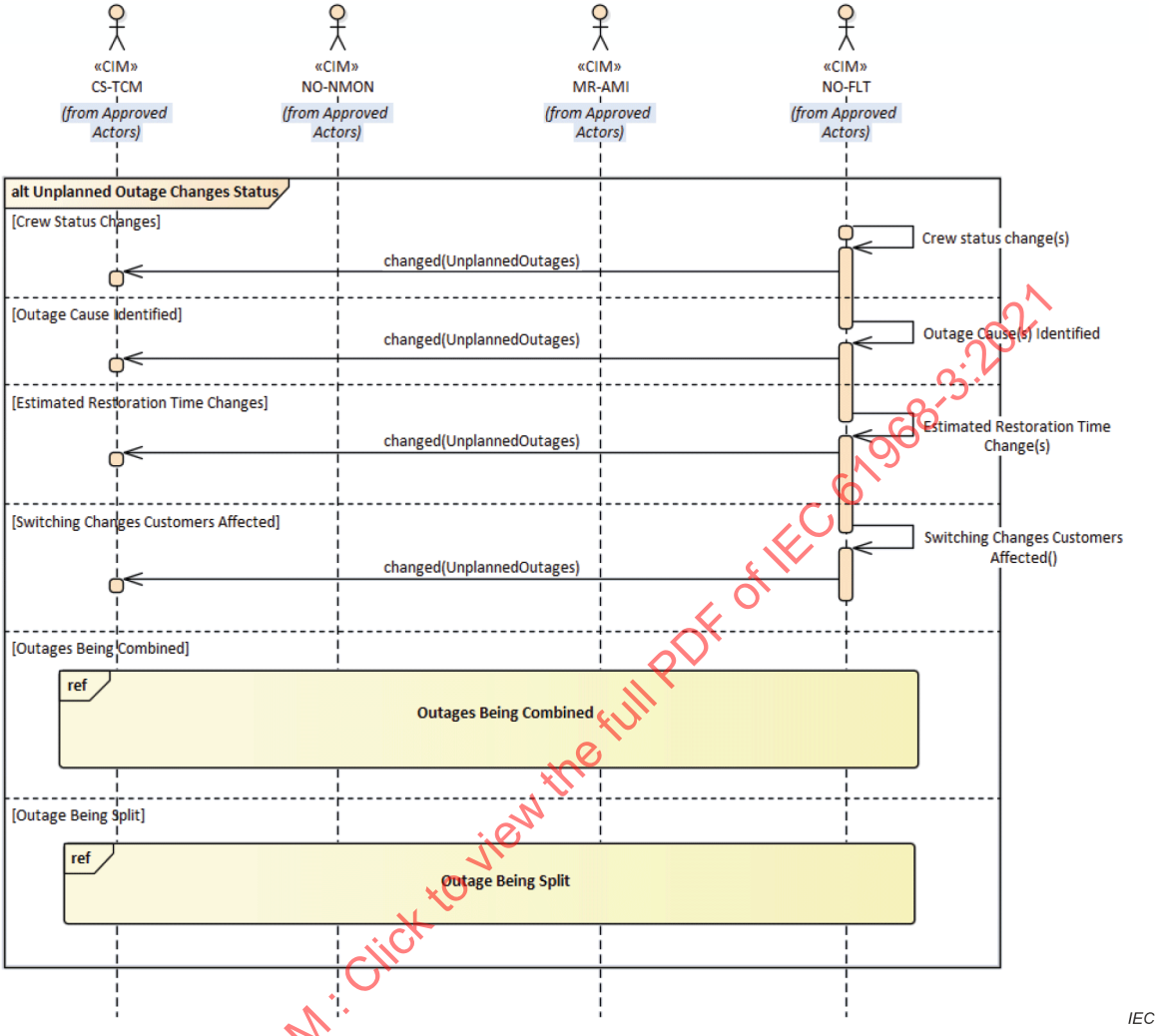


Figure A.7 – UnplannedOutages update

Figure A.8 shows two outages being combined during outage prediction. This typically happens when more information arrives that indicates that where there were two predicted outages, there is a common root cause upstream of the original outages. The two outages are therefore combined into a single outage upstream.

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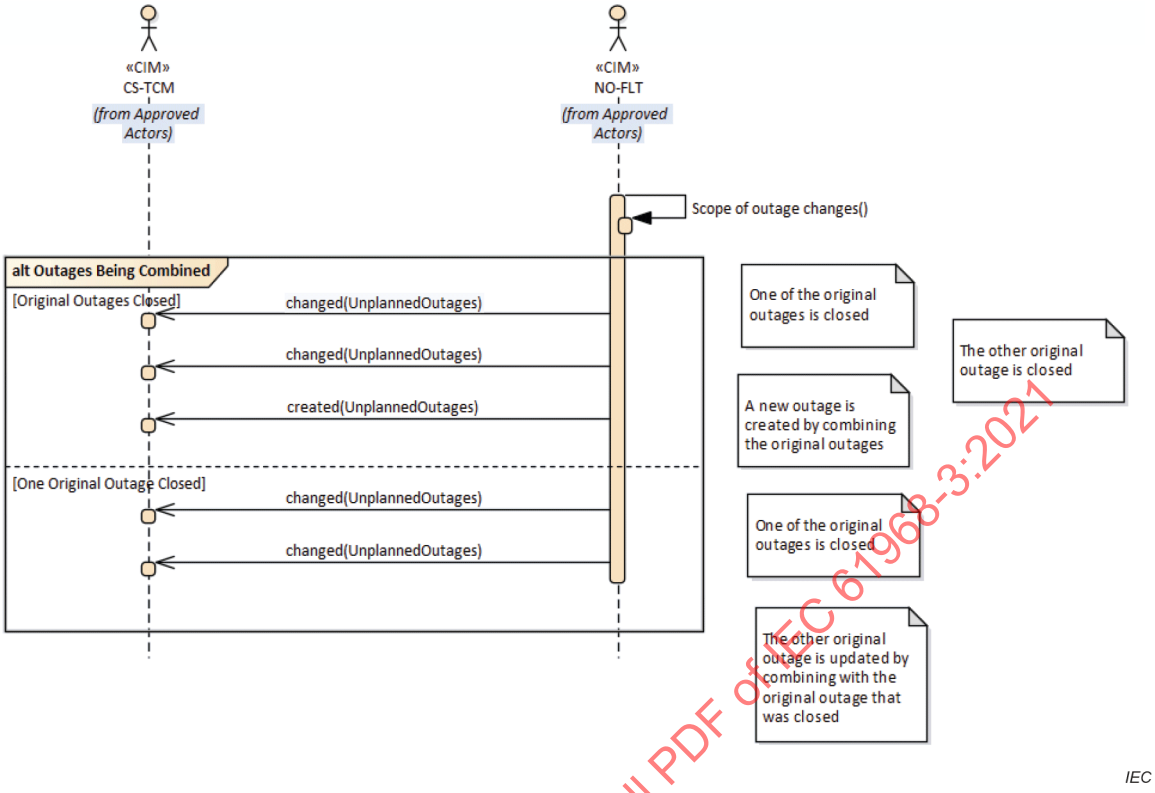


Figure A.8 – Outages being combined

Figure A.9 shows an outage being split into two outages during outage prediction. This can happen, for example, when a new confirmed outage is created downstream of a larger predicted outage and now the patten of TroubleTickets indicate that there should be two predicted outages instead of one.

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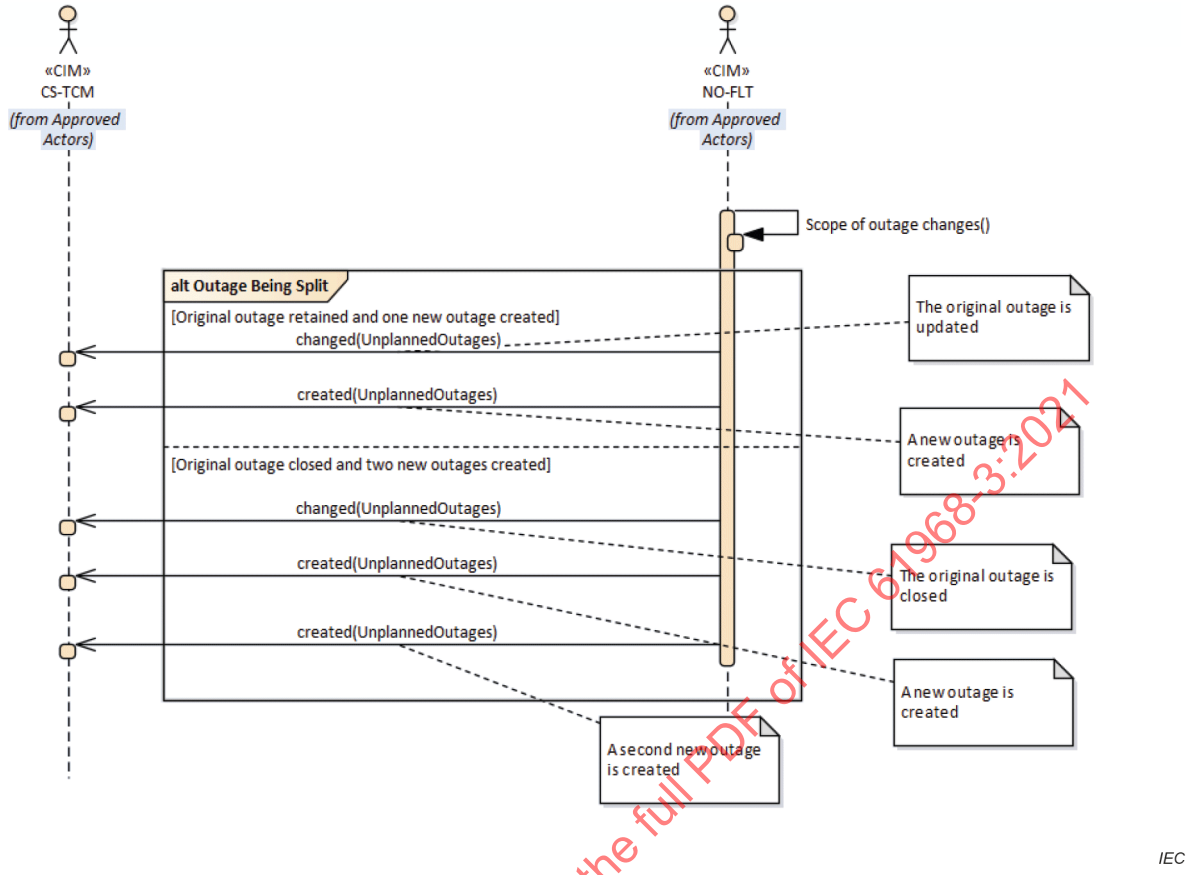


Figure A.9 – Outage being split

A.7.5.4 Steps – Unplanned outage is restored

Scenario							
Scenario name:	OMS restores an unplanned outage						
Step No.	**Event**	**Name of process/Activity**	**Description of process/ Activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
1	Outage is partially restored	Outage Analysis	Service to one or more customers who are part of an unplanned outage is restored	changed	NO-FLT (OMS)	CS-TCM (CIS)	UnplannedOutages
2	Outage is fully restored	Outage Analysis	Service to all customers who are part of an unplanned outage is restored	changed	NO-FLT (OMS)	CS-TCM (CIS)	UnplannedOutages

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Figure A.10 shows the restoration of an unplanned outage.

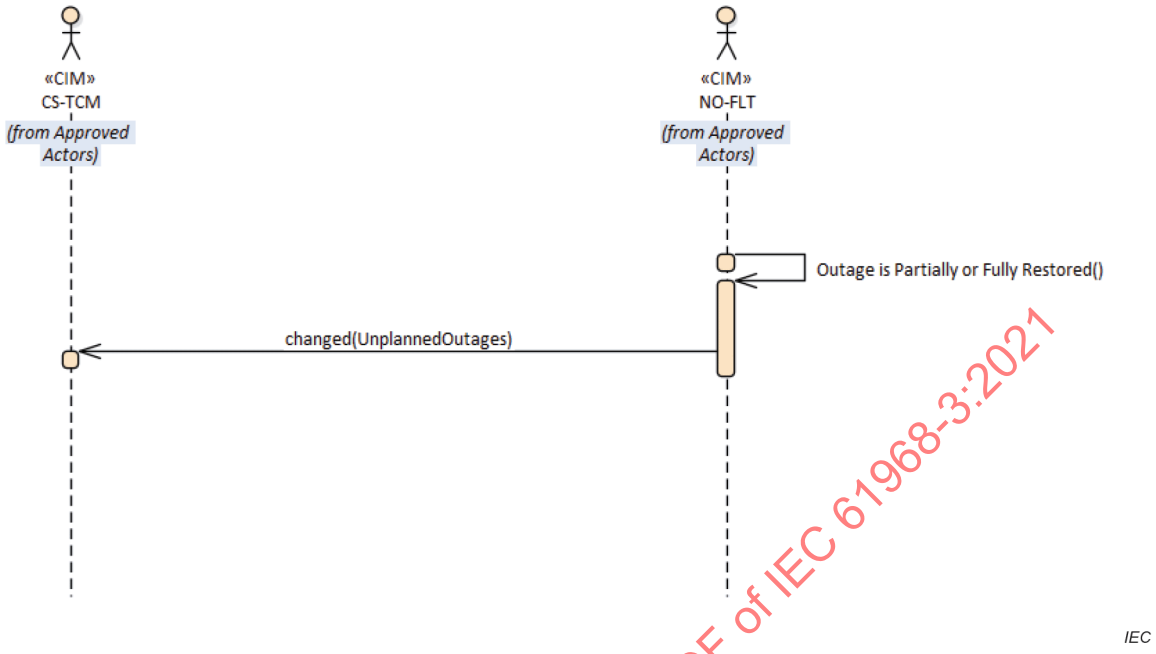


Figure A.10 – UnplannedOutage restore

A.7.6 Information exchanged

Information exchanged		
Name of information exchanged	**Description of information exchanged**	**Requirements to information data R-ID**
EndDeviceEvents		
PSRMeasurements		
UnplannedOutages		

A.7.7 Common terms and definitions

Common terms and definitions	
Term	**Definition**

A.8 Car hits pole but there is no outage

A.8.1 Description of the use case

A.8.1.1 Name of use case

Use case identification		
ID	**Domain(s)**	
		Car hits pole but there is no outage; resulting interaction between customer service and network operations.

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A.8.1.2 Version management

Version management						
Version management changes / Version	**Date (dd/mm/yyyy)**	**Name author(s) or committee**	**Domain expert**	**Area of expertise / Domain / Role**	**Title**	**Approval status draft, for comments, for voting, final**
1	24/04/2019	WG14 Part Teams Focus Community		Customer Information Systems, Outage Management		Draft

A.8.1.3 Scope and objectives of use case

Scope and objectives of use case	
Related business case	Car hits pole and there is an outage.
Scope	This use case includes passer-by interaction with a customer service representative after a car hits a utility pole but there is no outage, interaction between OMS and CIS, and interaction between OMS and field crew dispatch.

A.8.1.4 Narrative of use case

Narrative of use case
Short description – max 3 sentences
A vehicle hits a utility pole and a passer-by calls the utility to report that a pole has been hit. The information about the problem is sent to the OMS; no other information is received that there is an outage. The OMS tracks status changes and reports changes to the CIS, including repair of the pole.
Complete description
A vehicle hits a utility pole and a passer-by calls the utility to report that a pole has been hit. The call taker collects information about the problem and records it in the CIS, which sends the trouble call information to the OMS. The information in the Trouble Ticket is used to create an Incident, which is dispatched to a field crew to investigate. Changes in the lifecycle of the incident are reported to the CIS and the incident status is changed to field complete after the field work has been completed.

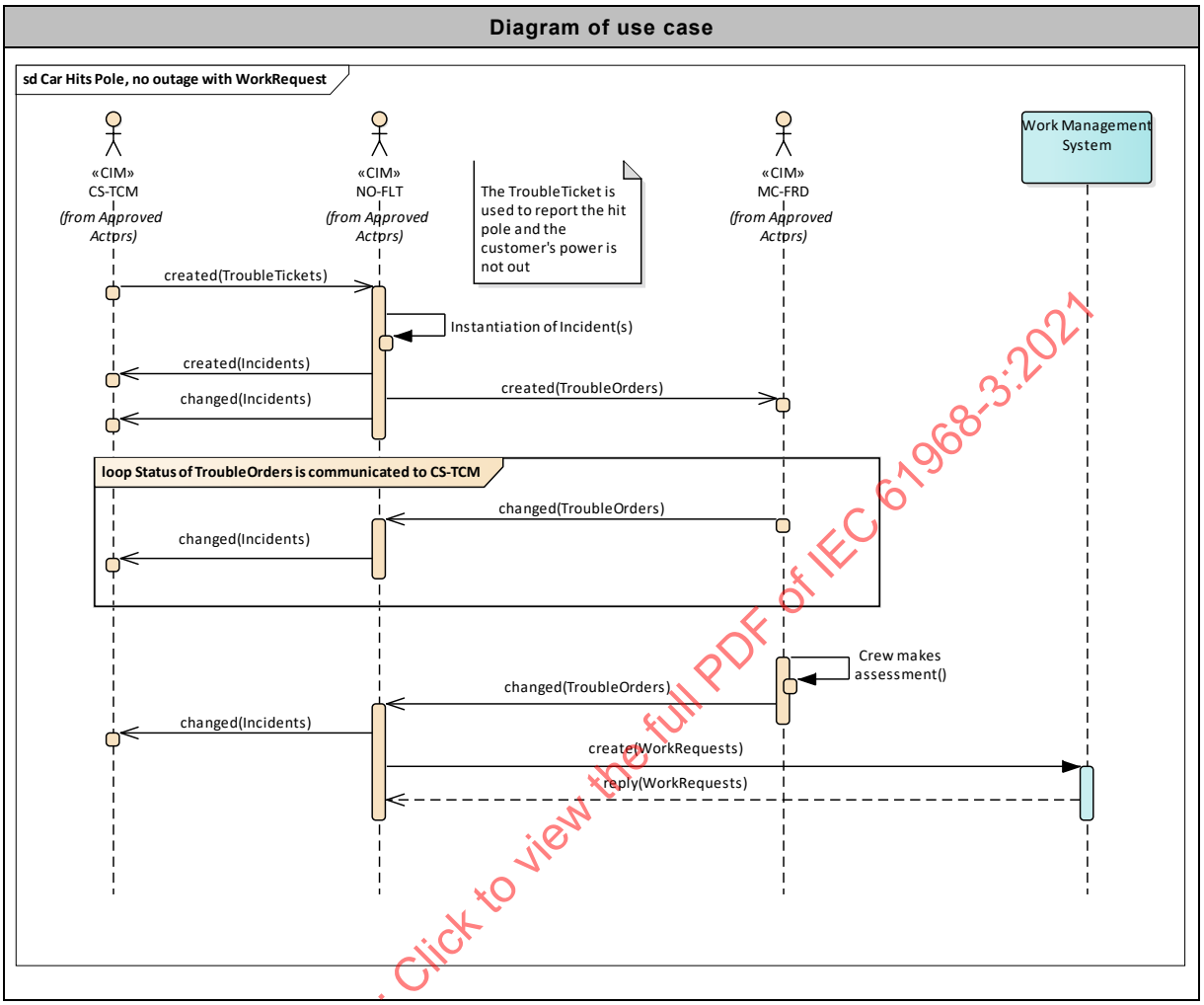
A.8.1.5 General remarks

General remarks

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A.8.2 Use case diagrams

The activity diagram shows the main activities from the main actors and the key deliverables.



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A.8.3 Technical details

A.8.3.1 Actors: People, systems, applications, databases, the power system, and other stakeholders

This use case is written using the following actors:

Actors			
Grouping (community)		**Group Description**	
Network Operations (NO)		IEC 61968-1 Interface Reference Model (IRM) Business Function	
Actor name **see actor list**	**Actor type** **see actor list**	**Actor description** **see actor list**	**Further information specific to this use case**
Passer-by	Person	A person who is a member of the public and is not acting in the role of a utility customer.	
Customer Service Representative (CSR)	Person		
Trouble Call Management (TCM)	System		
Outage Management System (OMS)	System	An Outage Management System (OMS) is a computer system that keeps track of customers who are out of power and maintains electric system reliability indices.	
Maintenance and Construction Field Resource Dispatch	System		
Work Management System	System		

A.8.3.2 Preconditions, assumptions, post condition, events

Use case conditions			
Actor/System/Information/Contract	**Triggering event**	**Pre-conditions**	**Assumption**
	A vehicle hits a utility pole	The pole was intact and there were no ongoing unplanned outages on the circuit that is associated with the pole.	

A.8.3.3 References / issues

References						
No.	**References type**	**Reference**	**Status**	**Impact on use case**	**Originator / Organisation**	**Link**
	Standards	IEC 61968-3, IEC 61968-6, IEC 61968-8		Use case is being used to validate these three standards.		

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A.8.3.4 Further Information to the use case for classification / mapping

Classification information
Relation to other use cases
Level of depth
System level use case
Prioritisation
Generic, regional or national relation
View
Further keywords for classification

A.8.4 Step by step analysis of use case

A.8.4.1 Preconditions

Scenario Conditions					
No.	**Scenario name**	**Primary actor**	**Triggering event**	**Pre-condition**	**Post-condition**
4.1	Passer-by calls to report that a car has hit a pole	Customer Service Representative	Car hits a pole	Pole is intact	The pole is repaired.

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A.8.4.2 Steps – Normal

Scenario							
Scenario name:		Passer-by calls to report that a vehicle has hit a pole and there is no outage					
Step No.	**Event**	**Name of process/activity**	**Description of Process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
1	A car hits a pole	N/A	Someone calls to say that a car hit pole (at this time it is not known whether anyone has lost power)	N/A	Customer	Customer Service Representative (CSR)	Verbal – identification of service affected, outage symptoms
2	CSR enters call information	N/A	CSR enters information regarding the time, nature of the problem and the location of the incident. CIS creates a TroubleTicket that is not associated with any electric service.	create	CSR	Customer Information System (CS-TCM)	TroubleTickets
3	CIS sends TroubleTicket to OMS	N/A		created	CIS (CS-TCM)	Outage Management System (NO-FLT)	TroubleTickets
4	OMS operator analyzes TroubleTicket	Outage Analysis	The OMS operator notices the TroubleTicket and creates an Incident and associates it with the TroubleTicket	create			Incidents
5			Time passes (e.g., several minutes) and no additional TroubleTickets, PSRMeasurements or EndDeviceEvents are received.				
6	OMS sends incident to CIS	Outage Analysis	The Incident with its association to TroubleTicket is sent to CIS (CS-TCM)	created	OMS (NO-FLT)	CIS (CS-TCM)	Incidents
7			A TroubleOrder is created within NO-FLT	create			TroubleOrders
8	The OMS operator dispatches the Incident to a field crew	Crew Dispatch	This results in OMS (NO-FLT) sending the TroubleOrder with the Incident information to a field crew (MC-FRD), either directly or through another system such as a dispatching system. The status of the TroubleOrder is set to dispatched	created	NO-FLT	MC-FRD	TroubleOrders
9	OMS sends update to CIS	Outage Analysis	A changed (Incidents) is sent to CIS (CS-TCM) with a status of dispatched, to ensure that CIS is aware of the new status of the Incident.	changed	NO-FLT	CS-TCM	Incidents

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Scenario							
Scenario name:		Passer-by calls to report that a vehicle has hit a pole and there is no outage					
Step No.	**Event**	**Name of process/activity**	**Description of Process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
10	Field crew goes enroute		The field crew (MC-FRD) receives the TroubleOrder and reports that they are enroute to investigate. This causes the status of the TroubleOrder to be changed to enroute.	changed	MC-FRD	NO-FLT	TroubleOrders
11	OMS sends update to CIS	Outage Analysis	A changed (Incidents) is sent to CIS (CS-TCM) with a status of enroute	changed	NO-FLT	CS-TCM	Incidents
12	Field crew arrives		The field crew (MC-FRD) reports that they have arrived at the site of the downed pole. This causes the status of the TroubleOrder to be changed to arrived.	changed	MC-FRD	NO-FLT	TroubleOrders
13	OMS sends update to CIS	Outage Analysis	A changed (Incidents) is sent to CIS (CS-TCM) with a status of arrived.	changed	NO-FLT	CS-TCM	Incidents
14	Field crew makes an assessment.		The field crew (MC-FRD) reports that they have determined what work needs to be done This causes the status of the TroubleOrder to be changed to field complete.	changed	MC-FRD	NO-FLT	TroubleOrders
15	OMS sends update to CIS	Outage Analysis	A changed (Incidents) is sent to CIS (CS-TCM) with a status of field complete.	changed	NO-FLT	CS-TCM	Incidents
16	OMS creates WorkRequest	Outage Analysis	A request to create a WorkRequest is sent to Work Management to perform the repairs. Either the WorkRequest number (mRID or name) is included in the request or it is assumed it will be returned in the reply.	create	NO-FLT	Work Management	WorkRequests
17	Work Management creates a WorkRequest	Work Management	A WorkRequest is created and the reply includes the mRID or name of the WorkRequest, if it was not included in the original WorkRequest.	created	Work Management	NO-FLT	WorkRequests

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A.8.5 Information exchanged

Information exchanged		
Name of information exchanged	**Description of information exchanged**	**Requirements to information data R-ID**
TroubleTickets	Location of the problem, nature of the problem, whether there is a hazard (e.g. wire down).	
Incidents	Location, related field crew status information, incident status, hazard information.	

A.8.6 Common terms and definitions

Common terms and definitions	
Term	**Definition**

A.9 Car hits pole and there is an outage

A.9.1 Description of the use case

A.9.1.1 Name of use case

Use case identification		
ID	**Domain(s)**	
		Car hits pole and there is an outage; resulting interaction between customer service and network operations.

A.9.1.2 Version management

Version management						
Version management changes / Version	**Date (dd/mm/yyyy)**	**Name author(s) or committee**	**Domain expert**	**Area of expertise / Domain / Role**	**Title**	**Approval status draft, for comments, for voting, final**
1	24/04/2019	WG14 Part Teams Focus Community		Customer Information Systems, Outage Management		Draft

A.9.1.3 Scope and objectives of use case

Scope and objectives of use case	
Related business case	Car hits pole and there is no outage.
Scope	This use case includes passer-by interaction with a customer service representative after a car hits a utility pole and there is an outage, interaction between OMS and CIS, and interaction between OMS and field crew dispatch.

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A.9.1.4 Narrative of use case

Narrative of use case
Short description – max 3 sentences
A vehicle hits a utility pole and a passer-by calls the utility to report that a pole has been hit. The information about the problem is sent to the OMS; subsequently other information is received that there is an outage. The OMS tracks status changes and reports changes to the CIS including repair of the pole and restoration of power.
Complete description
A vehicle hits a utility pole and a passer-by calls the utility to report that a pole has been hit. The call taker collects information about the problem and records it in the CIS, which sends the trouble call information to the OMS. The information in the TroubleTicket is used to create an Incident, which is dispatched to a field crew to investigate. Subsequently information is received from any combination of customer calls, AMI calls and SCADA status values, indicating that there is also an unplanned outage that resulted from the vehicle hit pole. The incident is associated with the unplanned outage and the association is reported to CIS. Changes in the lifecycle of the unplanned outage are reported to the CIS and the unplanned outage status is changed to field complete after the field work has been completed to repair the pole and restore power. This use case is sufficiently different from the car hits pole but there is no outage to warrant it being a use case in its own right. In the previous use case, the interactions between all parties (CIS, OMS and field crew) were done at the Incident level, while in this use case, the interactions are done at the UnplannedOutage level.

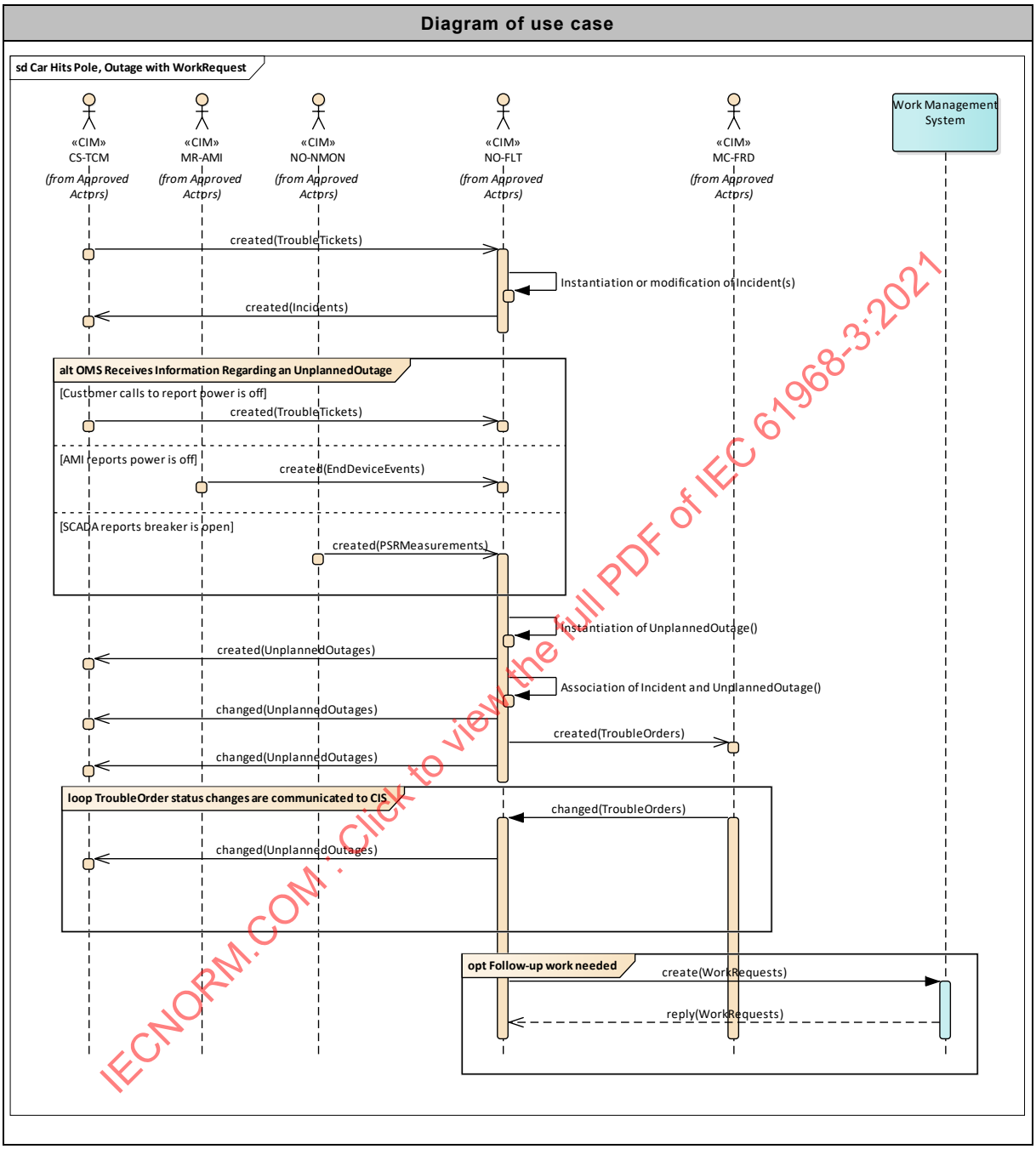
A.9.1.5 General remarks

General remarks

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A.9.2 Use case diagrams

The activity diagram shows the main activities from the main actors and the key deliverables.



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A.9.3 Technical details

A.9.3.1 Actors: People, systems, applications, databases, the power system, and other stakeholders

This use case is written using the following actors:

Actors			
Grouping (community)		**Group description**	
Network Operations (NO)		IEC 61968-1 Interface Reference Model (IRM) Business Function	
Actor name **see actor list**	**Actor type** **see actor list**	**Actor description** **see actor list**	**Further information specific to this use case**
Passer-by	Person	A person who is a member of the public and is not acting in the role of a utility customer.	
Customer Service Representative (CSR)	Person		
Trouble Call Management (TCM)	System		
Outage Management System (OMS)	System	An Outage Management System (OMS) is a computer system that keeps track of customers who are out of power and maintains electric system reliability indices.	
Maintenance and Construction Field Resource Dispatch	System		

A.9.3.2 Preconditions, assumptions, post condition, events

Use case conditions			
Actor/System/Information/Contract	**Triggering event**	**Pre-conditions**	**Assumption**
	A vehicle hits a utility pole	The pole was intact and there were no ongoing unplanned outages on the circuit that is associated with the pole.	

A.9.3.3 References / issues

References						
No.	**References type**	**Reference**	**Status**	**Impact on use case**	**Originator / Organisation**	**Link**
	Standards	IEC 61968-3, IEC 61968-6, IEC 61968-8		Use case is being used to validate these three standards.		

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A.9.4 Further Information to the use case for classification / mapping

Classification information
Relation to other use cases
Level of depth
System level use case
Prioritisation
Generic, regional or national relation
View
Further keywords for classification

A.9.5 Step by step analysis of use case

A.9.5.1 Preconditions

Scenario conditions					
No.	**Scenario name**	**Primary actor**	**Triggering event**	**Pre-condition**	**Post-condition**
4.1	Passer-by calls to report that a car has hit a pole	Customer Service Representative	Car hits a pole	Pole is intact and there is no outage.	The pole is repaired and power is restored.

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A.9.5.2 Steps – Normal

Scenario							
Scenario name:		Passer-by calls to report that a vehicle has hit a pole and there is and outage					
Step No.	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
1	A car hits a pole	N/A	Someone calls to say that a car hit pole (at this time it is not known whether anyone has lost power)	N/A	Customer	Customer Service Representative (CSR)	Verbal – identification of service affected, outage symptoms
2	CSR enters call information	Trouble Call Entry	CSR enters information regarding the time, nature of the problem and the location of the incident. CIS creates a TroubleTicket that is not associated with any electric service.	create	CSR	Customer Information System (CS-TCM)	TroubleTickets
3	CIS sends TroubleTicket to OMS			created	CIS (CS-TCM)	Outage Management System (NO-FLT)	TroubleTickets
4	OMS operator analyzes TroubleTicket	Outage Analysis	The OMS operator notices the TroubleTicket and creates an Incident and associates it with the TroubleTicket	create			Incidents
5	OMS sends incident to CIS	Outage Analysis	The Incident with its association to TroubleTicket is sent to CIS (CS-TCM)	created	OMS (NO-FLT)	CIS (CS-TCM)	Incidents
6 alt 1	Customer calls to report power is off	Trouble Call Entry		created			TroubleTickets
6 alt 2	AMI reports power is off	AMI		created			EndDeviceEvents
6 alt 3	SCADA reports breaker is open	SCADA		created			PSRMeasurements
7	The information is analysed by OMS	Outage Analysis	OMS predicts or confirms an UnplannedOutage at a location based on the information received. OMS associates any TroubleTickets with the UnplannedOutage	created	NO-FLT	CS-TCM	UnplannedOutages

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Scenario							
Scenario name:		Passer-by calls to report that a vehicle has hit a pole and there is and outage					
Step No.	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
8	The UnplannedOutage and car hit pole TroubleTicket are analysed.	Outage Analysis	The OMS or the OMS operator determines that the UnplannedOutage and the car hit pole TroubleTicket are probably related to the same root cause. The UnplannedOutage is updated to reference the Incident. The Incident also includes the car hit pole TroubleTicket.	Changed	NO-FLT	CS-TCM	UnplannedOutages
9			A TroubleOrder is created within NO-FLT	create			TroubleOrders
10	The OMS operator dispatches the TroubleOrder to a field crew	Crew Dispatch	The OMS operator dispatches the TroubleOrder to a field crew (MC-FRD), with both the UnplannedOutage and the Incident information. The TroubleOrder is sent to a field crew, either directly or through another system such as a dispatching system. The status of the TroubleOrder is set to dispatched	created	NO-FLT	MC-FRD	TroubleOrders
11	OMS sends update to CIS	Outage Analysis	A changed (UnplannedOutages) is sent to CIS (CS-TCM) with a status of dispatched	changed	NO-FLT	CS-TCM	UnplannedOutages
12	Field crew goes enroute	Field Crew Work	The field crew (MC-FRD) receives the TroubleOrder and reports that they are enroute to investigate. This causes the status of the TroubleOrder to be changed to enroute.	changed	MC-FRD	NO-FLT	TroubleOrders
13	OMS sends update to CIS	Outage Analysis	A changed (UnplannedOutages) is sent to CIS (CS-TCM) with a status of enroute	changed	NO-FLT	CS-TCM	UnplannedOutages
14	Field crew arrives	Field Crew Work	The field crew (MC-FRD) reports that they have arrived at the site of the outage or downed pole. This causes the status of the TroubleOrder to be changed to arrived.	changed	MC-FRD	NO-FLT	TroubleOrders
15	OMS sends update to CIS	Outage Analysis	A changed (UnplannedOutages) is sent to CIS (CS-TCM) with a status of arrived.	changed	NO-FLT	CS-TCM	UnplannedOutages

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Scenario							
Scenario name:		Passer-by calls to report that a vehicle has hit a pole and there is and outage					
Step No.	**Event**	**Name of process/activity**	**Description of process/activity**	**Service**	**Information producer (actor)**	**Information receiver (actor)**	**Information exchanged**
16	Field crew completes work	Field Crew Work	The field crew (MC-FRD) reports that they have completed repairs. This causes the status of the TroubleOrder to be changed to field complete.	changed	MC-FRD	NO-FLT	TroubleOrders
17	OMS sends update to CIS	Outage Analysis	A changed (UnplannedOutages) is sent to CIS (CS-TCM) with a status of field complete.	changed	NO-FLT	CS-TCM	UnplannedOutages
18 (optional)	OMS sends request for follow-up work to Work Management	Outage Analysis	If the field crew made temporary repairs to get the power back on, a create (WorkRequests) is sent to Work Management to have permanent repairs performed. Either the WorkRequest number (mRID or name) is included in the request or it is assumed it will be returned in the reply.	create	NO-FLT	Work Management	WorkRequests
19 (optional)	Work Management creates a WorkRequest	Work Management	Work Management creates a Work Request.	created	Work Management	NO-FLT	WorkRequests

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A.9.6 Information exchanged

Information exchanged		
Name of information exchanged	**Description of information exchanged**	**Requirements to information data R-ID**
TroubleTicket	Location of the problem, nature of the problem, whether there is a hazard (e.g. wire down).	
Incident	Location, related field crew status information, incident status, hazard information.	

A.9.7 Common terms and definitions

Common terms and definitions	
Term	**Definition**

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Annex B
(normative)

Payload fragments

B.1 General

The tables in this clause are the normative data requirements for the Network Operations related profiles.

Complete data definitions can be found in IEC 61968-11, *Application integration at electric utilities – System interfaces for distribution management – Part 11: Common information model (CIM) extensions for distribution*.

The profiles in this clause may have many types of serialization such as XSD, RDF, XML, JSON, or protobuf. For SOAP or JMS based integration guidance the reader is referred to IEC 61968-100:2013.

Many classes inherit from identifiedObject shown in Table B.1. The mRID attribute is defined as a string, but leading practice is that mRID should be constrained to a globally unique ID (GUID).

Table B.1 – IdentifiedObject

Core: IdentifiedObject			
Attribute	**Type**	**Cardinality**	**Comment**
aliasName	string	[0..1]	Not used in Part 3 profiles
description	string	[0..1]	
mRID	string	[0..1]	GUID
name	string	[0..1]	Not used in Part 3 profiles

In the following tables, profiles are detailed with a combination of attributes and super classes. A super class is an attribute which is itself, a class, e.g. Status. These tables document parts of profiles and are hence referred to as payload fragments. The profiles that use these fragments are documented in Subclause 5.3 and subsequent subclauses.

B.2 Accumulator fragment

Accumulator represents an accumulated (counted) Measurement, e.g. an energy value.

The attributes of **Accumulator** that are used in IEC 61968-3 profiles are shown in Table B.2.

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Table B.2 – Accumulator payload fragment

Meas: Accumulator				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
maxValue	Integer	[0..1]		Normal value range maximum for any of the MeasurementValue.values. Used for scaling, e.g. in bar graphs or of telemetered raw values.
measurementType	String	[0..1]		Specifies the type of measurement. For example, this specifies if the measurement represents an indoor temperature, outdoor temperature, bus voltage, line flow, etc. When the measurementType is set to "Specialization", the type of Measurement is defined in more detail by the specialized class which inherits from Measurement.
phases	PhaseCode	[0..1]	See C.12	Indicates to which phases the measurement applies and avoids the need to use 'measurementType' to also encode phase information (which would explode the types). The phase information in Measurement, along with 'measurementType' and 'phases' uniquely defines a Measurement for a device, based on normal network phase. Their meaning will not change when the computed energizing phasing is changed due to jumpers or other reasons. If the attribute is missing three phases (ABC) shall be assumed.
unitMultiplier	UnitMultiplier	[0..1]		The unit multiplier of the measured quantity.
unitSymbol	UnitSymbol	[0..1]		The unit of measure of the measured quantity.
AccumulatorValues	AccumulatorValue	[0..*]	See B.3	
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	

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B.3 **AccumulatorValue** Fragment

AccumulatorValue represents an accumulated (counted) **MeasurementValue**.

The attributes of **AccumulatorValue** that are used in IEC 61968-3 profiles are shown in Table B.3.

Table B.3 – AccumulatorValue payload fragment

Meas: AccumulatorValue				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of AccumulatorValue.
description	String	[0..1]		Free-form description of AccumulatorValue.
Names	Name	[0..*]	See B.56	Human-readable names for AccumulatorValue.
sensorAccuracy	PerCent	[0..1]		The limit, expressed as a percentage of the sensor maximum, that errors will not exceed when the sensor is used under reference conditions.
timestamp	DateTime	[0..1]		The time when the value was last updated
value	Integer	[0..1]		The value to supervise. The value is positive.
MeasurementValueQuality	MeasurementValueQuality	[0..1]	See B.53	Measurement quality flags. Bits 0 to -10 are defined for substation automation in draft IEC 61850-7-3. Bits 11 to 15 are reserved for future expansion by that document. Bits 16 to 31 are reserved for EMS applications.
MeasurementValueSource	MeasurementValueSource	[0..1]	See B.55	MeasurementValueSource describes the alternative sources updating a MeasurementValue. User conventions for how to use the MeasurementValueSource attributes are described in the introduction to IEC 61970-301.

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B.4 **ACLineSegment** fragment

An **ACLineSegment** is a wire or combination of wires, with consistent electrical characteristics, building a single electrical system, used to carry alternating current between points in the power system.

Figure B.1 shows the payload fragment for **ACLineSegment**.

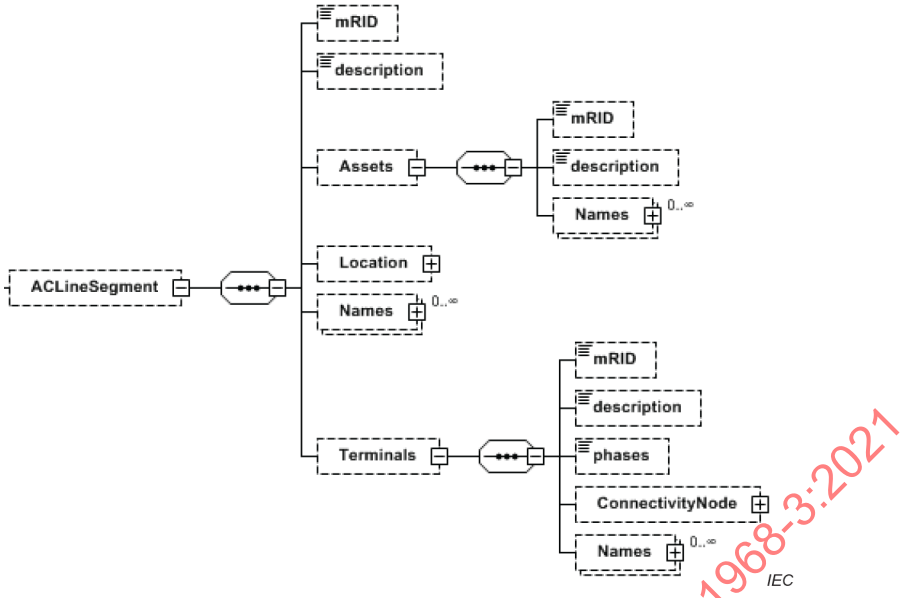


Figure B.1 – ACLineSegment payload fragment

The attributes of **ACLineSegment** that are used in IEC 61968-3 profiles are shown in Table B.4.

Table B.4 – ACLineSegment payload fragment

Wires: ACLineSegment					
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**	**Used by Profiles**
mRID	String	[0..1]	GUID	mRID of ACLineSegment.	UnplannedOutages SwitchingPlans SwitchingActions SwitchingEvents
description	String	[0..1]		Free-form description of ACLineSegment.	UnplannedOutages SwitchingPlans SwitchingActions SwitchingEvents
Names	Name	[0..*]	See B.56	Human-readable names for ACLineSegment.	UnplannedOutages SwitchingPlans SwitchingActions SwitchingEvents
Assets	Asset	[0..1]	See B.9	mRID, description and Names only. Asset associated with this ACLineSegment, such as a pole or a vault.	UnplannedOutages SwitchingPlans SwitchingActions SwitchingEvents
Location	Location	[0..1]	See B.52	Location of the ACLineSegment	UnplannedOutages SwitchingPlans SwitchingActions SwitchingEvents

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Wires: ACLineSegment					
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**	**Used by Profiles**
Terminals	Terminal	[0..1]	See B.90	For IEC 61968-3 profiles, although there are two terminals associated with an ACLineSegment, only one is specified because the terminal is used to determine where to connect temporary equipment to the network. If temporary equipment needs to be connected to two ends of the same ACLineSegment then the same ACLineSeqment would be repeated, once with terminal1 and once with terminal2	SwitchingPlans SwitchingActions SwitchingEvents

B.5 **ActivityRecord** fragment

An **ActivityRecord** records activity for an entity at a point in time; activity may be for an event that has already occurred or for a planned activity. The attributes of **ActivityRecord** that are used in IEC 61968-3 profiles are shown in Table B.5.

Table B.5 – ActivityRecord payload fragment

Common: ActivityRecord				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of ActivityRecord.
description	String	[0..1]		Free-form description of ActivityRecord.
Names	Name	[0..*]	See B.56	Human-readable names for ActivityRecord.
createdDateTime	DateTime			Date and time this activity record has been created (different from the 'status.dateTime', which is the time of a status change of the associated object, if applicable).
reason	String	[0..1]		Reason for event resulting in this activity record, typically supplied when user initiated.
severity	String	[0..1]		Severity level of event resulting in this activity record.
type	String	[0..1]		Type of event resulting in this activity record.
status	Status	[0..1]	See B.79	Information on consequence of event resulting in this activity record.

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B.6 **Analog** fragment

Analog represents an analog **Measurement**.

The attributes of **Analog** that are used in IEC 61968-3 profiles are shown in Table B.6.

Table B.6 – Analog payload fragment

Meas: Analog				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
maxValue	Float	[0..1]		Normal value range maximum for any of the MeasurementValue.values. Used for scaling, e.g. in bar graphs or of telemetered raw values.
measurementType	String	[0..1]		Specifies the type of measurement. For example, this specifies if the measurement represents an indoor temperature, outdoor temperature, bus voltage, line flow, etc. When the measurementType is set to "Specialization", the type of Measurement is defined in more detail by the specialized class which inherits from Measurement.
minValue	Float	[0..1]		Normal value range minimum for any of the MeasurementValue.values. Used for scaling, e.g. in bar graphs or of telemetered raw values.
normalValue	Float	[0..1]		Normal measurement value, e.g., used for percentage calculations.
phases	PhaseCode	[0..1]	See C.12	Indicates to which phases the measurement applies and avoids the need to use 'measurementType' to also encode phase information (which would explode the types). The phase information in Measurement, along with 'measurementType' and 'phases' uniquely defines a Measurement for a device, based on normal network phase. Their meaning will not change when the computed energizing phasing is changed due to jumpers or other reasons. If the attribute is missing three phases (ABC) shall be assumed.
positiveFlowIn	Boolean	[0..1]		If true then this measurement is an active power, reactive power or current with the convention that a positive value measured at the Terminal means power is flowing into the related PowerSystemResource.
unitMultiplier	UnitMultiplier	[0..1]		The unit multiplier of the measured quantity.
unitSymbol	UnitSymbol	[0..1]		The unit of measure of the measured quantity.
AnalogValues	AnalogValue	[0..*]	See B.7	
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	

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B.7 **AnalogValue** fragment

AnalogValue represents an analog **MeasurementValue**.

The attributes of **AnalogValue** that are used in IEC 61968-3 profiles are shown in Table B.7.

Table B.7 – AnalogValue payload fragment

Meas: AnalogValue				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of AnalogValue.
description	String	[0..1]		Free-form description of AnalogValue.
Names	Name	[0..*]	See B.56	Human-readable names for AnalogValue.
sensorAccuracy	PerCent	[0..1]		The limit, expressed as a percentage of the sensor maximum, that errors will not exceed when the sensor is used under reference conditions.
timestamp	DateTime	[0..1]		The time when the value was last updated
value	Float	[0..1]		The value to supervise.
MeasurementValueQuality	MeasurementValueQuality	[0..1]	See B.53	Measurement quality flags. Bits 0-10 are defined for substation automation in draft IEC 61850 part 7-3. Bits 11-15 are reserved for future expansion by that document. Bits 16-31 are reserved for EMS applications.
MeasurementValueSource	MeasurementValueSource	[0..1]	See B.55	MeasurementValueSource describes the alternative sources updating a MeasurementValue. User conventions for how to use the MeasurementValueSource attributes are described in the introduction to IEC 61970-301.

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B.8 **Approver** fragment

An **Approver** is a person who reviews and approves a document such as a **SwitchingPlan**. Either the **person** class can be used to specify individual parts of the person's name, or the **Name** class can be used to specify the names in a different format, e.g. employee ID.

Figure B.2 shows the payload fragment for an **Approver**.

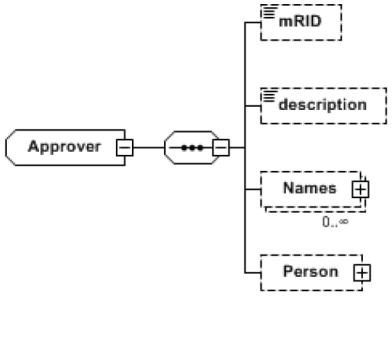


Figure B.2 – Approver payload fragment

The attributes of **Approver** that are used in IEC 61968-3 profiles are shown in Table B.8.

Table B.8 – Approver payload fragment

Common: Approver				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of Approver.
description	String	[0..1]		Free-form description of Approver.
Names	Name	[0..*]	See B.56	Human-readable names for Approver.
Person	Person	[0..1]	See B.65	General purpose information for name and other information to contact people.

B.9 Asset fragment

An **Asset** is a tangible resource of the utility, including power system equipment, various end devices, cabinets, buildings, etc. For electrical network equipment, the role of the asset is defined through PowerSystemResource and its subclasses, defined mainly in the Wires model (refer to IEC 61970-301 and model package IEC61970::Wires). Asset description places emphasis on the physical characteristics of the equipment fulfilling that role.

The attributes of **Asset** that are used in IEC 61968-3 profiles are shown in Table B.9.

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Table B.9 – Asset payload fragment

Assets: Asset					
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**	**Profiles used in**
mRID	String	[0..1]	GUID	mRID of asset.	All
description	String	[0..1]		Free-form text description of asset.	All
Names	Name	[0..*]	See B.56	Human-readable names for asset.	All
kind	AssetKind	[0..1]	See C.1.	Kind of asset. Used in description of asset components in asset instance templates.	TroubleOrders
serialNumber	String	[0..1]		Serial number of this asset.	TroubleOrders
type	String	[0..1]		Utility-specific classification of Asset and its subtypes, according to their corporate standards, practices, and existing IT systems (e.g., for management of assets, maintenance, work, outage, customers, etc.).	TroubleOrders UnplannedOutages
utcNumber	String	[0..1]		Uniquely tracked commodity (UTC) number. This could a bar code on an asset, for example.	TroubleOrders
AssetContainer	AssetContainer	[0..1]	See B.10	Asset that is an aggregation of other assets such as conductors, transformers, switchgear, land, fences, buildings, equipment, vehicles, etc. Can be used to identify the location of equipment when it is part of an aggregation, e.g. a vault number can be used to identify the location of a switch within that vault. Can also be used to identify equipment that is attached to a structure, such as a pole.	TroubleOrders
AssetInfo	AssetInfo	[0..1]	See B.11	AssetInfo can be used to convey information such as conductor type for a LineFault, for example.	TroubleOrders
Location	Location	[0..1]	See B.52	Location of the asset.	TroubleOrders
Ownerships	Ownership	[0..*]	See B.64	Used to determine if the asset is shared with other parties (e.g. cable TV or phone company) so that they can be notified if there is damage to the asset.	TroubleOrders
PowerSystemResources	PowerSystemResource	[0..*]	See B.68		Incidents TroubleOrders

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B.10 **AssetContainer** fragment

AssetContainer is an aggregation of other assets such as conductors, transformers, switchgear, land, fences, buildings, equipment, vehicles, etc. In the context of this document, can be used to identify the location of equipment when it is part of an aggregation, e.g. the **AssetContainer** could be a vault, whose number can be used to identify the location of a switch within that vault. **AssetContainer** could also be used to identify the pole that equipment is attached to.

The attributes of **AssetContainer** that are used in IEC 61968-3 profiles are shown in Table B.10.

Table B.10 – AssetContainer payload fragment

Assets: AssetContainer				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of AssetContainer
description	String	[0..1]		Free-form text description of AssetContainer
Names	Name	[0..*]	See B.56	Human-readable names for AssetContainer.

B.11 **AssetInfo** fragment

AssetInfo is a set of attributes of an **asset**, representing typical datasheet information of a physical device that can be instantiated and shared in different data exchange contexts:

- as attributes of an asset instance (installed or in stock)
- as attributes of an asset model (product by a manufacturer)
- as attributes of a type asset (generic type of an asset as used in designs/extension planning).

AssetInfo can be used to convey information such as conductor type for a **LineFault**, for example.

The attributes of **AssetInfo** that are used in IEC 61968-3 profiles are shown in Table B.11.

Table B.11 – AssetInfo payload fragment

Assets: AssetInfo				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of AssetInfo.
description	String	[0..1]		Free-form description of AssetInfo.
Names	Name	[0..*]	See B.56	Human-readable names for AssetInfo.

B.12 **AssetOwner** fragment

An **AssetOwner** is an organisation who owns a portion of an asset. An asset such as a pole can be shared by a cable TV or phone company, for example. Can be useful if a shared pole is damaged in order to determine who should be contacted to notify them of the damage.

The attributes of **AssetOwner** that are used in IEC 61968-3 profiles are shown in Table B.12.

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Table B.12 – AssetOwner payload fragment

Assets: AssetOwner				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of AssetOwner.
description	String	[0..1]		Free-form description of AssetOwner.
Names	Name	[0..*]	See B.56	Human-readable names for AssetOwner.
Organisation	Organisation	[0..1]	See B.62	Contact information for the asset owner.

B.13 Author fragment

Figure B.3 shows the payload fragment for an **Author**. An **Author** is a person who created a document or activity record such as a **SwitchingPlan** or **TroubleTicket.** Either the **person** class can be used to specify individual parts of the person's name, or the **Name** class can be used to specify the names in a different format, e.g. employee ID.

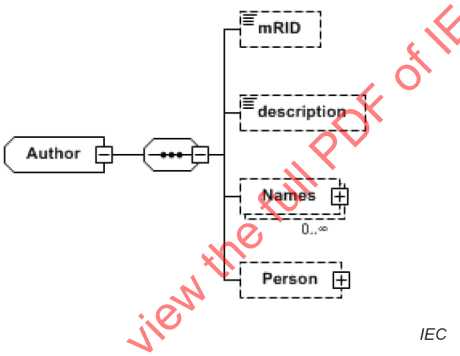


Figure B.3 – Author payload fragment

The attributes of **Author** that are used in IEC 61968-3 profiles are shown in Table B.13.

Table B.13 – Author payload fragment

Common: Author				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of Author.
description	String	[0..1]		Free-form description of Author.
Names	Name	[0..*]	See B.56	Human-readable names for Author.
Person	Person	[0..1]	See B.65	General purpose information for name and other information to contact people.

B.14 Cabinet fragment

A **Cabinet** is an enclosure that offers protection to the equipment it contains and/or safety to people/animals outside it. **Cabinet** inherits from **AssetContainer**, which in itself is an **Asset**.

The attributes of **Cabinet** that are used in IEC 61968-3 profiles are shown in Table B.14.

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Table B.14 – Cabinet payload fragment

Assets: Cabinet				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the Cabinet
description	String	[0..1]		Free form description
Names	Name	[0..*]	See B.56	Human-readable names for the Cabinet.
kind	AssetKind	[0..1]	See C.1	Kind of asset. Used in description of asset components in asset instance templates.
serialNumber	String	[0..1]		Serial number of this asset.
type	String	[0..1]		Utility-specific classification of Asset and its subtypes, according to their corporate standards, practices, and existing IT systems (e.g., for management of assets, maintenance, work, outage, customers, etc.).
utcNumber	String	[0..1]		Uniquely tracked commodity (UTC) number. This could a bar code on an asset, for example.
Location	Location	[0..1]	See B.52	

B.15 Clamp fragment

A **Clamp** is a galvanic connection at a line segment where other equipment is connected. A **Clamp** does not cut the line segment. A **Clamp** is **ConductingEquipment** and has one **Terminal** which is associated with a **ConnectivityNode**. A terminal of any other **ConductingEquipment** can be associated with the same **ConnectivityNode**.

Clamps are used to connect **jumpers** to an **ACLineSegment** in the case where the **jumper** is to be connected part way along an **ACLineSegment**. If the **jumper** is to be connected at either end of an **ACLineSegment**, then a **clamp** is not required.

The attributes of **Clamp** that are used in IEC 61968-3 profiles are shown in Table B.14.

Table B.15 – Clamp payload fragment

Wires: Clamp				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the Clamp
description	String	[0..1]		free form description
Names	Name	[0..*]	See B.56	names associated with the Clamp that can be used to describe the Clamp to the field crew
lengthFromTerminal1	Length	[0..1]		The length to the place where the clamp is located starting from side one of the line segment, i.e. the line segment terminal with sequence number equal to 1.
ACLineSegment	ACLineSegment	[0..1]	See B.4	ACLineSegment that the Clamp is to be placed on or removed from
Terminals	Terminal	[0..1]	See B.90	Single terminal that is associated with the Clamp

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B.16 **Clearance** fragment

A **Clearance** is of type **ClearanceDocument**, which inherits from **SafetyDocument**.

The attributes of **Clearance** that are used in IEC 61968-3 profiles are shown in Table B.16.

Table B.16 – Clearance payload fragment

Operations: Clearance				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the SafetyDocument
Names	Name	[0..*]	See B.56	Names used for the Clearance, such as an internal Clearance number.
description	String	[0..1]		Free form description of the Clearance
comment	String	[0..1]		Free form comments associated with the Clearance
createdDateTime	DateTime	[0..1]		Date/time that the Clearance was created.
issuedDateTime	DateTime	[0..1]		Date and time this Clearance has been issued.
releasedDateTime	DateTime	[0..1]		Date and time this Clearance has been released.
type	String	[0..1]		String describing the type of the Clearance.
Approver	Approver	[0..1]	See B.8	Person who approved the Clearance.
Author	Author	[0..1]	See B.13	Person who wrote the Clearance document.
electronicAddress	electronicAddress	[0..1]	See B.32	Electronic address associated with the Clearance. This could be the author of the Clearance.
IssuedBySupervisor	OperationsSafetySupervisor	[0..1]	See B.61	Person who issued the Clearance.
IssuedToSupervisor	FieldSafetySupervisor	[0..1]	See B.42	Person that the Clearance was issued to.
ReleasedBySupervisor	FieldSafetySupervisor	[0..1]	See B.42	Person who released the Clearance.
ReleasedToSupervisor	OperationsSafetySupervisor	[0..1]	See B.61	Person that the Clearance was released to.
status	Status	[0..1]	See B.79	Current status of the Clearance. E.g. status.value of 'Not Issued', 'Issued', 'Released'.
mustBeDeenergized	Boolean	[0..1]		Boolean indicating whether the area defined by the Clearance must be de-energized before the Clearance can be issued.

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Operations: Clearance				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mustBeGrounded	Boolean	[0..1]		Boolean indicating whether the area defined by the Clearance must be grounded before the Clearance can be issued.
TaggedPSRs	PowerSystemResource	[0..*]	See B.68	List of tagged PowerSystemResources. It is a list of the PowerSystemResources that must have tags placed on them as part of the Clearance. They define the area that is protected by the Clearance, which is bounded by these PowerSystemResources.

B.17 **ConductingEquipment** fragment

The attributes of **ConductingEquipment** that are used in IEC 61968-3 profiles are shown in Table B.17.

Table B.17 – ConductingEquipment payload fragment attributes

Wires: ConductingEquipment				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of ConductingEquipment
description	String	[0..1]		Free-form description of ConductingEquipment
Names	Name	[0..*]	See B.56	Human-readable names for ConductingEquipment
Assets	Asset	[0..*]	See B.9	Assets that are associated with the conducting equipment that can be used to help with its identification and to improve the efficiency of repair efforts.
Feeder	Feeder	[0..1]	See B.41	Feeder that is associated with this ConductingEquipment
Location	Location	[0..1]	See B.52	Location of the equipment
PSRType	PSRType	[0..1]	See B.71	PSRType of the equipment that can be used to classify instances of the same class, e.g. overhead and underground ACLineSegments. This classification mechanism is intended to provide flexibility outside the scope of this standard, i.e. provide customisation that is non standard.
Terminals	Terminal	[0..*]	See B.90	The phase of the equipment that is predicted open is specified by Terminal.phases and is the actual phase predicted open, not the as-built phase.

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B.18 **Cut** fragment

A **Cut** separates a line segment into two parts. The cut appears as a switch inserted between these two parts and connects them together. As the cut is normally open there is no galvanic connection between the two line segment parts. But it is possible to close the cut to get galvanic connection.

The cut terminals are oriented towards the line segment terminals with the same sequence number. Hence the cut terminal with sequence number equal to 1 is oriented to the line segment's terminal with sequence number equal to 1.

The cut terminals also act as connection points for jumpers and other equipment, e.g. a mobile generator. To enable this, connectivity nodes are placed at the cut terminals. Once the connectivity nodes are in place any conducting equipment can be connected at them.

The attributes of **Cut** that are used in IEC 61968-3 profiles are shown in Table B.18.

Table B.18 – Cut payload fragment

Wires: Cut				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the cut
description	String	[0..1]		Description of the cut
Names	Name	[0..*]	See B.56	Human-readable names for the cut
lengthFromTerminal1	Length	[0..1]		length from terminal 1 of the ACLineSegment where the cut should be placed
ACLineSegment	ACLineSegment	[0..1]	See B.4	Conductor on which the cut should be placed.
SwitchPhase	SwitchPhase	[0..*]	See B.87	Defines which phases will be cut, the initial state and normal state of the cut. As an example, the normal state of the cut could be open and the initial state could be open if the cut is modelling the temporary removal of jumpers on a pole, or it could be placed in the closed state to model a temporary switch that has been installed for future use.
Terminals	Terminal	[0..*]	See B.90	The two terminals that are associated with the cut being placed or removed.

B.19 ConfigurationEvent fragment

Figure B.3 shows the payload fragment for **ConfigurationEvent**. A **ConfigurationEvent** is used to report details on creation, change or deletion of an entity or its configuration.

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Figure B.4 – ConfigurationEvent payload fragment

The attributes of **ConfigurationEvent** that are used in IEC 61968-3 profiles are shown in Table B.19.

Table B.19 – ConfigurationEvent payload fragment

Common: ConfigurationEvent				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of ConfigurationEvent
createdDateTime	DateTime	[0..1]		Date and time this activity record has been created (different from the 'status.dateTime', which is the time of a status change of the associated object, if applicable).
effectiveDateTime	DateTime	[0..1]		Date and time this event has or will become effective.
modifiedBy	String	[0..1]		Source/initiator of modification.
reason	String	[0..1]		Reason for event resulting in this activity record, typically supplied when user initiated.
remark	String	[0..1]		Free text remarks.
severity	String	[0..1]		Severity level of event resulting in this activity record.
type	String	[0..1]		Type of event resulting in this activity record.
Names	Name	[0..*]	See B.56	Human-readable names for ConfigurationEvent.
status	Status	[0..1]	See B.79	Information on consequence of event resulting in this activity record.

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B.20 ConnectivityNode fragment

Connectivity nodes are points where terminals of AC conducting equipment are connected together with zero impedance.

In this document, **ConnectivityNodes** are used to connect temporary equipment to the network during switching operations and unplanned outage restoration.

The attributes of **ConnectivityNode** that are used in IEC 61968-3 profiles are shown in Table B.20.

Table B.20 – ConnectivityNode payload fragment

Core: ConnectivityNode				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		
Names	Name	[0..*]	See B.56	

B.21 CoordinateSystem fragment

This class defines the coordinate system that is used by the **PositionPoint** class. Its attributes that are used in IEC 61968-3 profiles are described in Table B.21.

Table B.21 – CoordinateSystem payload fragment

Common: CoordinateSystem				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
crsURN	String	[1..1]		A Uniform Resource Name (URN) for the coordinate reference system (crs) used to define 'Location.PositionPoints'. An example would be the European Petroleum Survey Group (EPSG) code for a coordinate reference system, defined in URN under the Open Geospatial Consortium (OGC) namespace as: urn:ogc:def:crs:EPSG::XXXX, where XXXX is an EPSG code (a full list of codes can be found at the EPSG Registry web site http://www.epsg-registry.org/). To define the coordinate system as being WGS84 (latitude, longitude) using an EPSG OGC, this attribute would be urn:ogc:def:crs:EPSG::4236. A profile should limit this code to a set of allowed URNs agreed to by all sending and receiving parties.

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B.22 Crew fragment

Figure B.5 shows the payload fragment for **Crew**. A **Crew** is a group of people with specific skills.

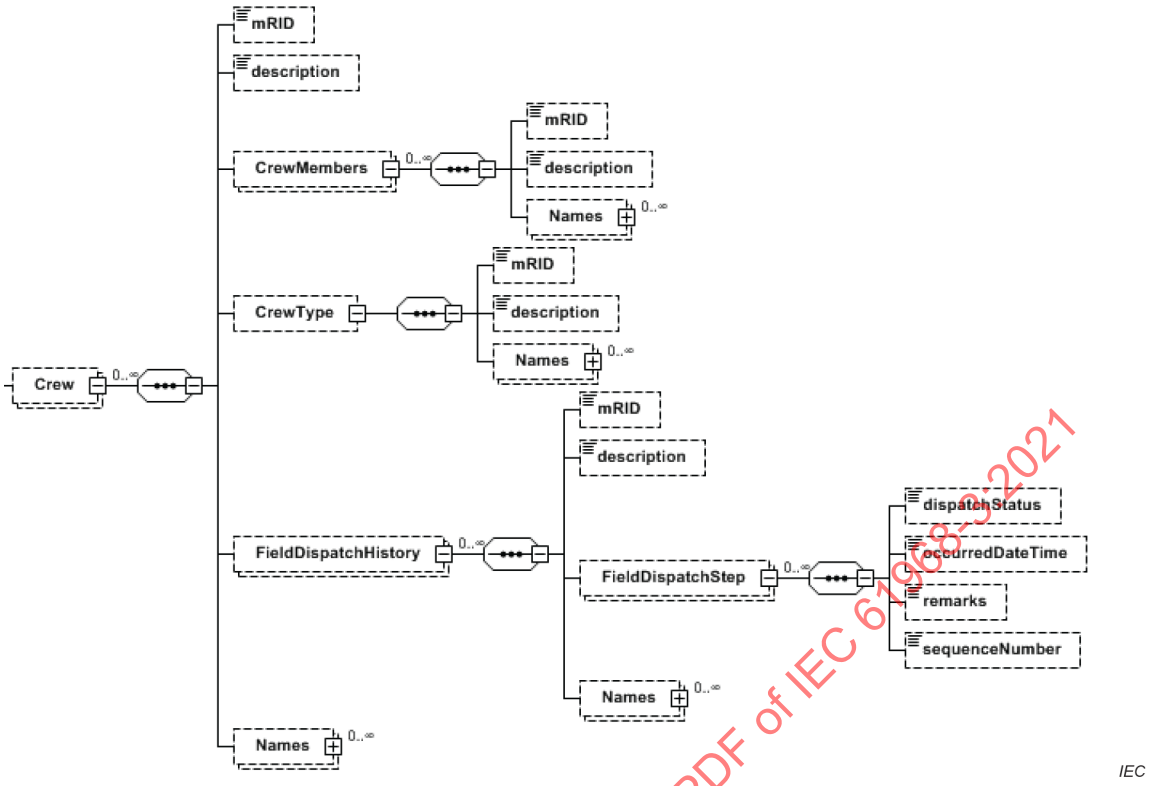


Figure B.5 – Crew payload fragment

The attributes of **Crew** that are used in IEC 61968-3 profiles are shown in Table B.22.

Table B.22 – Crew payload fragment

Common: Crew				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the crew.
description	String	[0..1]		Free-form text description of the crew.
CrewMembers	CrewMember	[0..*]	See B.23	List of people assigned to work on the crew
CrewType	CrewType	[0..1]	See B.24	Defines the skillset of the crew and can be used to determine the best available crew to work on a particular task
FieldDispatchHistory	FieldDispatchHistory	[0..*]	See B.43	Used to track crew events related to an **UnplannedOutage** or a **WorkTask**, for example, and would typically be filled out as the field worker works through the steps in the lifecycle of the task such as when a crew was dispatched, enroute, arrived, etc. Each time a new activity is performed, a new **FieldDispatchStep** is added to the history. The **FieldDispatchHistory** applies to the current **UnplannedOutage** or **WorkTask** that the **Crew** is assigned to, not the entire dispatch history for the **Crew**.
Names	Name	[0..*]	See B.56	List of human-readable names for the crew.

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B.23 **CrewMember** fragment

A **CrewMember** is member of a Crew.

The attributes of **CrewMember** that are used in IEC 61968-3 profiles are shown in Table B.23.

Table B.23 – CrewMember payload fragment

Common: CrewMember				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of CrewMember.
description	String	[0..1]		Free-form description of CrewMember.
Names	Name	[0..*]	See B.56	Human-readable names for CrewMember.

B.24 **CrewType** fragment

Figure B.5 shows the payload fragment for **CrewType**. A **CrewType** is a custom description of the type of crew. This may be used to determine the type of work the crew can be assigned to. Examples include repair, tree trimming, switching, etc. In this document this is is used to specify the skill set need to perform various tasks, such as investigating an **UnplannedOutage** or executing a **SwitchingPlan**.

The attributes of **CrewType** that are used in IEC 61968-3 profiles are shown in Table B.24.

Table B.24 – CrewType payload fragment

Common: CrewType				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of CrewType.
description	String	[0..1]		Free-form description of CrewType.
Names	Name	[0..*]	See B.56	Human-readable names for CrewType.

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B.25 **Customer** fragment

Important information for **Customer** includes **locale**, which determines the language spoken by the customer for notifications, for example, and **specialNeed**, such as life support, hospital, jail, etc. The customer contact information is part of the **Organisation** fragment (see B.62).

Note that the payload can be exchanged either with the requisite fields completed, or by using the **mRID** in conjuction with a previously exchanged **CustomerConfig** message with the same **mRID** (see Clause D.2).

The attributes of **Customer** that are used in IEC 61968-3 profiles are shown in Table B.25 and Figure B.6

Table B.25 – Customer payload fragment

Customers: Customer				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID for the customer
description	String	[0..1]		Free-form description of the customer.
Names	Name	[0..*]	See B.56	Human-readable names for the Customer.
kind	CustomerKind	[0..1]	See C.7	Defines the kind of customer, such as residential, commercial, etc.
locale	String	[0..1]		Locale designating language to use in communications with this customer.
specialNeed	String	[0..1]		True if customer organisation has special service needs such as life support, hospitals, etc.
Organisation	Organisation	[0..1]	See B.62	Used to define customer contact information

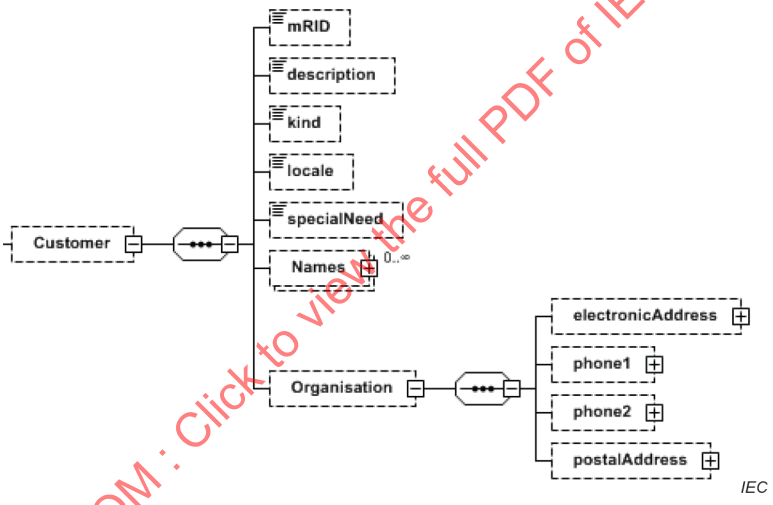


Figure B.6 – Customer payload fragment

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B.26 CustomerAgreement fragment

Figure B.7 shows the payload fragment for **CustomerAgreement.** In the context of this document this is used to convey customer information in payloads such as the **TroubleTicket** part of the **TroubleOrder** message and in the **DeEnergizedUsagePoints** part of the **UnplannedOutages** message.

Note that the payload can be exchanged either with the requisite fields completed, or by using the **mRID** in conjuction with a previously exchanged **CustomerAgreementConfig** message with the same **mRID** (see Clause D.1).

The attributes of **CustomerAgreement** that are used in IEC 61968-3 profiles are shown in Table B.26.

Table B.26 – CustomerAgreement payload fragment

Customers: CustomerAgreement				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of CustomerAgreement.
description	String	[0..1]		Free-form description of CustomerAgreement.
Names	Name	[0..*]	See B.56	Human-readable names for CustomerAgreement.
Customer	Customer	[0..1]	See B.25	

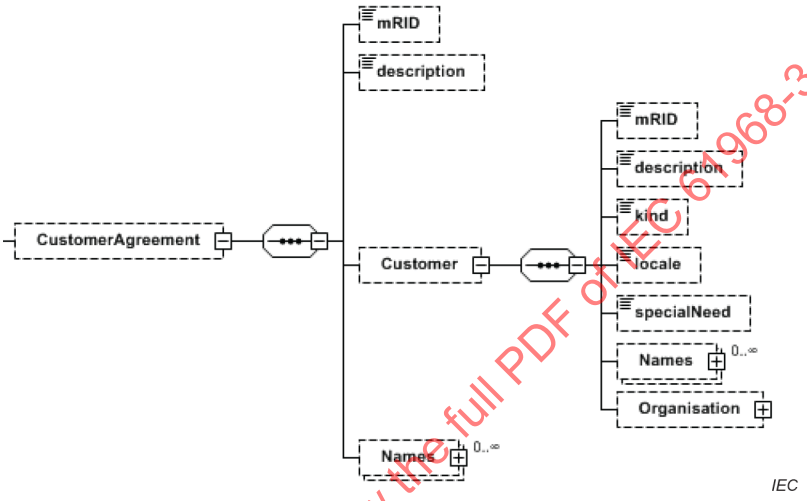


Figure B.7 – CustomerAgreement payload fragment

B.27 DeEnergizedUsagePoint fragment

Figure B.8 shows the payload fragment for **DeEnergizedUsagePoint**. A **DeEnergizedUsagePoint** is a **UsagePoint** at a **UsagePointLocation** that has been de-energized as a result of an **UnplannedOutage**. The **EnergizedUsagePoint** payload fragment has the same structure.

The **UsagePoint** payload is described in B.97.The payload also includes a list of **EndDevices**, which are used to convey the meter numbers impacted by the outage.

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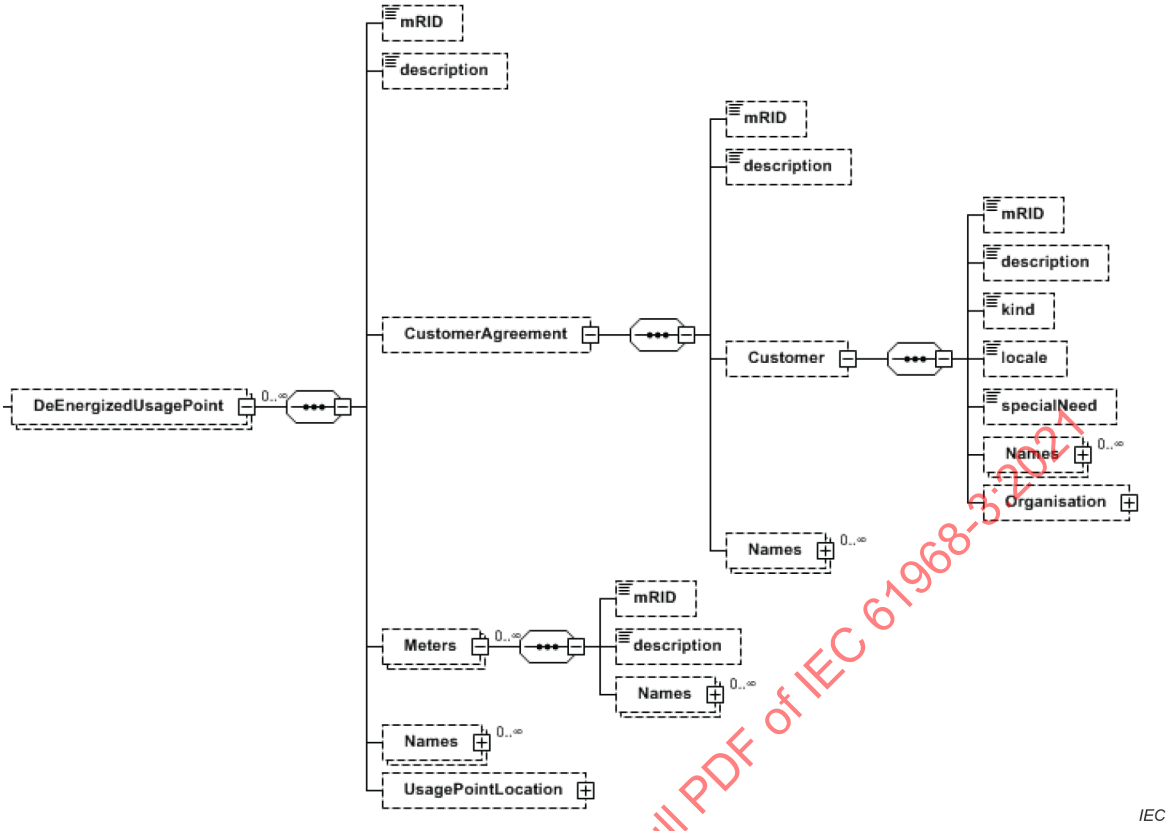


Figure B.8 – DeEnergizedUsagePoint payload fragment

B.28 Discrete fragment

The attributes of **Discrete** that are used in IEC 61968-3 profiles are shown in Table B.27.

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Table B.27 – Discrete payload fragment

Meas: Discrete				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
maxValue	Integer	[0..1]		Normal value range maximum for any of the MeasurementValue.values. Used for scaling, e.g. in bar graphs or of telemetered raw values.
measurementType	String	[0..1]		Specifies the type of measurement. For example, this specifies if the measurement represents an indoor temperature, outdoor temperature, bus voltage, line flow, etc. When the measurementType is set to "Specialization", the type of Measurement is defined in more detail by the specialized class which inherits from Measurement.
minValue	Integer	[0..1]		Normal value range minimum for any of the MeasurementValue.values. Used for scaling, e.g. in bar graphs or of telemetered raw values.
normalValue	Integer	[0..1]		Normal value range minimum for any of the MeasurementValue.values. Used for scaling, e.g. in bar graphs or of telemetered raw values.
phases	PhaseCode	[0..1]	See C.12	Indicates to which phases the measurement applies and avoids the need to use 'measurementType' to also encode phase information (which would explode the types). The phase information in Measurement, along with 'measurementType' and 'phases' uniquely defines a Measurement for a device, based on normal network phase. Their meaning will not change when the computed energizing phasing is changed due to jumpers or other reasons. If the attribute is missing three phases (ABC) shall be assumed.
unitMultiplier	UnitMultiplier	[0..1]		The unit multiplier of the measured quantity.
unitSymbol	UnitSymbol	[0..1]		The unit of measure of the measured quantity.
DiscreteValues	DiscreteValue	[0..*]	See B.29	
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	

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B.29 **DiscreteValue** fragment

The attributes of **DiscreteValue** that are used in IEC 61968-3 profiles are shown in Table B.28.

Table B.28 – DiscreteValue payload fragment

Meas: DiscreteValue				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		
Names	Name	[0..*]	See B.56	
sensorAccuracy	PerCent	[0..1]		The limit, expressed as a percentage of the sensor maximum, that errors will not exceed when the sensor is used under reference conditions.
timestamp	DateTime	[0..1]		The time when the value was last updated
value	Integer	[0..1]		The value to supervise.
MeasurementValueQuality	MeasurementValueQuality	[0..1]	See B.53	Measurement quality flags. Bits 0-10 are defined for substation automation in draft IEC 61850 part 7-3. Bits 11-15 are reserved for future expansion by that document. Bits 16-31 are reserved for EMS applications.
MeasurementValueSource	MeasurementValueSource	[0..1]	See B.55	MeasurementValueSource describes the alternative sources updating a MeasurementValue. User conventions for how to use the MeasurementValueSource attributes are described in the introduction to IEC 61970-301.

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B.30 **DuctBank** fragment

A **DuctBank** contains individual wires in the layout as specified with associated wire spacing instances; number of them gives the number of conductors in this duct. **DuctBank** inherits from **AssetContainer**, which in itself is an **Asset**.

The attributes of **DuctBank** that are used in IEC 61968-3 profiles are shown in Table B.14.

Table B.29 – DuctBank payload fragment

Assets: DuctBank				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the Cabinet
description	String	[0..1]		Free form description
Names	Name	[0..*]	See B.56	Human-readable names for the Cabinet.
circuitCount	Integer	[0..1]		Number of circuits in duct bank. Refer to associations between a duct (ConductorAsset) and an ACLineSegment to understand which circuits are in which ducts.
kind	AssetKind	[0..1]	See C.1	Kind of asset. Used in description of asset components in asset instance templates.
serialNumber	String	[0..1]		Serial number of this asset.
type	String	[0..1]		Utility-specific classification of Asset and its subtypes, according to their corporate standards, practices, and existing IT systems (e.g., for management of assets, maintenance, work, outage, customers, etc.).
utcNumber	String	[0..1]		Uniquely tracked commodity (UTC) number. This could a bar code on an asset, for example.
Location	Location	[0..1]	See B.52	
WireSpacingInfos	WireSpacing	[0..*]	See B.99	

B.31 Editor fragment

Figure B.9 shows the payload fragment for an **Editor**. An **Editor** is a person who makes changes to an activity record or a document such as a **SwitchingPlan** or **TroubleTicket.** Either the **person** class can be used to specify individual parts of the person's name, or the **Name** class can be used to specify the names in a different format, e.g. employee ID.

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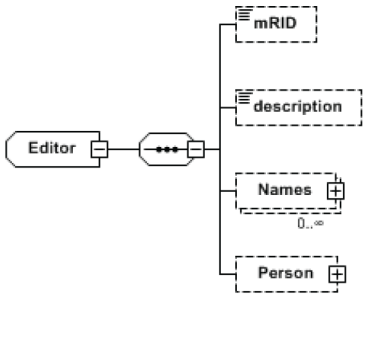


Figure B.9 – Editor payload fragment

The attributes of **Editor** that are used in IEC 61968-3 profiles are shown in Table B.30.

Table B.30 – Editor payload fragment

Common: Editor				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of Editor.
description	String	[0..1]		Free-form description of Editor.
Names	Name	[0..*]	See B.56	Human-readable names for Editor.
Person	Person	[0..1]	See B.65	General purpose information for name and other information to contact people.

B.32 ElectronicAddress fragment

Figure B.10 shows the payload fragment for **ElectronicAddress**. An **ElectronicAddress** defines email and other means of communication with a person or organization. It is also used to identify hardware addresses for assets such as intelligent electronic devices.

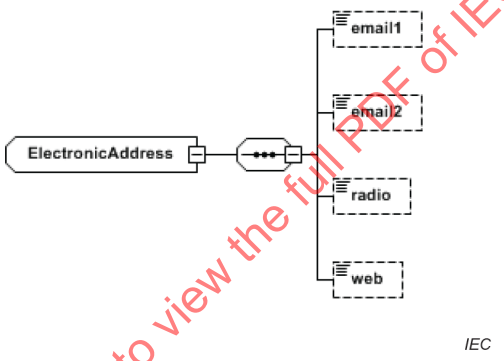


Figure B.10 – ElectronicAddress payload fragment

The attributes of **ElectronicAddress** that are used in IEC 61968-3 payload fragments are shown in Table B.31.

Table B.31 – ElectronicAddress payload fragment

Common: ElectronicAddress					
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**	**Used in Profile**
email1	String	[0..1]		Primary email address	All
email2	String	[0..1]		Alternative email address	All
radio	String	[0..1]		Radio ID for crew	All
web	String	[0..1]		Web address for an organization; could also be social media address for an organisation.	All
lan	String	[0..1]		Address on local area network.	AssetConfig
mac	String	[0..1]		MAC (Media Access Control) address.	AssetConfig
userID	String	[0..1]		User ID needed to log in, which can be for an individual person, an organisation, a location, etc.	AssetConfig
password	String	[0..1]		Password needed to log in.	AssetConfig

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B.33 **EndDevice** fragment

An **EndDevice** is an asset container that performs one or more end device functions. One type of end device is a meter which can perform metering, load management, connect/disconnect, accounting functions, etc. Some end devices, such as ones monitoring and controlling air conditioners, refrigerators, pool pumps may be connected to a meter. All end devices may have communication capability defined by the associated communication function(s). An end device may be owned by a consumer, a service provider, utility or otherwise.

There may be a related end device function that identifies a sensor or control point within a metering application or communications systems (e.g., water, gas, electricity).

Some devices may use an optical port that conforms to the ANSI C12.18 standard for communications.

The attributes of **EndDevice** that are used in IEC 61968-3 payload fragments are shown in Table B.32.

Table B.32 – EndDevice payload fragment

Metering: EndDevice				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the EndDevice
Description	String	[0..1]		Free-form text description of the EndDevice
Names	Name	[0..*]	See B.56	Human-readable names for the EndDevice

B.34 **EnergyConsumer** fragment

An **EnergyConsumer** is a Generic user of energy – a point of consumption on the power system model.

The attributes of **EnergyConsumer** that are used in IEC 61968-3 profiles are shown in Table B.33 and graphically in Figure B.11.

Table B.33 – EnergyConsumer payload fragment

Wires: EnergyConsumer				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the EnergyConsumer
description	String	[0..1]		Free form description of EnergyConsumer
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the EnergyConsumer.
Assets	Asset	[0..1]	See B.9	Assets associated with the EnergyConsumer, identified by its mRID, description and Names
Location	Location	[0..1]	See B.52	Geographic location of EnergyConsumer

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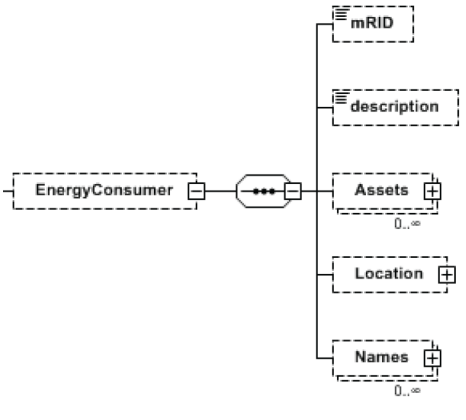


Figure B.11 – EnergyConsumer payload fragment

B.35 EnergySource fragment

An **EnergySource** is a generic equivalent for an energy supplier on a transmission or distribution voltage level. In the context of switching, it is a temporary means to energize the network, such as a temporary generator or a mobile transformer.

The attributes of **EnergySource** that are used in IEC 61968-3 profiles are shown in Table B.34 and graphically in Figure B.12.

Table B.34 – EnergySource payload fragment

Wires::EnergySource				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the EnergySource
description	String	[0..1]		Free form description of EnergySource
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the EnergySource.
activePower	ActivePower	[0..1]		High voltage source active injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for steady state solutions.
nominalVoltage	Voltage	[0..1]		Phase-to-phase nominal voltage.
pMax	ActivePower	[0..1]		This is the maximum active power that can be produced by the source. Load sign convention is used, i.e. positive sign means flow out from a TopologicalNode (bus) into the conducting equipment.
pMin	ActivePower	[0..1]		This is the minimum active power that can be produced by the source. Load sign convention is used, i.e. positive sign means flow out from a TopologicalNode (bus) into the conducting equipment.
r	Resistance	[0..1]		Positive sequence Thevenin resistance.
r0	Resistance	[0..1]		Zero sequence Thevenin resistance.
reactivePower	ReactivePower	[0..1]		High voltage source reactive injection. Load sign convention is used, i.e. positive sign means flow out from a node. Starting value for steady state solutions.
rn	Resistance	[0..1]		Negative sequence Thevenin resistance.

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Wires: EnergySource				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
voltageAngle	AngleRadians	[0..1]		Phase angle of a-phase open circuit used when voltage characteristics need to be imposed at the node associated with the terminal of the energy source, such as when voltages and angles from the transmission level are used as input to the distribution network. The attribute shall be a positive value or zero.
voltageMagnitude	Voltage	[0..1]		Phase-to-phase open circuit voltage magnitude used when voltage characteristics need to be imposed at the node associated with the terminal of the energy source, such as when voltages and angles from the transmission level are used as input to the distribution network. The attribute shall be a positive value or zero.
x	Reactance	[0..1]		Positive sequence Thevenin reactance.
x0	Reactance	[0..1]		Zero sequence Thevenin reactance.
xn	Reactance	[0..1]		Negative sequence Thevenin reactance.
Assets	Asset	[0..1]	See B.9	Assets associated with the EnergySource, identified by its mRID, description and Names
Location	Location	[0..1]	See B.52	Geographic Location of where EnergySource is to be placed or removed.
Terminals	Terminal	[0..*]	See B.90	Terminal where the EnergySource is to be placed or removed on the network.

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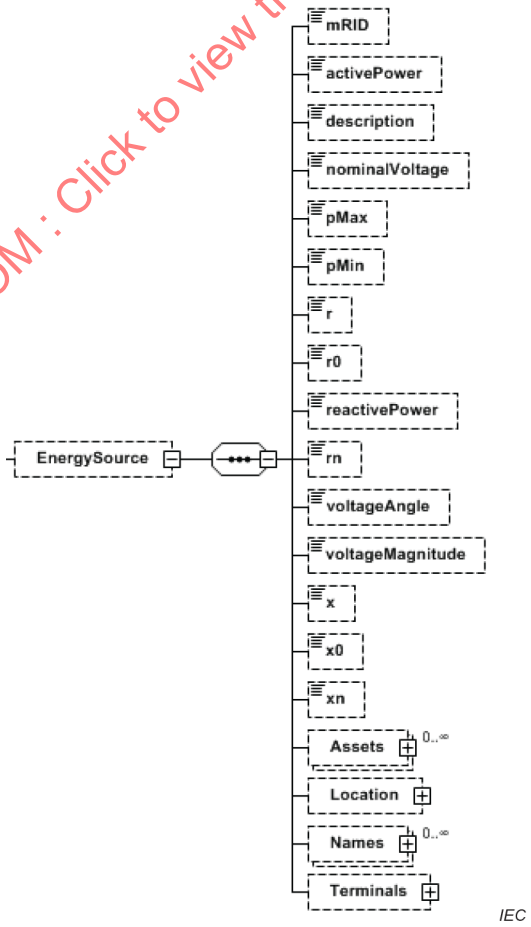


Figure B.12 – EnergySource payload fragment

B.36 **EnergizedUsagePoint** fragment

Figure B.13 shows the payload fragment for **EnergizedUsagePoint**. An **EnergizedUsagePoint** is a **UsagePoint** that has been energized as a result of an **UnplannedOutage** being restored.

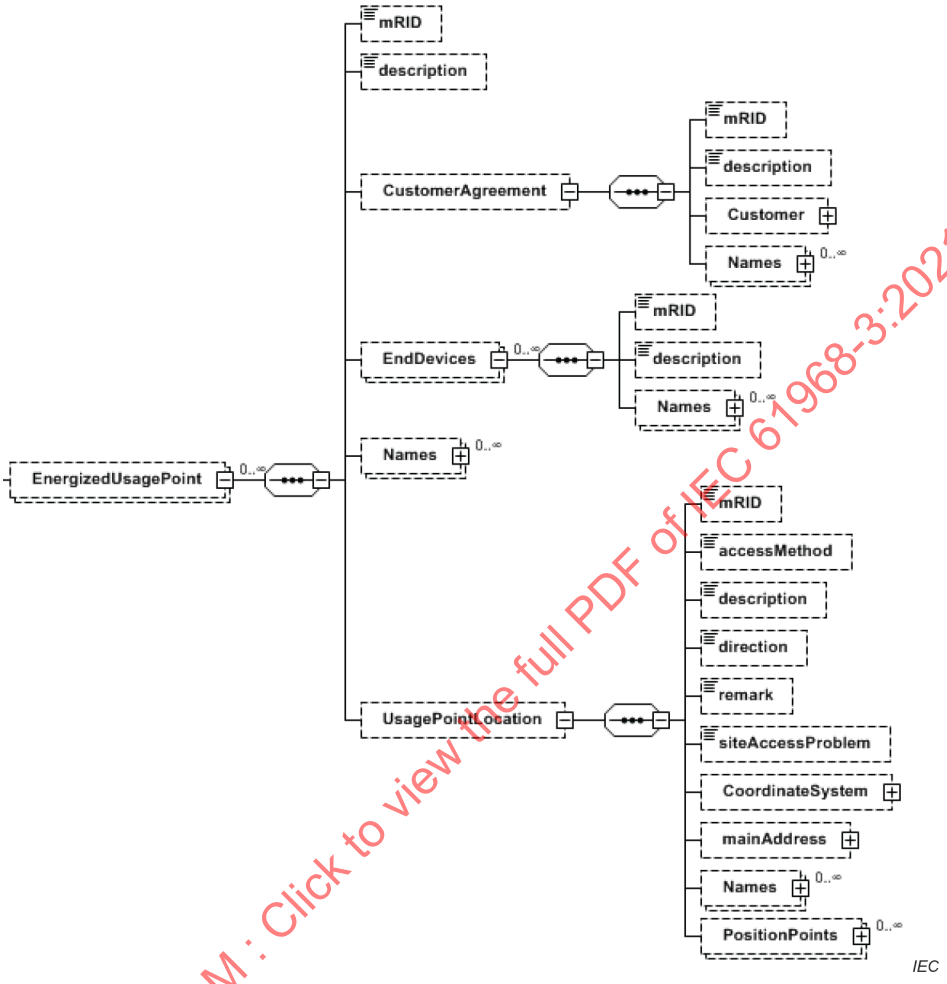


Figure B.13 – EnergizedUsagePoint payload fragment

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The payload fragment has the same structure as the **DeEnergizedUsagePoint** payload fragment, but it is a list of **UsagePoints** that are now energized but were previously de-energized. It could be used to identify those **UsagePoints** that have been abnormally fed from an alternative feeder in order to partially restore the outage, for example.

The details of the UsagePoint fragment are described in B.97.

B.37 **Equipment** fragment

An **Equipment** is defined as the parts of a power system that are physical devices, electronic or mechanical.

The attributes of **Equipment** that are used in IEC 61968-3 profiles are shown in Table B.35

Table B.35 – Equipment payload fragment

Core: Equipment				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the Equipment
description	String	[0..1]		Free form description of Equipment
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the Equipment.
Assets	Asset	[0..1]	See B.9	Asset associated with the Equipment, identified by its mRID, description and Names
Location	Location	[0..1]	See B.52	Geographic location of the Equipment.

B.38 EstimatedRestorationTime fragment

The attributes for **EstimatedRestorationTime** that are used in IEC 61968-3 profiles are shown in Table B.36.

Table B.36 – EstimatedRestorationTime payload fragment

Operations: EstimatedRestorationTime				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
ertSource	String	[0..1]		Defines the source that provided the ERT value.
etr	DateTime	[0..1]		Estimated time the outage will be restored
confidenceKind	ertConfidenceKind	[0..1]	See C.8	The estimated time of restoration can have a confidence factor applied such as high or low confidence that the ERT will be accomplished. This confidence factor may be updated as needed during the outage period – just as the actual ERT can be updated.

B.39 FaultImpedance fragment

FaultImpedance is defined as the impedance description for the fault.

The attributes of **FaultImpedance** that are used in IEC 61968-3 profiles are shown in Table B.37.

Table B.37 – FaultImpedance payload fragment

Fault: FaultImpedance				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
rGround		[0..1]	Resistance	The resistance of the fault between phases and ground.
rLineToLine		[0..1]	Resistance	The resistance of the fault between phases.
xGround		[0..*]	Reactance	The reactance of the fault between phases and ground.
xLineToLine		[0..1]	Reactance	The reactance of the fault between phases.

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B.40 **FaultCauseTypes** fragment

FaultCauseTypes is defined as the type of cause of the fault.

The attributes of **FaultCauseTypes** that are used in IEC 61968-3 profiles are shown in Table B.38.

Table B.38 – FaultCodeTypes payload fragment

Fault: FaultCauseTypes				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the FaultCauseType
description	String	[0..1]		Free-form description of FaultCauseType
Names	Name	[0..*]	See B.56	Human-readable names for FaultCauseType

B.41 **Feeder** fragment

A **Feeder** is a collection of equipment for organizational purposes, used for grouping distribution resources.

The organization of a feeder does not necessarily reflect connectivity or current operation state.

The attributes of **Feeder** that are used in IEC 61968-3 profiles are shown in Table B.39.

Table B.39 – Feeder payload fragment

Core: Feeder				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the Feeder
description	String	[0..1]		Free form description of Feeder
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the Feeder.
Substation	Substation	[0..1]	See B.85	Substation associated with the Feeder, identified by its mRID, description and Names

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B.42 **FieldSafetySupervisor** fragment

A **FieldSafetySupervisor** is a crew member on a work site responsible for all local safety measures for the work crew doing maintenance, construction and repair in a substation or on a power line/cable. Figure B.14 shows the payload fragment for a **FieldSafetySupervisor**.

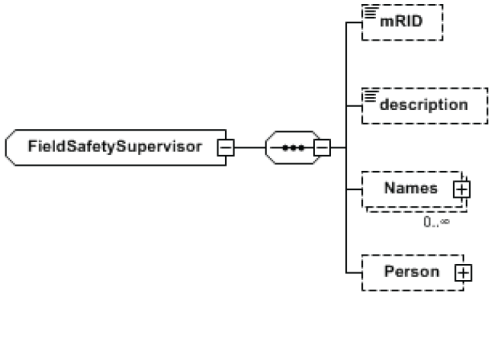


Figure B.14 – FieldSafetySupervisor payload fragment

The attributes of **FieldSafetySupervisor** that are used in IEC 61968-3 profiles are shown in Table B.40.

Table B.40 – FieldSafetySupervisor payload fragment

Common: FieldSafetySupervisor				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the FieldSafetySupervisor
description	String	[0..1]		Free-form description of FieldSafetySupervisor
Names	Name	[0..*]	See B.56	Human-readable names for FieldSafetySupervisor
Person	Person	[0..1]	See B.65	General purpose information for name and other information to contact people.

B.43 FieldDispatchHistory fragment

Figure B.15 shows the payload fragment for a **FieldDispatchHistory**. A **FieldDispatchHistory** is the history of field dispatch statuses for this work. It consists of zero or more **FieldDispatchSteps**.

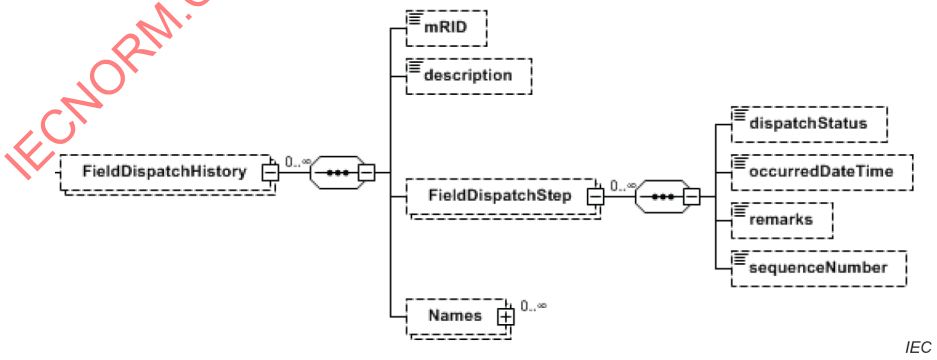


Figure B.15 – FieldDispatchHistory payload fragment

The attributes of **FieldDispatchHistory** that are used in IEC 61968-3 profiles are shown in Table B.41.

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Table B.41 – FieldDispatchHistory payload fragment

Common: FieldDispatchHistory				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the FieldDispatchHistory
description	String	[0..1]		Free-form description of FieldDispatchHistory
Names	Name	[0..*]	See B.56	Human-readable names for FieldDispatchHistory
FieldDispatchStep	FieldDispatchStep	[0..*]	See B.44	

B.44 Ground fragment

A **Ground** is a point where the system is grounded used for connecting conducting equipment to ground. The power system model can have any number of **Ground**s.

The attributes of **Ground** that are used in IEC 61968-3 profiles are shown in Table B.42.

Table B.42 – Ground payload fragment

Wires: Ground				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the Ground
description	String	[0..1]		Free-form description of the Ground
Names	Name	[0..*]	See B.56	List of Names of the Ground
Terminals	Terminal	[0..1]	See B.90	Single terminal that is used to attach the Ground to the component to be grounded

B.45 FieldDispatchStep fragment

The attributes of **FieldDispatchStep** that are used in IEC 61968-3 profiles are shown in Table B.43.

Table B.43 – FieldDispatchStep payload fragment

Common: FieldDispatchStep				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
dispatchStatus	CrewStatusKind	[0..1]	See C.1	Whether the crew is enroute, arrived, etc.
occurredTimeDate	DateTime	[0..1]		The date and time at which the dispatch status occurred.
remarks	String	[0..1]		Free form comments related to the dispatch to perform field work.
sequenceNumber	Integer	[0..1]		The sequence number of the field dispatch step within the field dispatch history. Begins with 1 and increments up.

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B.46 **Hazard** fragment

Figure B.16 shows the payload fragment for **Hazard**. A **Hazard** represents a hazardous condition in the field, such as a wire down or a transformer fire. It can be made safe by changing its status. A **Hazard** can be associated with a **TroubleTicket** or an **Incident**. For futher details of **Hazard**, please see IEC 61968-8.

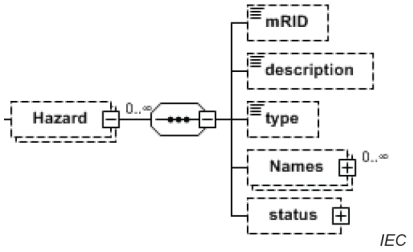


Figure B.16 – Hazard payload fragment

This class defines a hazardous situation associated with an incident. Examples are line down, gas leak, fire, etc. The class itself is part of the Customer package but the payload is defined here because it is used in Network Operations profiles.

The attributes for **Hazard** that are used in IEC 61968-3 profiles are shown in Table B.44.

Table B.44 – Hazard payload fragment

Common: Hazard				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of Hazard
description	String	[0..1]		Free-form description of Hazard
Names	Name	[0..*]	See B.56	Human-readable names for Hazard
type	String	[0..1]		Type of tHazard
status	Status	[0..1]	See B.79	Status.value has values of 'Open', 'Closed' to indicate the status of the Incident.

B.47 **Issuer** fragment

Figure B.17 shows the payload fragment for an **Issuer**. An **Issuer** is a person who performs the role of issuing an order to a work management system, such as a **SwitchingOrder**, **OutageOrder** or **TroubleOrder**. Either the **person** class can be used to specify individual parts of the person's name, or the **Name** class can be used to specify the names in a different format, e.g. employee ID.

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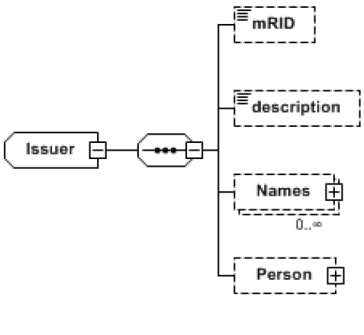


Figure B.17 – Issuer payload fragment

The attributes of **Issuer** that are used in IEC 61968-3 profiles are shown in Table B.45.

Table B.45 – Issuer payload fragment

Common: Issuer				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of Issuer.
description	String	[0..1]		Free-form description of Issuer.
Names	Name	[0..*]	See B.56	Human-readable names for Issuer.
Person	Person	[0..1]	See B.65	General purpose information for name and other information to contact people.

B.48 IssuedBySupervisor fragment

Figure B.18 shows the payload fragment for an **IssuedBySupervisor**. An **IssuedBySupervisor** is an **OperationsSafetySupervisor** who performs the role of issuing a clearance, permit or safety document to a **FieldSafetySupervisor**.

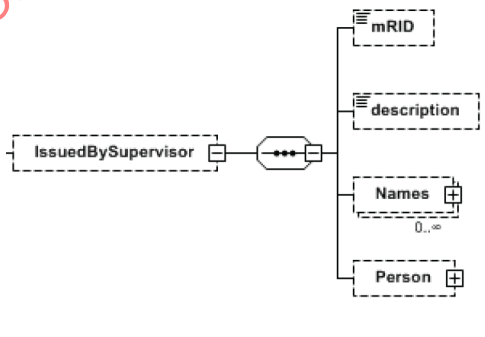


Figure B.18 – IssuedBySupervisor payload fragment

The attributes of **IssuedBySupervisor** that are used in IEC 61968-3 profiles are of type **OperationsSafetySupervisor** and are described in B.61.

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B.49 IssuedToSupervisor fragment

Figure B.19 shows the payload fragment for an **IssuedToSupervisor**. An **IssuedToSupervisor** is a **FieldSafetySupervisor** who performs the role of receiving a clearance, permit or safety document from an **OperationsSafetySupervisor**.

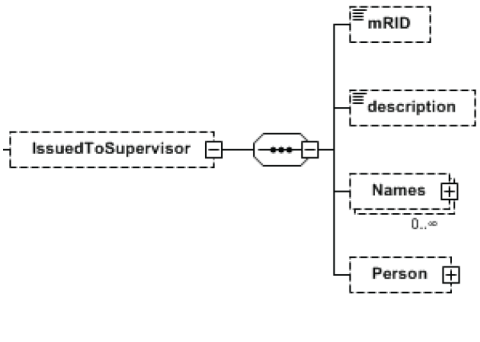


Figure B.19 – IssuedToSupervisor payload fragment

The attributes of **IssuedToSupervisor** that are used in IEC 61968-3 profiles are of type **FieldSafetySupervisor** and are described in B.42.

B.50 lifecycleDate fragment

This compound defines lifecycle dates for an asset.

The attributes of **lifecycleDate** that are used in IEC 61968-3 profiles are shown in Figure B.20 and Table B.46.

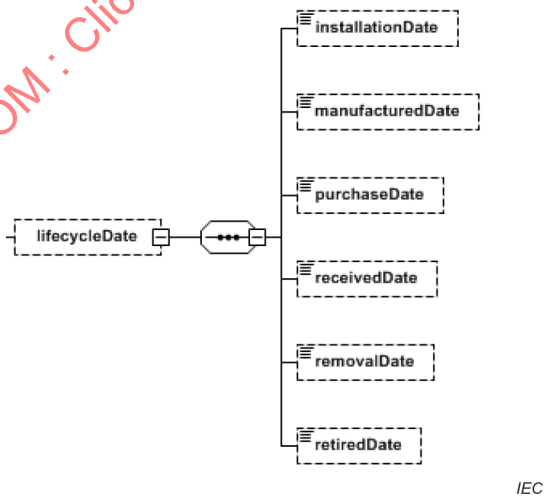


Figure B.20 – lifecycleDate fragment

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Table B.46 – lifecycleDate payload fragment

Asset: LifecycleDate				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
installationDate	Date	[0..1]		Date current installation was completed, which may not be the same as the in-service date. Asset may have been installed at other locations previously. Ignored if asset is (1) not currently installed (e.g., stored in a depot) or (2) not intended to be installed (e.g., vehicle, tool).
manufacturedDate	Date	[0..1]		Date the asset was manufactured.
purchaseDate	Date	[0..1]		Date the asset was purchased. Note that even though an asset may have been purchased, it may not have been received into inventory at the time of purchase.
receivedDate	Date	[0..1]		Date the asset was received and first placed into inventory
removalDate	Date	[0..1]		Date when the asset was last removed from service. Ignored if (1) not intended to be in service, or (2) currently in service.
retiredDate	Date	[0..1]		Date the asset is permanently retired from service and may be scheduled for disposal. Ignored if asset is (1) currently in service, or (2) permanently removed from service.

B.51 Jumper fragment

A **Jumper** is a temporary conductor that is used to energize the network and has negligible impedance.

The attributes of **Jumper** that are used in IEC 61968-3 profiles are shown in Table B.47.

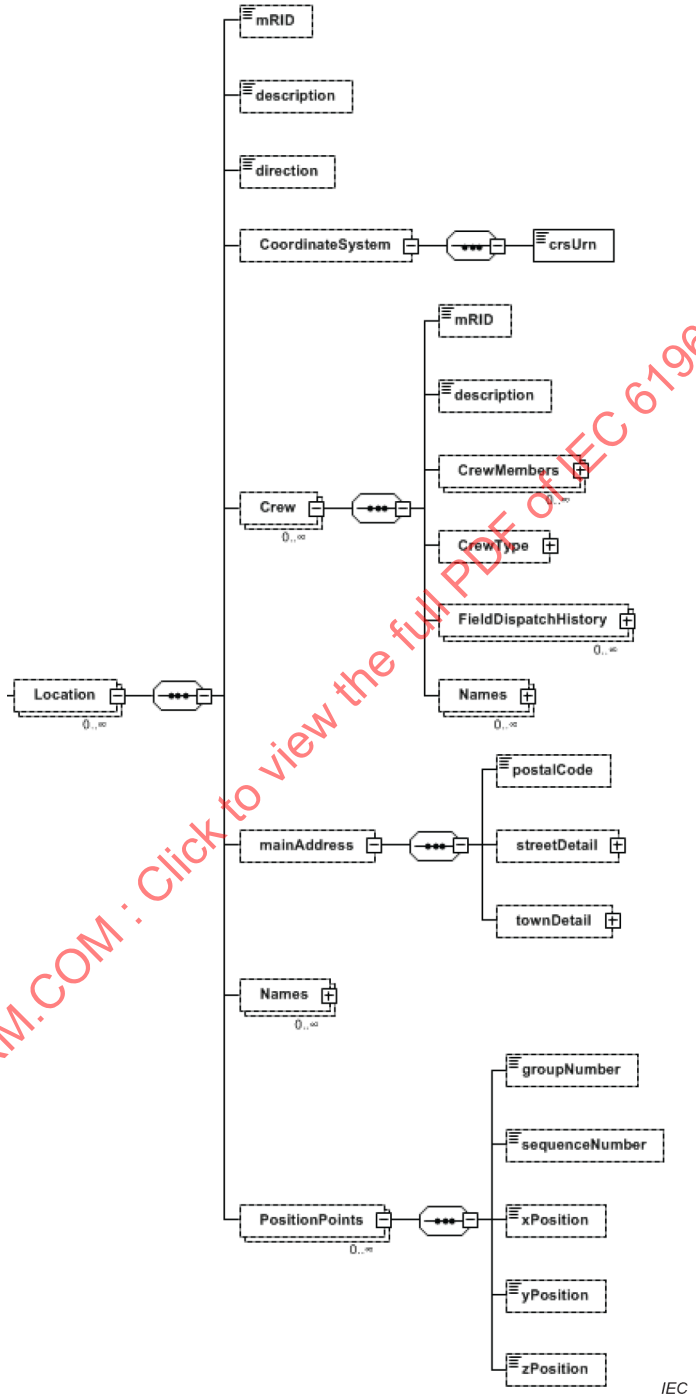
Table B.47 – Jumper payload fragment

Wires: Jumper				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the Jumper
description	String	[0..1]		Description of the jumper
Names	Name	[0..*]	See B.56	Human-readable names for the jumper
Assets	Asset	[0..*]		List of Assets associated with the Jumper, identified by mRID, description and Names
SwitchPhase	SwitchPhase	[0..*]	See B.87	Defines which phases will be cut, the initial state and normal state of the cut. As an example, the normal state of the cut could be open and the initial state could be open if the cut is modelling the temporary removal of jumpers on a pole, or it could be placed in the closed state to model a temporary switch that has been installed for future use.
Terminals	Terminal	[0..*]	See B.90	Pair of Terminals that will be created with the Jumper. These are required independently of the Terminals of the Clamps, ACLineSegment and/or JumpedEquipements that the Jumper connects to. The terminal fragment specifies the ConnectivityNode that defines where the jumper connects to.

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B.52 **Location** fragment

Figure B.21 shows the payload fragment for **Location**. A **Location** is the place, scene, or point of something where someone or something has been, is, and/or will be at a given moment in time.



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Figure B.21 – Location payload fragment

It can be defined with one or more **PositionPoints** (coordinates) in a given **CoordinateSystem**. **mainAddress** is used to specify the town and street of the **Location**.

Note that whenever a **Location** is part of a message payload, either the required contents of the **Location** can be sent as part of the payload, or just the **mRID**. However, if just the **mRID** is sent, then a **LocationConfig** message with that **mRID** must have been previously exchanged between the participating systems prior to using the **mRID**. See Subclause 5.3.5 for details of the **LocationConfig** message.

Location can be defined with one or more position points (coordinates) in a given coordinate system. The attributes that are used in IEC 61968-3 profiles are shown in Table B.48. The rightmost column in the table shows which attributes are used in which profiles. For example, the crew attribute is only used by the SwitchOrders and TroubleOrders profiles.

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Table B.48 – Location payload fragment

Common: Location					
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**	**Used by profiles**
mRID	String	[0..1]	GUID	mRID of this location	All
description	String	[0..1]		Free-form text for this location	All
Names	Name	[0..*]	See B.56	Human-readable names for this location.	All
CoordinateSystem	CoordinateSystem	[0..1]	See B.21	Defines the coordinate system that is used by the PositionPoints attribute of the Location class.	All
Crew	Crew	[0..*]	See B.22	When present, Crew.CrewType can be used to specify resource requirements at a location for scheduling purposes.	SwitchingOrders
direction	String	[0..1]		Direction that allows field crews to quickly find a given asset. For a given location, such as a street address, this is the relative direction in which to find the asset. For example, a streetlight may be located at the 'NW' (northwest) corner of the customer's site, or a usage point may be located on the second floor of an apartment building.	Incidents SwitchingActions SwitchingOrders SwitchingPlans TroubleOrders
mainAddress	StreetAddress	[0..1]	See B.80	Main address of the location.	All
phone1	TelephoneNumber	[0..1]	See B.89	Phone number.	TroubleOrders
phone2	TelephoneNumber	[0..1]	See B.89	Additional phone number.	TroubleOrders
PositionPoints	PositionPoint	[0..1]	See B.67	Set of spatial coordinates that determine a point, defined in the coordinate system specified in 'Location.CoordinateSystem'. Use a single position point instance to desribe a point-oriented location. Use a sequence of position points to describe a line-oriented object (physical location of non-point oriented objects like cables or lines), or area of an object (like a substation or a geographical zone – in this case, have first and last position point with the same values).	All

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B.53 **Manufacturer** fragment

A **Manufacturer** is the manufacturer of an asset model.

The attributes that are used in IEC 61968-3 profiles are shown in Figure B.22 and Table B.49.

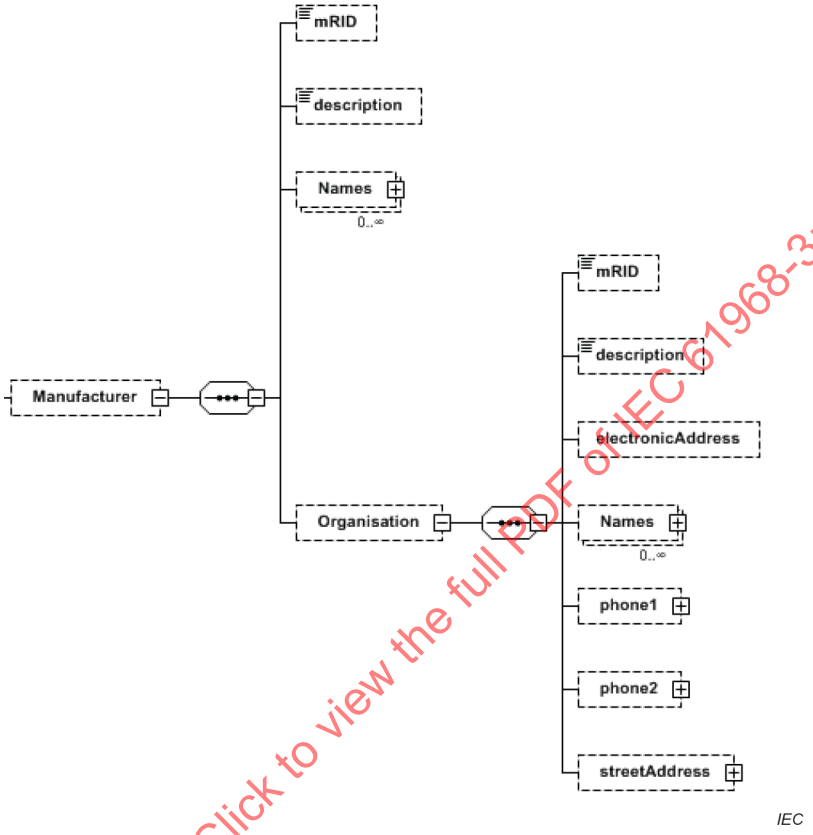


Figure B.22 – Manufacturer fragment

Table B.49 – Manufacturer payload fragment

Assets: Manufacturer				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of this Manfacturer
description	String	[0..1]		Free form description
Names	Name	[0..*]	See B.56	Human readable names
Organisation	Organisation	[0..1]	See B.62	Contact information for manufacturer.

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B.54 **MeasurementValueQuality** fragment

Figure B.23 shows the payload fragment for **MeasurementValueQuality**. **MeasurementValueQuality** defines measurement quality flags. Bits 0 to 10 are defined for substation automation in IEC 61850-7-3. Bits 11 to 15 are reserved for future expansion by that document. Bits 16 to 31 are reserved for EMS applications.



Figure B.23 – MeasurementValueQuality payload fragment

The attributes that are used in IEC 61968-3 profiles are shown in Table B.50.

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Table B.50 – MeasurementValueQuality payload fragment

Meas: MeasurementValueQuality				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
badReference	Boolean	[0..1]		Measurement value may be incorrect due to a reference being out of calibration.
estimatorReplaced	Boolean	[0..1]		Value has been replaced by State Estimator. estimatorReplaced is not an IEC61850 quality bit but has been put in this class for convenience.
failure	Boolean	[0..1]		This identifier indicates that a supervision function has detected an internal or external failure, e.g. communication failure.
oldData	Boolean	[0..1]		Measurement value is old and possibly invalid, as it has not been successfully updated during a specified time interval.
operatorBlocked	Boolean	[0..1]		Measurement value is blocked and hence unavailable for transmission.
oscillatory	Boolean	[0..1]		To prevent some overload of the communication it is sensible to detect and suppress oscillating (fast changing) binary inputs. If a signal changes in a defined time (tosc) twice in the same direction (from 0 to 1 or from 1 to 0) then oscillation is detected and the detail quality identifier "oscillatory" is set. If it is detected a configured numbers of transient changes could be passed by. In this time the validity status "questionable" is set. If after this defined numbers of changes the signal is still in the oscillating state the value shall be set either to the opposite state of the previous stable value or to a defined default value. In this case the validity status "questionable" is reset and "invalid" is set as long as the signal is oscillating. If it is configured such that no transient changes should be passed by then the validity status "invalid" is set immediately in addition to the detail quality identifier "oscillatory" (used for status information only).
outOfRange	Boolean	[0..1]		Measurement value is beyond a predefined range of value.
overFlow	Boolean	[0..1]		Measurement value is beyond the capability of being represented properly. For example, a counter value overflows from maximum count back to a value of zero.
source	Source	[0..1]	See C.12	Source gives information related to the origin of a value. The value may be acquired from the process, defaulted or substituted.
suspect	Boolean	[0..1]		A correlation function has detected that the value is not consistent with other values. Typically set by a network State Estimator.
test	Boolean	[0..1]		Measurement value is transmitted for test purposes.
validity	Validity	[0..1]	See C.20	Validity of the measurement value.

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B.55 MeasurementValueSource fragment

Figure B.24 shows the payload fragment for **MeasurementValueSource**. A **MeasurementValueSource** describes the alternative sources updating a **MeasurementValue**. User conventions for how to use the **MeasurementValueSource** attributes are described in the introduction to IEC 61970-301.

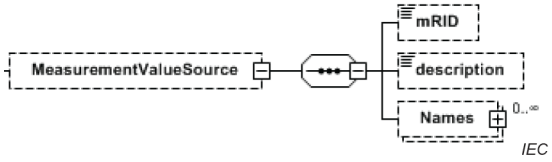


Figure B.24 – MeasurementValueSource payload fragment

The attributes of **MeasurementValueSource** that are used in IEC 61968-3 profiles are shown in Table B.51.

Table B.51 – MeasurementValueSource payload fragment

Meas: MeasurementValueSource				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of MeasurementValueSource.
description	String	[0..1]		Free-form description of MeasurementValueSource.
Names	Name	[0..*]	See B.56	Human-readable names for MeasurementValueSource.

B.56 Name fragment

Figure B.25 shows the payload fragment for **Name**. The **Name** class provides the means to define any number of human readable names for an object. A name is **not** to be used for defining inter-object relationships. For inter-object relationships instead use the object identification **mRID**.

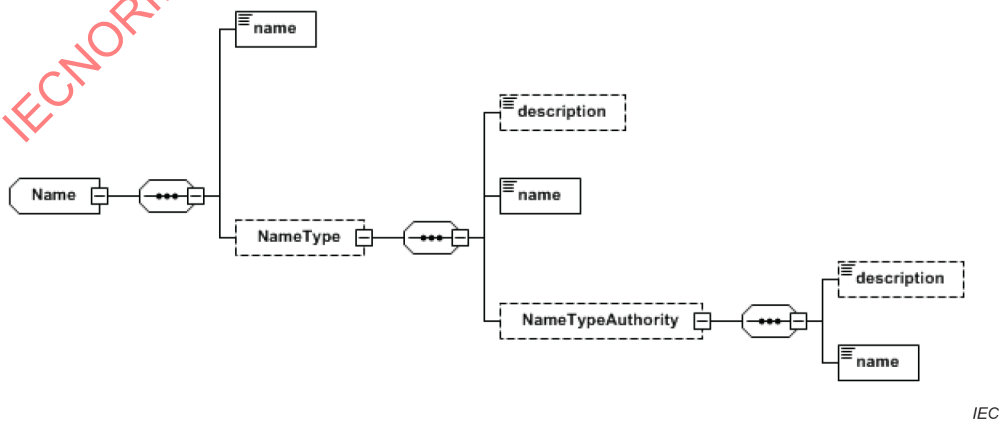


Figure B.25 – Name payload fragment

The attributes that are used in IEC 61968-3 profiles are shown in Table B.52.

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Table B.52 – Name payload fragment

Core: Name			
Attribute	**Data Type**	**Cardinality**	**Comments**
name	String	[1..1]	
NameType	NameType	[0..1]	See B.57

B.57 NameType fragment

This class defines the type of name. Possible values for attribute 'name' are implementation dependent but standard profiles may specify types. An enterprise may have multiple IT systems each having its own local name for the same object, e.g. a planning system may have different names from an EMS. An object may also have different names within the same IT system, e.g. localName as defined in CIM version 14. The definition from CIM14 is:

The localName is a human readable name of the object. It is a free text name local to a node in a naming hierarchy similar to a file directory structure. A power system related naming hierarchy may be: Substation, VoltageLevel, Equipment etc. Children of the same parent in such a hierarchy have names that typically are unique among them.

The attributes that are used in IEC 61968-3 profiles are shown in Table B.53.

Table B.53 – NameType payload fragment

Core: NameType			
Attribute	**Data type**	**Cardinality**	**Comments**
description	String	[0..1]	
name	String	[1..1]	
NameTypeAuthority	NameTypeAuthority	[0..1]	See B.58

B.58 NameTypeAuthority fragment

Authority responsible for creation and management of names of a given type; typically an organization or an enterprise system. The attributes that are used in IEC 61968-3 profiles are shown in Table B.54.

Table B.54 – NameTypeAuthority payload fragment

Core: NameTypeAuthority			
Attribute	**Data type**	**Cardinality**	**Description**
description	String	[0..1]	Description of the name type authority.
name	String	[1..1]	Name of the name type authority.

B.59 OperationalTag fragment

An **OperationalTag** is an operational tag placed on a power system resource or asset in the context of switching plan execution or other work in the field.

The attributes of **OperationalTag** that are used in IEC 61968-3 profiles are shown in Table B.55.

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Table B.55 – OperationalTag payload fragment

Operations: OperationalTag				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the tag
description	String	[0..1]		Free form description of the OperationalTag
Names	Name	[0..*]	See B.56	List of human-readable names associated with the tag.
comment	String	[0..1]		Comments to be associated with the OperationalTag
createdDateTime	DateTime	[0..1]		Date and time that the OperationalTag was added. Initially blank
lastModifiedDateTime	DateTime	[0..1]		Date and time that the OperationalTag was last modified; e.g. comment change
subject	String	[0..1]		Free form text
title	String	[0..1]		Free form text
revisionNumber	String	[0..1]		Can be used to increment whenever the OperationalTag is modified.
type	String	[0..1]		Mutually agreed set of text strings that describe the function that the tag performs, e.g. ‘Do not open’, ‘Do not close’, ‘Do not operate’
Approver	Approver	[0..1]	See B.8	Person who approved the tag.
Author	Author	[0..1]	See B.13	Person who placed the tag.
PowerSystemResource	PowerSytemResource	[0..1]	See B.68	PowerSystemResource – reference to PowerSystemResource that is tagged.
status	Status	[0..1]	See B.79	Status of the tag, either placed or removed. A status.value of ‘1’ means that the tag is placed, while a status.value of ‘0’ means that the tag is removed.

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B.60 Operator fragment

Figure B.26 shows the payload fragment for an **Operator**. An **Operator** is a person who is a user of an energy control system. In the context of this document, an **Operator** is a person who initiates the execution of a **SwitchingPlan** step.

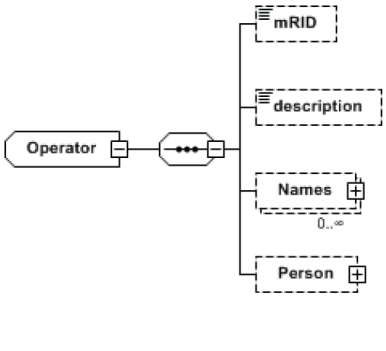


Figure B.26 – Operator payload fragment

The attributes of **Operator** that are used in IEC 61968-3 profiles are shown in Table B.56.

Table B.56 – Operator payload fragment

Common: Operator				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of Operator.
description	String	[0..1]		Free-form description of Operator.
Names	Name	[0..*]	See B.56	Human-readable names for Operator.
Person	Person	[0..1]	See B.65	General purpose information for name and other information to contact people.

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B.61 OperationsSafetySupervisor fragment

Figure B.27 shows the payload fragment for an **OperationsSafetySupervisor**. An **OperationsSafetySupervisor** is an **operator** with the responsibility that the work in high voltage installations is executed in a safe manner and according to safety regulations.

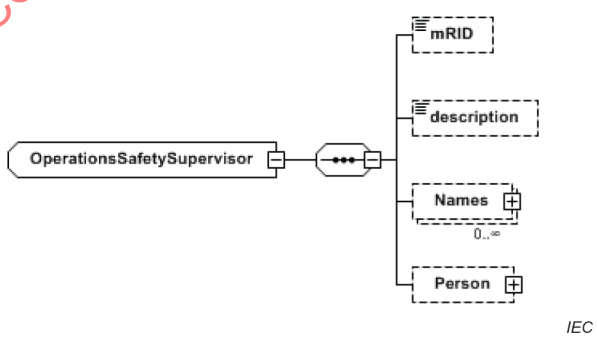


Figure B.27 – OperationsSafetySupervisor payload fragment

The attributes of **OperationsSafetySupervisor** that are used in IEC 61968-3 profiles are shown in Table B.57.

Table B.57 – OperationsSafetySupervisor payload fragment

Common: OperationsSafetySupervisor				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of OperationsSafetySupervisor.
description	String	[0..1]		Free-form description of OperationsSafetySupervisor.
Names	Name	[0..*]	See B.56	Human-readable names for OperationsSafetySupervisor.
Person	Person	[0..1]	See B.65	General purpose information for name and other information to contact people.

B.62 Organisation fragment

Figure B.28 shows the payload fragment for **Organisation**. An **Organisation** that might have roles as utility, contractor, supplier, manufacturer, customer, etc. The payload includes two phone numbers and an address of the organisation. In this document, **Organisation** is used to convey customer contact and switching plan requestor information.

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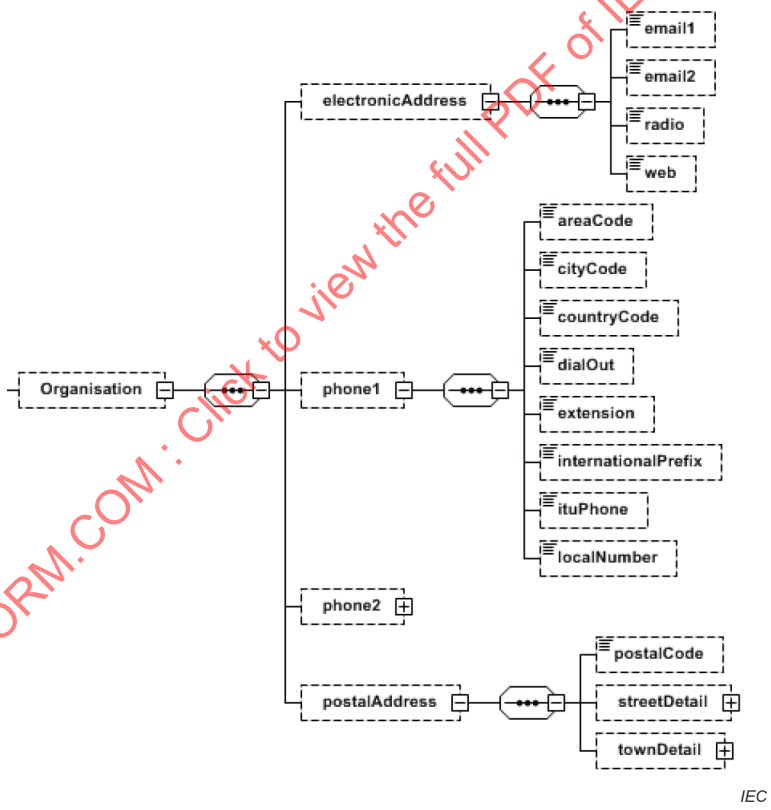


Figure B.28 – Organisation payload fragment

The attributes of **Organisation** that are used in IEC 61968-3 profiles are shown in Table B.58.

Table B.58 – Organisation payload fragment

Common: Organisation				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
electronicAddress	electronicAddress	[0..1]	See B.32	Email address of organisation.
phone1	TelephoneNumber	[0..1]	See B.89	Phone number.
phone2	TelephoneNumber	[0..1]	See B.89	Additional phone number.
postalAddress	StreetAddress	[0..1]	See B.80	Postal address, potentially different than 'streetAddress' (e.g., another city).

B.63 OutageIsolationEquipment fragment

Figure B.29 shows the payload fragment for the **OutageIsolationEquipment** part of the **UnplannedOutages** and **TroubleOrders** payloads.

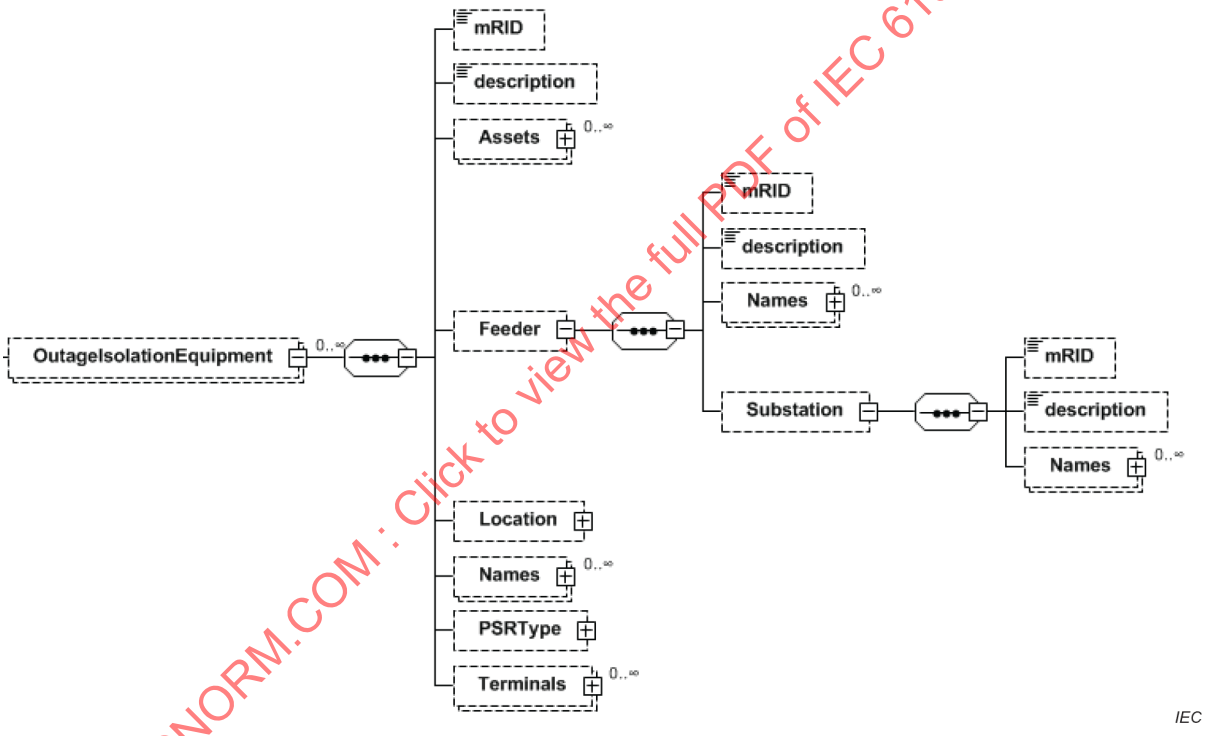


Figure B.29 – OutageIsolationEquipment payload fragment

This is a list of **ConductingEquipment** that is predicted or confirmed to be open for an **UnplannedOutage**. In a radial configuration there may be just one **ConductingEquipment**, but in meshed configurations there could be several equipments that are open to cause a predicted outage.

The attributes of **OutageIsolationEquipment** that are used in IEC 61968-3 profiles are described in B.17.

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B.64 OwnerShip fragment

Ownership is ownership of e.g. asset. In the context of IEC 61968-3, this can be used to indicate whether a damaged asset is shared. If it is shared then the joint owners(s) may need to be contacted to notify them the asset has been damaged and repairs may be necessary to the equipment that is associated with the shared asset. The Ownerships payload fragment is shown in Figure B.30.

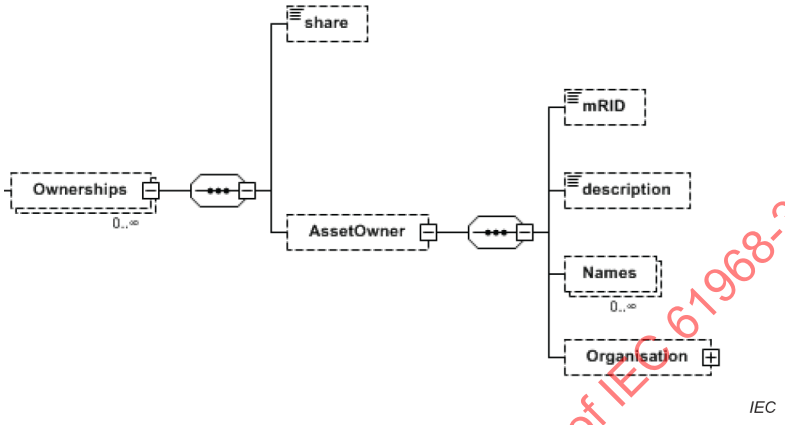


Figure B.30 – Ownerships payload fragment

The attributes of **OwnerShip** that are used in IEC 61968-3 profiles are shown in Table B.59.

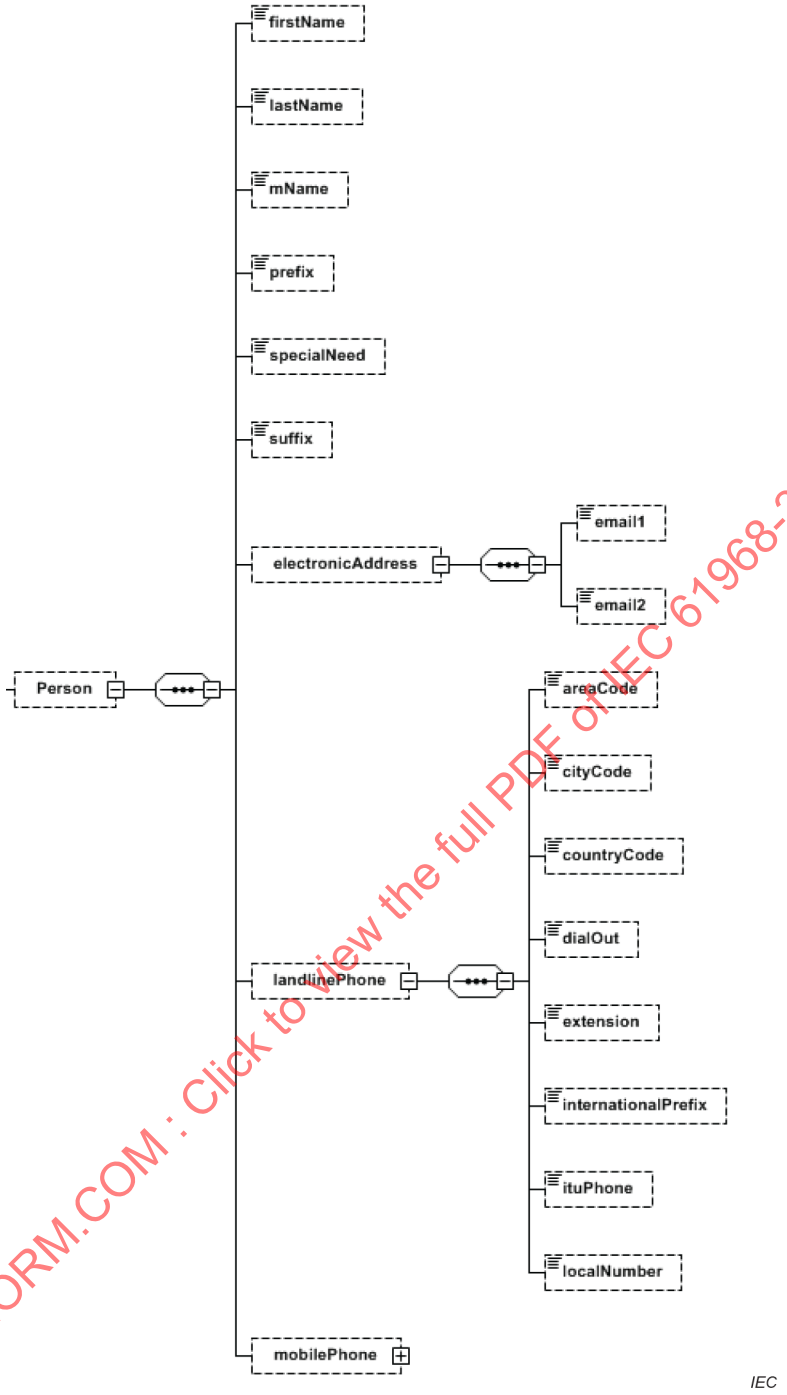
Table B.59 – OwnerShip payload fragment

Common: Ownership				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
share	PerCent	[0..1]		Share of this ownership.
AssetOwner	AssetOwner	[0..1]	See B.12	Contact information about the owner of the shared asset.

B.65 Person fragment

Figure B.31 shows the payload fragment for **person**. General purpose information for name and other information to contact people. For IEC 61968-3, this defines a person who participates in various activities and document actions such as approving and authoring.

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Figure B.31 – Person payload fragment

The attributes of **Person** that are used in IEC 61968-3 profiles are shown in Table B.60.

Table B.60 – Person payload fragment

Common: Person					
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**	**Used In Profiles**
firstName	String	[0..1]		Person's first name.	OperationalTags SwitchingActions SwitchingPlanRequests TroubleOrders
lastName	String	[0..1]		Person's last (family, sir) name.	OperationalTags SwitchingActions SwitchingPlanRequests TroubleOrders
mName	String	[0..1]		Middle name(s) or initial(s).	OperationalTags SwitchingActions SwitchingPlanRequests TroubleOrders
prefix	String	[0..1]		A prefix or title for the person's name, such as Miss, Mister, Doctor, etc.	OperationalTags SwitchingActions SwitchingPlanRequests TroubleOrders
suffix	String	[0..1]		A suffix for the person's name, such as II, III, etc.	OperationalTags SwitchingActions SwitchingPlanRequests TroubleOrders
specialNeed	String	[0..1]		Special service needs for the person (contact) are described; examples include life support, etc.	OperationalTags SwitchingActions SwitchingPlanRequests
electronicAddress	ElectronicAddress	[0..1]	See B.32	Electronic address.	OperationalTags SwitchingActions SwitchingPlanRequests
landlinePhone	TelephoneNumber	[0..1]	See B.89	Landline phone number.	OperationalTags SwitchingActions SwitchingPlanRequests
mobilePhone	TelephoneNumber	[0..1]	See B.89	Mobile phone number.	OperationalTags SwitchingActions SwitchingPlanRequests

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B.66 Pole fragment

A **Pole** is a pole asset. **Pole** inherits from **AssetContainer**, which in itself is an **Asset**.

The attributes of **Pole** that are used in IEC 61968-3 profiles are shown in Table B.61.

Table B.61 – Pole payload fragment

Assets: Pole				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the Pole
description	String	[0..1]		Free form description
Names	Name	[0..*]	See B.56	Human-readable names for the Pole.
baseKind	PoleBaseKind	[0..1]	See C.14	Kind of base for this pole.
breastBlock	Boolean	[0..1]		True if a block of material has been attached to base of pole in ground for stability. This technique is used primarily when anchors can not be used.
construction	String	[0..1]		The framing structure mounted on the pole.
diameter	Length	[0..1]		Diameter of the pole.
height	Length	[0..1]		Visible height of structure above ground level for overhead construction (e.g., Pole or Tower) or below ground level for an underground vault, manhole, etc. Refer to associated DimensionPropertiesInfo for other types of dimensions.
jpaReference	String	[0..1]		Joint pole agreement reference number.
length	Length	[0..1]		Length of the pole (inclusive of any section of the pole that may be underground post-installation).
ratedVoltage	Voltage	[0..1]		Maximum rated voltage of the equipment that can be mounted on/contained within the structure.
serialNumber	String	[0..1]		Serial number of this asset.
speciesType	String	[0..1]		Pole species. Aluminum, Aluminum Davit, Concrete, Fiberglass, Galvanized Davit, Galvanized, Steel Davit Primed, Steel Davit, Steel Standard Primed, Steel, Truncated, Wood-Treated, Wood-Hard, Wood-Salt Treated, Wood-Soft, Wood, Other, Unknown.
utcNumber	String	[0..1]		Uniquely tracked commodity (UTC) number. This could a bar code on an asset, for example.
Location	Location	[0..1]	See B.52	

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B.67 PositionPoint fragment

A PositionPoint is a set of spatial coordinates that determine a point, defined in the coordinate system specified in 'Location.CoordinateSystem'. Use a single position point instance to describe a point-oriented location. Use a sequence of position points to describe a line-oriented object (physical location of non-point oriented objects like cables or lines), or area of an object (like a substation or a geographical zone – in this case, have first and last position point with the same values). The attributes that are used in IEC 61968-3 profiles are defined in Table B.62.

Table B.62 – PositionPoint payload fragment

Common: PositionPoint				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
groupNumber	Integer	[0..1]		Zero-relative sequence number of this group within a series of points; used when there is a need to express disjoint groups of points that are considered to be part of a single location.
sequenceNumber	Integer	[0..1]		Zero-relative sequence number of this point within a series of points.
xPosition	String	[0..1]		X axis position.
yPosition	String	[0..1]		Y axis position.
zPosition	String	[0..1]		(if applicable) Z axis position.

B.68 PowerSystemResource fragment

A power system resource can be an item of equipment such as a switch, an equipment container containing many individual items of equipment such as a substation, or an organisational entity such as sub-control area. Power system resources can have measurements associated with them.

Figure B.32 shows the detail of the **PowerSystemResource** payload fragment. Not all elements are shown, since they vary from one profile to another as noted in Table B.63.

The attributes of **PowerSystemResource** that are used in IEC 61968-3 profiles are shown in Table B.63.

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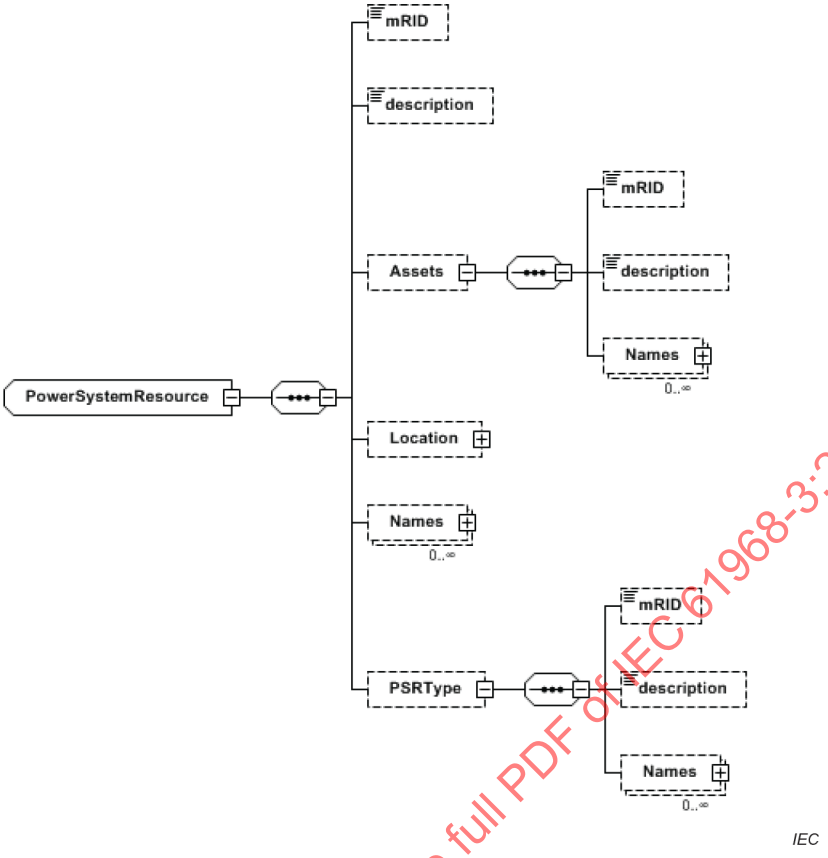


Figure B.32 – PowerSystemResource fragment

Table B.63 – PowerSystemResource payload fragment

Core: PowerSystemResource					
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**	**Used in profiles**
mRID	String	[0..1]	GUID	mRID of the PowerSystemResource	All
description	String	[0..1]		Description of the **PowerSystemResource**	All
Names	Name	[0..*]	See B.56	List of names of the **PowerSystemResource**.	All
Assets	Asset	[0..*]	See B.9	List of assets associated with the **PowerSystemResource**.	**PSRControls**, **PSRMeasurements**, **SwitchingActions**, **SwitchingEvents**, SwitchingPlans
Feeder	Feeder	[0..1]	See B.41	Feeder associated with this **PowerSystemResource**	**Incidents**, **TroubleOrders**
Location	Location	[0..1]	See B.52	**Location** of the **PowerSystemResource**.	**PSRControls**, **PSRMeasurements**, **SwitchingActions**, **SwitchingEvents**, SwitchingPlans

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Core: PowerSystemResource					
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**	**Used in profiles**
PSRType	PSRType	[0..1]	See B.71	Free form text describing the type of the **PowerSystemSource**, e.g. blade switch, air break switch, elbow, fuse, circuit breaker, etc.	Incidents, **PSRControls**, **PSRMeasurements**, **SwitchingActions**, **SwitchingEvents**, SwitchingPlans

B.69 **Priority** fragment

Priority definition.

The attributes of **Priority** that are used in IEC 61968-3 profiles are shown in Table B.64.

Table B.64 – Priority payload fragment

Common: Priority				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
Justification	String	[0..1]		Justification for 'rank'.
rank	Integer	[0..1]		Priority level; usually, lower number means high priority, but the details are provided in 'type'.
type	String	[0..1]		Type describing 'rank'; e.g., high, emergency, etc.

B.70 **ProductAssetModel** fragment

The model of an asset.

The attributes of **ProductAssetModel** that are used in IEC 61968-3 profiles are shown in Figure B.33 and Table B.65.

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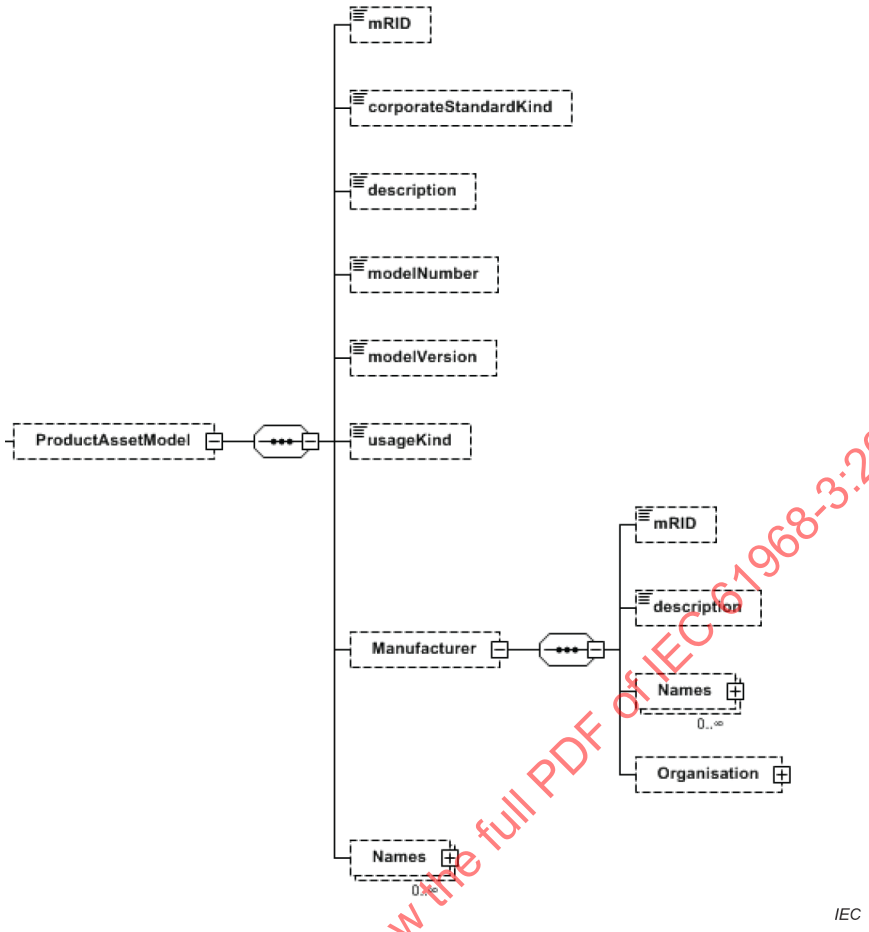


Figure B.33 – ProductAssetModel fragment

Table B.65 – ProductAssetModel payload fragment

Assets: ProductAssetModel				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of this ProductAssetModel
description	String	[0..1]		Free-form description
Names	Name	[0..1]	See B.56	Human-readable names
corporateStandardKind	CorporateStandardKind	[0..1]	See C.5	Kind of corporate standard for this asset model.
modelNumber	String	[0..1]		Manufacturer's model number.
modelVersion	String	[0..1]		Version number for product model, which indicates vintage of the product.
usageKind	AssetModelUsageKind	[0..1]	See C.3	Intended usage for this asset model.
Manufacturer	Manufacturer	[0..1]	See B.53	Manufacturer of this asset model.

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B.71 **PSRType** fragment

PSRType is used for classifying instances of the same class, e.g. overhead and underground ACLineSegments. This classification mechanism is intended to provide flexibility outside the scope of this standard, i.e. provide customisation that is non standard.

The attributes of **PSRType** that are used in IEC 61968-3 profiles are shown in Table B.66.

Table B.66 – PSRType payload fragment

Core: PSRType				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of PSRType.
description	String	[0..1]		Free-form description of PSRType.
Names	Name	[0..*]	See B.56	Human-readable names for PSRType.

B.72 **ReleasedBySupervisor** fragment

Figure B.34 shows the payload fragment for **ReleasedBySupervisor**. A **ReleasedBySupervisor** is a **FieldSafetySupervisor** who performs the role of releasing a clearance, permit or safety document back to an **OperationsSafetySupervisor**.

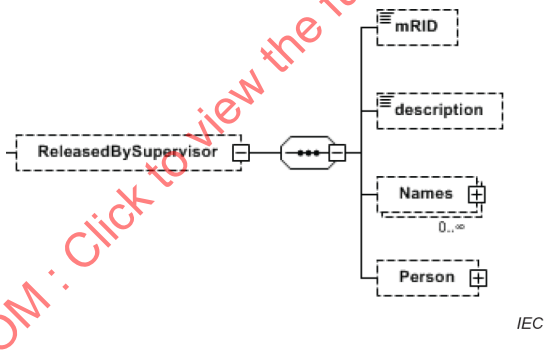


Figure B.34 – ReleasedBySupervisor payload fragment

The attributes of **ReleasedBySupervisor** that are used in IEC 61968-3 profiles are of type **FieldSafetySupervisor** and are described in B.42.

B.73 **ReleasedToSupervisor** fragment

Figure B.35 shows the payload fragment for **ReleasedToSupervisor**. A **ReleasedToSupervisor** is an **OperationsSafetySupervisor** who performs the role of receiving a clearance, permit or safety document back from a **FieldSafetySupervisor**.

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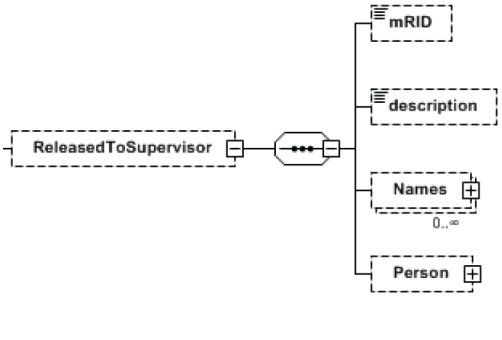


Figure B.35 – ReleasedToSupervisor payload fragment

The attributes of **ReleasedToSupervisor** that are used in IEC 61968-3 profiles are of type **OperationsSafetySupervisor** and are described in B.61.

B.74 RevisionHistory fragment

Figure B.36 shows the payload fragment for **RevisionHistory**. A **RevisionHistory** is the history of changes made to a **SwitchingStep** after the **SwitchingPlan** has been approved. It is used to keep a permanent record of changes made to a **SwitchingPlan** and to ensure that **SwitchingStep**s retain their numbering even when steps are added or removed.

In the days of paper written switching plans, a step that could not be executed due to field conditions such as switch being inaccessible, the step would be crossed out in the switching plan. Both the field crew and the control room operator would cross the step out in their copy of the switching plan and indicate that the step is void. This is indicated by the kind element being set to a value of **void**. This ensure that the steps following the voided step would continue to be numbered as before, so that there would be no confusion as to which steps are being executed.

In a similar way, if a step has to be added, it is added, it is shown as a sub-numbered step in the switching plan, e.g. step 3, substep 1, if the step is inserted after step 3. This is indicated using a kind of **added**.

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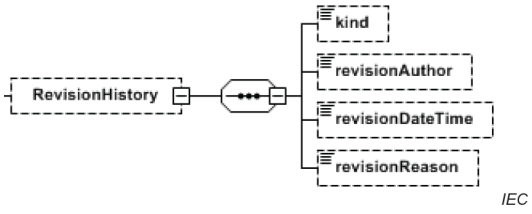


Figure B.36 – RevisionHistory payload fragment

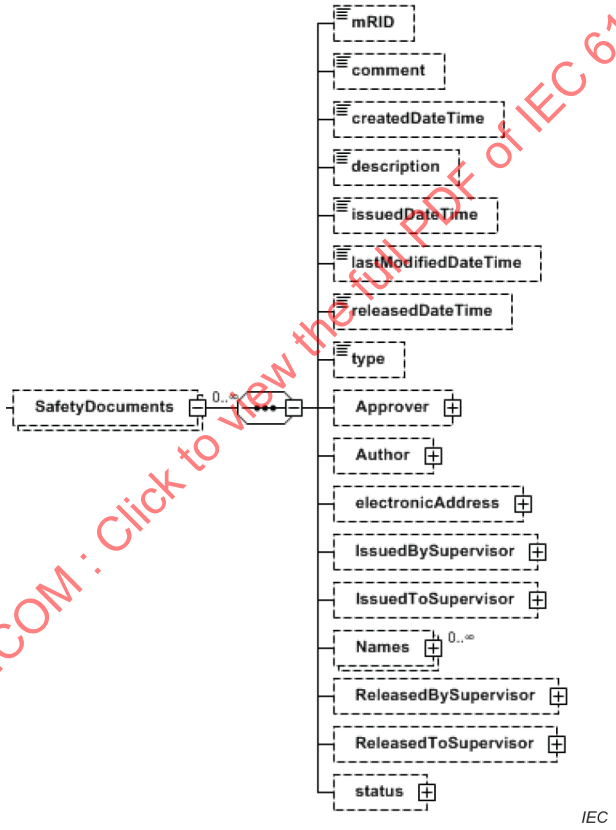
The attributes of **RevisionHistory** that are used in IEC 61968-3 profiles are shown in Table B.67.

Table B.67 – RevisionHistory payload fragment

Operations: RevisionHistory				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
kind	RevisionKind	[0..1]	See Annex C.15	Whether the step has been added or voided (deleted)
revisionAuthor	String	[0..1]		Person who made the change.
revisionDateTime	DateTime	[0..1]		When the change was made.
revisionReason	String	[0..1]		The reason for the change.

B.75 SafetyDocument fragment

Figure B.37 shows the details of the **SafetyDocument** payload fragment.



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Figure B.37 – SafetyDocument payload fragment

The attributes of **SafetyDocument** that are used in IEC 61968-3 profiles are shown in Table B.68.

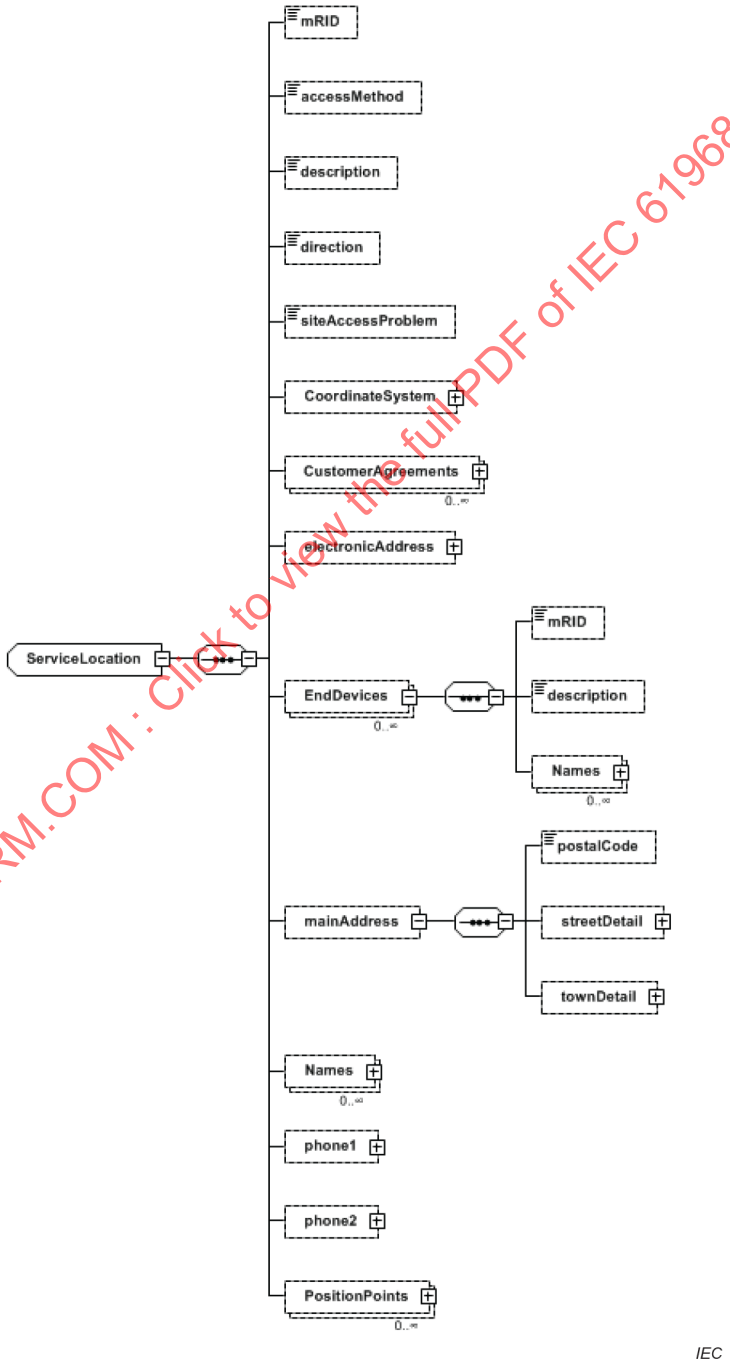
Table B.68 – SafetyDocument payload fragment

Operations: SafetyDocument				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	**mRID** of the **SafetyDocument**
Names	Name	[0..*]	See B.56	Names used for the SafetyDocument, such as an internal SafetyDocument number.
description	String	[0..1]		Free form description of the **SafetyDocument**
comment	String	[0..1]		Free form comments associated with the SafetyDocument
createdDateTime	DateTime	[0..1]		Date and time that the safety document was created.
issuedDateTime	DateTime	[0..1]		Date and time this safety document has been issued.
releasedDateTime	DateTime	[0..1]		Date and time this safety document has been released.
type	String	[0..1]		String describing the type of the safety document.
Approver	Approver	[0..1]	See B.8	Person who approved the safety document.
Author	Author	[0..1]	See B.13	Person who wrote the safety document.
electronicAddress	electronicAddress	[0..1]	See B.32	Electronic address associated with the safety document. This could be the author of the safety document.
IssuedBySupervisor	OperationsSafetySupervisor	[0..1]	See B.61	Person who issued the safety document.
IssuedToSupervisor	FieldSafetySupervisor	[0..1]	See B.42	Person that the safety document was issued to.
ReleasedBySupervisor	FieldSafetySupervisor	[0..1]	See B.42	Person who released the safety document.
ReleasedToSupervisor	OperationsSafetySupervisor	[0..1]	See B.61	Person that the safety document was released to.
status	Status	[0..1]	See B.79	Current status of the safety document. E.g. status.value of 'Not Issued', 'Issued', 'Released'.

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B.76 **ServiceLocation** fragment

Figure B.38 shows the payload fragment for **ServiceLocation**. A **ServiceLocation** is a real estate location, commonly referred to as premises. To facilitate identifying the **ServiceLocation**, this payload fragment includes the list of **EndDevices** associated with this **ServiceLocation**. **EndDevices** in this case are the meters, so that crews can use the meter number to find the **ServiceLocation**. **accessMethod** can be used to convey a gate code for gated communities, for example, and **siteAccessProblem**, which can be used to convey information such as bad dogs or other information useful for the safety of the field crew. Customer information, such as phone numbers, is included in the **CustomerAgreements** part of this fragment (see B.26 for further details).



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Figure B.38 – ServiceLocation payload fragment

The attributes of **ServiceLocation** that are used in IEC 61968-3 profiles are shown in Table B.69.

Table B.69 – ServiceLocation payload fragment

Customers: ServiceLocation				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of ServiceLocation.
description	String	[0..1]		Free-form description of ServiceLocation.
Names	Name	[0..*]	See B.56	Human-readable names for ServiceLocation.
accessMethod	String	[0..1]		Method for the service person to access this service location. For example, a description of where to obtain a key if the facility is unmanned and secured. Could also be the gate code for a gated community.
direction	String	[0..1]		Free-form text describing driving directions of how to get to the ServiceLocation.
siteAccessProblem	String	[0..1]		Problems previously encountered when visiting or performing work on this location. Examples include: bad dog, violent customer, verbally abusive occupant, obstructions, safety hazards, etc.
CoordinateSystem	CoordinateSystem	[0..1]	See B.21	Defines the coordinate system used by the PositionPoints.
CustomerAgreements	CustomerAgreement	[0..*]	See B.26	Used to contact the customer at the ServiceLocation and to identify if the customer has special needs.
electronicAddress	electronicAddress	[0..1]	See B.32	Used to contact the customer at the ServiceLocation.
EndDevices	EndDevice	[0..*]	See B.33	List of meters associated with the ServiceLocation.
mainAddress	StreetAddress	[0..1]	See B.80	Street address of the ServiceLocation
phone1	TelephoneNumber	[0..1]	See B.89	Used to contact the customer at the ServiceLocation.
phone2	TelephoneNumber	[0..1]	See B.89	Used to contact the customer at the ServiceLocation.
PositionPoints	PositionPoint	[0..*]	See B.67	Coordinates of the ServiceLocation (e.g. lattitude/longitude), defined by CoordinateSystem.

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B.77 ServicePointOutageSummary fragment

The **ServicePointOutageSummary** class attributes that are used in IEC 61968-3 profiles are shown in Table B.70.

Table B.70 – ServicePointOutageSummary payload fragment

Operations: ServicePointOutageSummary			
Attribute	**Data type**	**Cardinality**	**Description**
criticalCount	Integer	[0..1]	Number of critical service (delivery) points affected by an outage.
totalCount	Integer	[0..1]	Number of all service (delivery) points affected by an outage.

B.78 ShuntCompensator fragment

A **ShuntCompensator** is a shunt capacitor or reactor or switchable bank of shunt capacitors or reactors. A section of a shunt compensator is an individual capacitor or reactor. A negative value for reactivePerSection indicates that the compensator is a reactor. ShuntCompensator is a single terminal device. Ground is implied.

The attributes of **ShuntCompensator** that are used in IEC 61968-3 profiles are shown in Table B.71 and graphically in Figure B.39.

Table B.71 – ShuntCompensator payload fragment

Wires: ShuntCompensator				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the ShuntCompensator
description	String	[0..1]		Free form description of the ShuntCompensator
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the ShuntCompensator.
Assets	Asset	[0..1]	See B.9	Assets associated with the ShuntCompensator, identified by its mRID, description and Names
Location	Location	[0..1]	See B.52	Geographic location of ShuntCompensator

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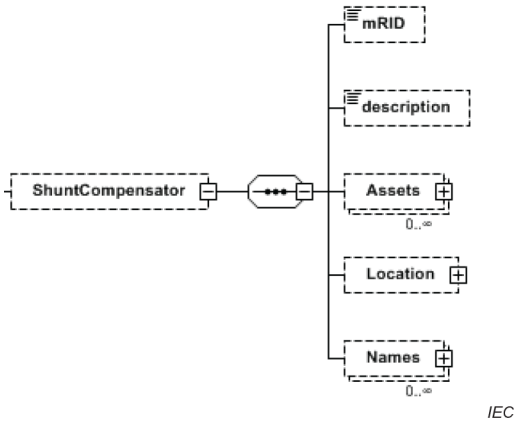


Figure B.39 – ShuntCompensator payload fragment

B.79 Status fragment

Figure B.40 shows the payload fragment for **Status**. **Status** defines current status information relevant to an entity.

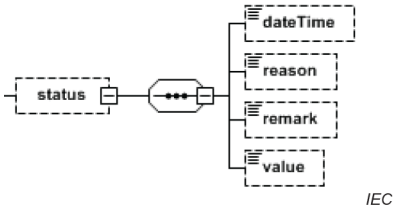


Figure B.40 – Status payload fragment

This class defines current status information relevant to an entity. The attributes used by IEC 61968-3 profiles are defined in Table B.72.

Table B.72 – Status payload fragment

Common: Status				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
dateTime	DateTime	[0..1]		Date and time for which status 'value' applies.
reason	String	[0..1]		Reason code or explanation for why an object went to the current status 'value'.
remark	String	[0..1]		Pertinent information regarding the current 'value', as free form text.
value	String	[0..1]		Status value at 'dateTime'; prior status changes may have been kept in instances of activity records associated with the object to which this status applies.

B.80 StreetAddress fragment

This class defines general purpose street and postal address information. The attributes that are used in IEC 61968-3 profiles are shown in Table B.73.

Table B.73 – StreetAddress payload fragment

Common: StreetAddress			
Attribute	**Data type**	**Cardinality**	**Comments**
postalCode	String	[0..1]	
streetDetail	StreetDetail	[0..1]	See B.81
townDetail	TownDetail	[0..1]	See B.94

B.81 StreetDetail fragment

Figure B.41 shows the payload fragment for **StreetDetail**. A **StreetDetail** describes street details, in the context of address. The attributes of **StreetDetail** that are used in IEC 61968-3 profiles are shown in Table B.74.

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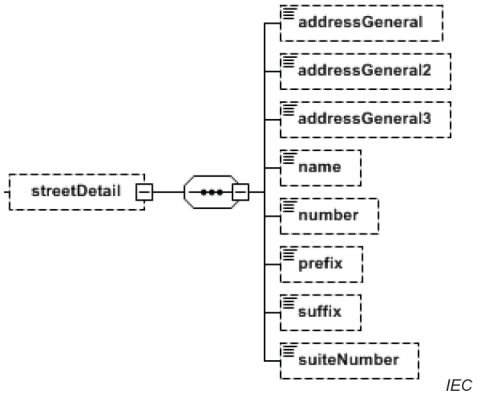


Figure B.41 – StreetDetail payload fragment

Table B.74 – StreetDetail payload fragment

Common: StreetDetail			
Attribute	**Data type**	**Cardinality**	**Description**
addressGeneral	String	[0..1]	First line of a free form address or some additional address information (for example a mail stop).
addressGeneral2	String	[0..1]	(if applicable) Second line of a free form address.
addressGeneral3	String	[0..1]	(if applicable) Third line of a free form address.
name	String	[0..1]	Name of the street.
number	String	[0..1]	Designator of the specific location on the street.
prefix	String	[0..1]	Prefix to the street name. For example: North, South, East, West.
suffix	String	[0..1]	Suffix to the street name. For example: North, South, East, West.
suiteNumber	String	[0..1]	Number of the apartment or suite.

B.82 StringMeasurement fragment

The attributes of **StringMeaasurement** that are used in IEC 61968-3 profiles are shown in Table B.75.

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Table B.75 – StringMeasurement payload fragment

Meas: StringMeasurement				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
measurementType	String	[0..1]		Specifies the type of measurement. For example, this specifies if the measurement represents an indoor temperature, outdoor temperature, bus voltage, line flow, etc. When the measurementType is set to "Specialization", the type of Measurement is defined in more detail by the specialized class which inherits from Measurement.
phases	PhaseCode	[0..1]	See C.12	Indicates to which phases the measurement applies and avoids the need to use 'measurementType' to also encode phase information (which would explode the types). The phase information in Measurement, along with 'measurementType' and 'phases' uniquely defines a Measurement for a device, based on normal network phase. Their meaning will not change when the computed energizing phasing is changed due to jumpers or other reasons. If the attribute is missing three phases (ABC) shall be assumed.
unitMultiplier	UnitMultiplier	[0..1]		The unit multiplier of the measured quantity.
unitSymbol	UnitSymbol	[0..1]		The unit of measure of the measured quantity.
StringMeasurementValues	StringMeasurementValue	[0..*]	See B.83	
PowerSystemResource	PowerSystemResource	[0..1]	See B.68	

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B.83 **StringMeasurementValue** fragment

The attributes of **StringMeaasurementValue** that are used in IEC 61968-3 profiles are shown in Table B.76.

Table B.76 – StringMeasurementValue payload fragment

Meas: StringMeasurementValue				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of StringMeasurementValue.
description	String	[0..1]		Free-form description of StringMeasurementValue.
Names	Name	[0..*]	See B.56	Human-readable names for StringMeasurementValue.
sensorAccuracy	PerCent	[0..1]		The limit, expressed as a percentage of the sensor maximum, that errors will not exceed when the sensor is used under reference conditions.
timestamp	DateTime	[0..1]		The time when the value was last updated
value	String	[0..1]		The value to supervise.
MeasurementValueQuality	MeasurementValueQuality	[0..1]	See B.53	Measurement quality flags. Bits 0-10 are defined for substation automation in draft IEC 61850 part 7-3. Bits 11-15 are reserved for future expansion by that document. Bits 16-31 are reserved for EMS applications.
MeasurementValueSource	MeasurementValueSource	[0..1]	See B.55	MeasurementValueSource describes the alternative sources updating a MeasurementValue. User conventions for how to use the MeasurementValueSource attributes are described in the introduction to IEC 61970-301.

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B.84 **Structure** fragment

A **Structure** is construction holding assets such as conductors, transformers, switchgear, etc. Where applicable, number of conductors can be derived from the number of associated wire spacing instances. **Structure** inherits from **AssetContainer**, which in itself is an **Asset**.

The attributes of **Structure** that are used in IEC 61968-3 profiles are shown in Table B.77.

Table B.77 – Structure payload fragment

Assets: Structure				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the Structure
description	String	[0..1]		Free form description
Names	Name	[0..*]	See B.56	Human-readable names for the Structure.
height	Length	[0..1]		Visible height of structure above ground level for overhead construction (e.g., Pole or Tower) or below ground level for an underground vault, manhole, etc. Refer to associated DimensionPropertiesInfo for other types of dimensions.
materialKind	StructureMaterialKind	[0..1]	See C.19	Material this structure is made of.
ratedVoltage	Voltage	[0..1]		Maximum rated voltage of the equipment that can be mounted on/contained within the structure.
Location	Location	[0..1]	See B.52	Location of the structure.
WireSpacingInfos	WireSpacing	[0..*]	See B.101	Wire arrangement on the structure.

B.85 Substation fragment

A **Substation** is a collection of equipment for purposes other than generation or utilization, through which electric energy in bulk is passed for the purposes of switching or modifying its characteristics.

The attributes of **Substation** that are used in IEC 61968-3 profiles are shown in Table B.78.

Table B.78 – Substation payload fragment

Core: Substation				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the Substation
description	String	[0..1]		Free form description of Substation
Names	Name	[0..*]	See B.56	Human-readable list of names associated with the Substation.

B.86 Switch fragment

A **Switch** is a generic device designed to close, or open, or both, one or more electric circuits. All switches are two terminal devices including grounding switches.

The attributes of **Switch** that are used in IEC 61968-3 profiles are shown in Table B.79.

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Table B.79 – Switch payload fragment

Wires: Switch				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of Switch.
description	String	[0..1]		Free-form description of Switch.
Names	Name	[0..*]	See B.56	Human-readable names for Switch.
Assets	Asset	[0..1]	See B.9	List of Assets associated with the Switch, identified by their mRID, description and Names
Location	Location	[0..1]	See B.52	Geographic Location of Switch.
SwitchPhase	SwitchPhase	[0..*]	See B.87	Phases to operate.

B.87 SwitchPhase fragment

Figure B.42 shows the payload fragment for **SwitchPhase**. A **SwitchPhase** is a single phase of a multi-phase switch when its attributes might be different per phase. Thus a three-phase unganged switch must have three separate **SwitchPhase**s associated with it.

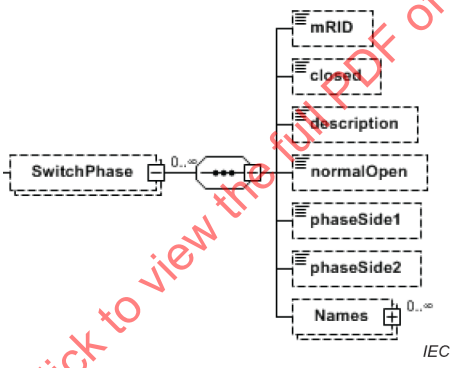


Figure B.42 – SwitchPhase payload fragment

A full description and an example of **SwitchPhase** is given in IEC 61970-301.

The attributes of **SwitchPhase** that are used in IEC 61968-3 profiles are shown in Table B.80.

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Table B.80 – SwitchPhase payload fragment

Wires: SwitchPhase				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of SwitchPhase.
description	String	[0..1]		Free-form description of SwitchPhase.
Names	Name	[0..*]	See B.56	Human-readable names for SwitchPhase.
closed	Boolean	[0..1]		Curent state of the SwitchPhase (open or closed)
normalOpen	Boolean	[0..1]		Used in cases when no Measurement for the status value is present. If the SwitchPhase has a status measurement the Discrete.normalValue is expected to match with this value. In this document this can be used to identify the normal open point in the network when creating switching plans.
phaseSide1	SinglePhaseKind	[0..1]	See C.12	Phase of this SwitchPhase on the side with terminal sequence number equal 1. Should be a phase contained in that terminal's phases attribute.
phaseSide2	SinglePhaseKind	[0..1]	See C.12	Phase of this SwitchPhase on the side with terminal sequence number equal 2. Should be a phase contained in that terminal's phases attribute.

B.88 TaggedPSRs fragment

A list of tagged PowerSystemResources (**TaggedPSRs**) is shown in Figure B.43.

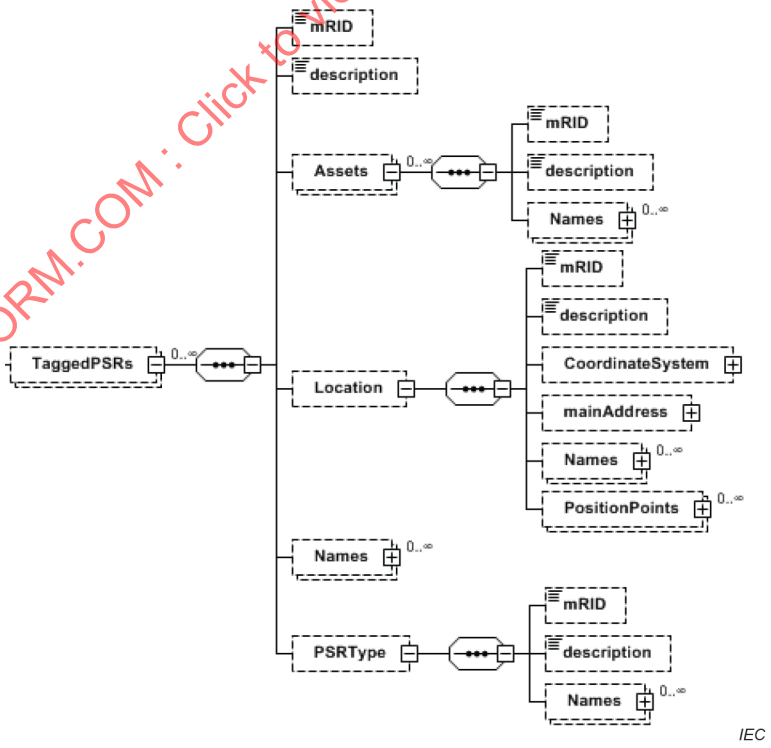


Figure B.43 – TaggedPSRs payload fragment

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The attributes of **TaggedPSRs** that are used in IEC 61968-3 profiles are shown in Table B.63 and are the same as the attributes of a PowerSystemResource. TaggedPSRs are used in **clearances** to identify the devices that are being used to isolate the part of the network that is subject to the **clearance**.

B.89 TelephoneNumber fragment

This class defines a telephone number. Its attributes that are used in IEC 61968-3 profiles are shown in Table B.81.

Table B.81 – TelephoneNumber payload fragment

Common: TelephoneNumber				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
areaCode	String	[0..1]		(if applicable) Area or region code.
cityCode	String	[0..1]		City code.
countryCode	String	[0..1]		Country code.
dialOut	String	[0..1]		(if applicable) Dial out code, for instance to call outside an enterprise.
extension	String	[0..1]		(if applicable) Extension for this telephone number.
internationalPrefix	String	[0..1]		(if applicable) Prefix used when calling an international number.
ituPhone	String	[0..1]		Phone number according to ITU E.164.
localNumber	String	[0..1]		Main (local) part of this telephone number.

B.90 Terminal fragment

Figure B.44 shows the payload fragment for **Terminal**. A **Terminal** is an AC electrical connection point to a piece of conducting equipment. Terminals are connected at physical connection points called connectivity nodes. It also defines the **phases**, using the enumeration **phaseCode** (e.g. A, AB, AC, ABC).

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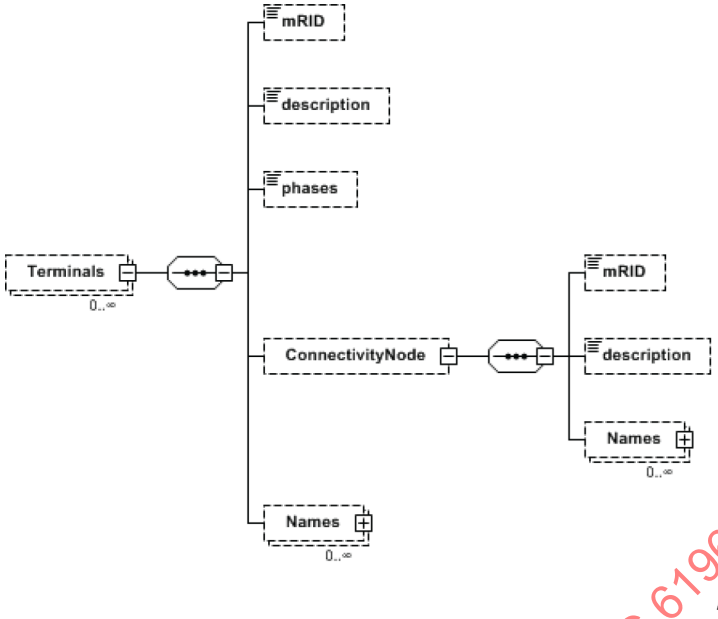


Figure B.44 – Terminal payload fragment

The attributes of **Terminal** that are used in IEC 61968-3 profiles are shown in Table B.82.

Table B.82 – Terminal payload fragment

Core: Terminal					
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**	**Used in Profiles**
mRID	String	[0..1]	GUID	mRID of Terminal.	EquipmentFaults, SwitchingActions, SwitchingEvents, SwitchingPlans
description	String	[0..1]		Free-form description of Terminal.	EquipmentFaults, SwitchingActions, SwitchingEvents, SwitchingPlans
Names	Name	[0..*]	See B.56	Human-readable names for Terminal.	EquipmentFaults, SwitchingActions, SwitchingEvents, SwitchingPlans
phases	PhaseCode	[0..1]	See C.12	Represents the normal network phasing condition. If the attribute is missing three phases (ABC or ABCN) shall be assumed.	EquipmentFaults, SwitchingActions, SwitchingEvents, SwitchingPlans

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Core: Terminal					
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**	**Used in Profiles**
ConnectityNode	ConnectivityNode	[0..1]	See B.20	Connectivity nodes are points where terminals of AC conducting equipment are connected together with zero impedance. In this document, ConnectivityNodes are used to connect temporary equipment to the network during switching operations and unplanned outage restoration.	SwitchingActions, SwitchingEvents, SwitchingPlans

B.91 **TimeSchedule** fragment

Figure B.44 shows the payload fragment for **TimeSchedule**. A **TimeSchedule** is a description of anything that changes through time. Time schedule is used to perform a single-valued function of time. Use inherited 'type' attribute to give additional information on this schedule, such as: periodic (hourly, daily, weekly, monthly, etc.), day of the month, by date, calendar (specific times and dates).

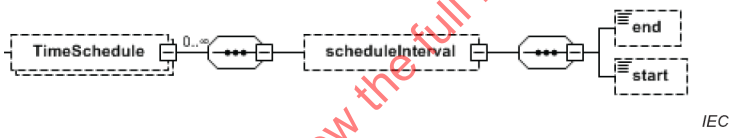


Figure B.45 – TimeSchedule payload fragment

The attributes of **TimeSchedule** that are used in IEC 61968-3 profiles are shown in Table B.83.

Table B.83 – TimeSchedule payload fragment

Common: TimeSchedule				
Attribute	**Data Type**	**Cardinality**	**Comments**	**Description**
scheduleInterval	DateTimeInterval	[0..1]		Schedule date and time interval.

B.92 **Tower** fragment

A **Tower** is a Tower asset. Dimensions of the Tower are specified in associated DimensionsInfo class.

When used for planning purposes, a transmission tower carrying two 3-phase circuits will have 2 instances of Connection, each of which will have 3 MountingPoint instances, one for each phase all with coordinates relative to a common origin on the tower. (It may also have a 3rd Connection with a single MountingPoint for the Neutral line). **Tower** inherits from **AssetContainer**, which in itself is an **Asset**.

The attributes of **Tower** that are used in IEC 61968-3 profiles are shown in Table B.84

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Table B.84 – Tower payload fragment

Assets: Tower				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the Tower
description	String	[0..1]		Free form description
Names	Name	[0..*]	See B.56	Human-readable names for the Tower.
constructionKind	TowerConstructionKind	[0..1]	See C.23	Construction structure on the tower.
height	Length	[0..1]		Visible height of structure above ground level for overhead construction (e.g., Pole or Tower) or below ground level for an underground vault, manhole, etc. Refer to associated DimensionPropertiesInfo for other types of dimensions.
kind	AssetKind	[0..1]	See C.1	Kind of asset. Used in description of asset components in asset instance templates.
materialKind	StructureMaterialKind	[0..1]	See C.19	Length of the pole (inclusive of any section of the pole that may be underground post-installation).
ratedVoltage	Voltage	[0..1]		Maximum rated voltage of the equipment that can be mounted on/contained within the structure.
serialNumber	String	[0..1]		Serial number of this asset.
type	String	[0..1]		Utility-specific classification of Asset and its subtypes, according to their corporate standards, practices, and existing IT systems (e.g., for management of assets, maintenance, work, outage, customers, etc.).
utcNumber	String	[0..1]		Uniquely tracked commodity (UTC) number. This could a bar code on an asset, for example.
Location	Location	[0..1]	See B.52	Location of this asset.

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B.93 TownDetail fragment

Figure B.46 shows the payload fragment for **TownDetail**. A **TownDetail** defines town details, in the context of address.

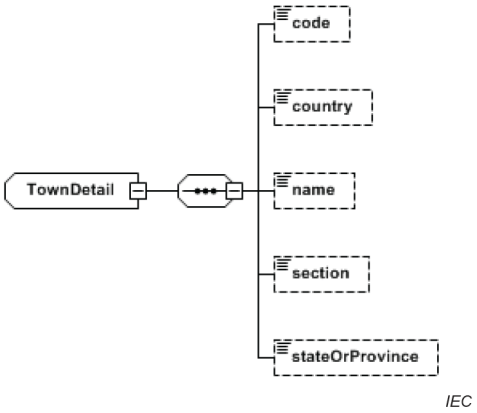


Figure B.46 – TownDetail payload fragment

The attributes used by IEC 61968-3 profiles are defined in Table B.85.

Table B.85 – TownDetail payload fragment

Common: TownDetail				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
code	String	[0..1]		Town code.
country	String	[0..1]		Name of the country.
name	String	[0..1]		Town name.
section	String	[0..1]		Town section. For example, it is common for there to be 36 sections per township.
stateOrProvince	String	[0..1]		Name of the state or province.

B.94 TroubleReporter fragment

Figure B.47 shows the payload fragment for **TroubleReporter**. A **TroubleReporter** defines a type and a person who reports trouble regarding the state of the electrical network.

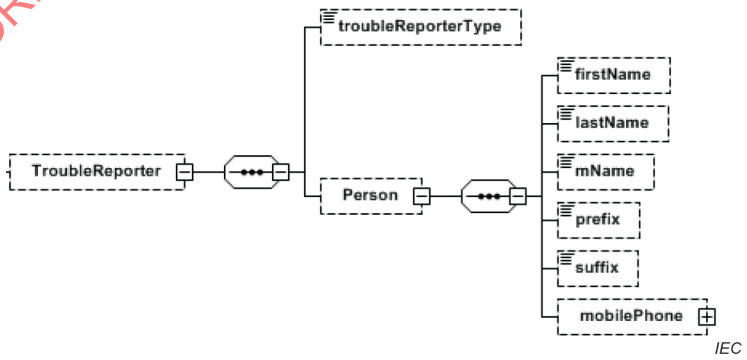


Figure B.47 – TroubleReporter payload fragment

The attributes used by IEC 61968-3 profiles are defined in Table B.86.

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Table B.86 – TroubleReporter payload fragment

Customer: TroubleReporter				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
troubleReporterType	String	[0..1]		Type of person reporting trouble, e.g. passer-by, first responder.
Person	Person	[0..1]	See B.65	Person who is reporting the trouble.

B.95 TroubleSymptoms fragment

Figure B.48 shows the payload fragment for **TroubleSymptoms**. **TroubleSymptoms** define symptoms reported by the person reporting the trouble. The symptoms provide clues to utility personnel analyzing the ticket to help identify the root cause of the problem.



Figure B.48 – TroubleSymptoms payload fragment

The attributes used by IEC 61968-3 profiles are defined in Table B.87.

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Table B.87 – TroubleSymptoms payload fragment

Customer: TroubleSymptoms				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
troubleSymptomsExtent	troubleSymptomsExtentKind	[0..1]	See C.25	The extent of the problem being reported.
troubleSymptomsExtentOther	String	[0..1]		The extent of the problem being reported that does not fit any of the enumeration values.
troubleSymptomsLight	troubleSymptomsLightKind	[0..1]	See C.26	The problem with lights being reported.
troubleSymptomsLightOther	String	[0..1]		The problem with lights being reported that does not fit any of the enumeration values.
troubleSymptomsPole	troubleSymptomsPoleKind	[0..1]	See C.27	The problem with pole being reported.
troubleSymptomsPoleOther	String	[0..1]		The pole problem being reported that does not fit any of the enumeration values.
troubleSymptomsTransformer	troubleSymptomsTransformerKind	[0..1]	See C.28	The problem with transformer being reported.
troubleSymptomsTransformerOther	String	[0..1]		The problem with transformer being reported that does not fit any of the enumeration values.
troubleSymptomsTree	troubleSymptomsTreeKind	[0..1]	See C.29	The problem with tree being reported.
troubleSymptomsTreeOther	String	[0..1]		The problem with tree being reported that does not fit any of the enumeration values.
troubleSymptomsWire	troubleSymptomsWireKind	[0..1]	See C.30	The problem with wire being reported.
troubleSymptomsWireOther	String	[0..1]		The problem with wire being reported that does not fit any of the enumeration values.

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B.96 **UndergroundStructure** fragment

An **UndergroundStructure** is an underground structure such as a vault or manhole that contains assets. **UndergroundStructure** inherits from **AssetContainer**, which in itself is an **Asset**.

The attributes of **UndergroundStructure** that are used in IEC 61968-3 profiles are shown in Table B.88.

Table B.88 – UndergroundStructure payload fragment

Assets: UndergroundStructure				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of the UndergroundStructure
description	String	[0..1]		Free form description
Names	Name	[0..*]	See B.56	Human readable names for the UndergroundStructure.
hasVentilation	Boolean	[0..1]		True if vault is ventilating.
kind	UndergroundStructureKind	[0..1]	See C.25	
material	String	[0..1]		Primary material of underground structure.
materialKind	StructureMaterialKind	[0..1]	See C.19	Material this structure is made of.
ratedVoltage	Voltage	[0..1]		Maximum rated voltage of the equipment that can be mounted on/contained within the structure.
Location	Location	[0..1]	See B.52	Location of the structure.

B.97 **UsagePoint** fragment

A **UsagePoint** is a logical or physical point in the network to which readings or events may be attributed. Used at the place where a physical or virtual meter may be located; however, it is not required that a meter be present.

The attributes of **UsagePoint** that are used in IEC 61968-3 profiles are shown in Table B.89. In this document, this is used by the **DeEnergizedUsagePoint** and **EnergizedUsagePoint** payload fragments to convey information about the energization status of each **UsagePoint** that is associated with an **UnplannedOutage**.

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Table B.89 – UsagePoint payload fragment

Metering: UsagePoint				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of UsagePoint.
description	String	[0..1]		Free-form description of UsagePoint.
Names	Name	[0..*]	See B.56	Human-readable names for UsagePoint.
CustomerAgreement	CustomerAgreement	[0..1]	See B.25	Agreement between the customer and the service supplier to pay for service at a specific service location. It records certain billing information about the type of service provided at the service location and is used during charge creation to determine the type of service.
EndDevices	EndDevice	[0..*]		Used to define the meters associated with this UsagePoint. This can help the field crew identify the location of an UnplannedOutage where there are multiple meters in close proximity, such as an apartment building. Asset container that performs one or more end device functions. One type of end device is a meter which can perform metering, load management, connect/disconnect, accounting functions, etc. Some end devices, such as ones monitoring and controlling air conditioners, refrigerators, pool pumps may be connected to a meter. All end devices may have communication capability defined by the associated communication function(s). An end device may be owned by a consumer, a service provider, utility or otherwise. There may be a related end device function that identifies a sensor or control point within a metering application or communications systems (e.g., water, gas, electricity). Some devices may use an optical port that conforms to the ANSI C12.18 standard for communications.
UsagePointLocation	UsagePointLocation	[0..1]	See B.98	Location of an individual usage point.

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B.98 UsagePointLocation fragment

A **UsagePointLocation** is the location of an individual usage point.

Figure B.49 shows the payload fragment for **UsagePointLocation**. It defines the location of a usage point, but not customer information. The payload includes **accessMethod**, which can be used to convey a gate code for gated communities, for example, and **siteAccessProblem**, which can be used to convey information such as bad dogs or other information useful for the safety of the field crew.



Figure B.49 – UsagePointLocation payload fragment

Note that whenever a **UsagePointLocation** is part of a message payload, either the required contents of the **UsagePointLocation** can be sent as part of the payload, or just the **mRID**. However, if just the **mRID** is sent, then a **UsagePointLocationConfig** message with that **mRID** must have been previously exchanged between the participating systems prior to using the **mRID**. See Clause D.5 for details of the **UsagePointLocationConfig** message.

Customer location and contact information is part of the **ServiceLocation** fragment (see Clause B.75).

The attributes of **UsagePointLocation** that are used in IEC 61968-3 profiles are shown in Table B.90.

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Table B.90 – UsagePointLocation payload fragment

Metering: UsagePointLocation				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of UsagePointLocation.
description	String	[0..1]		Free-form description of UsagePointLocation.
Names	Name	[0..*]	See B.56	Human-readable names for UsagePointLocation.
accessMethod	String	[0..1]		Method for the service person to access this usage point location. For example, a description of where to obtain a key if the facility is unmanned and secured.
direction	String	[0..1]		Direction that allows field crews to quickly find a given asset. For a given location, such as a street address, this is the relative direction in which to find the asset. For example, a streetlight may be located at the "NW" (northwest) corner of the customer's site, or a usage point may be located on the second floor of an apartment building.
remark	String	[0..1]		Remarks about this location.
siteAccessProblem	String	[0..1]		Problems previously encountered when visiting or performing work at this location. Examples include: bad dog, violent customer, verbally abusive occupant, obstructions, safety hazards, etc.
CoordinateSystem	CoordinateSystem	[0..1]	See B.21	Coordinate system used by PositionPoints
mainAddress	StreetAddress	[0..1]	See B.80	Address of the usage point.
PositionPoints	PositionPoint	[0..*]	See B.67	Coordinates of the usage point

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B.99 WirePhaseInfo fragment

A **WirePhaseInfo** is information on a wire carrying a single phase.

The attributes of **WirePhaseInfo** that are used in IEC 61968-3 profiles are shown in Table B.91.

Table B.91 – WirePhaseInfo payload fragment

AssetInfo: WirePhaseInfo				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
phaseInfo	SinglePhaseKind	[0..1]	See C.17	Phase information.

B.100 WirePosition fragment

A **WirePosition** is the identification, spacing and configuration of the wires of a conductor with respect to a structure.

The attributes of **WirePosition** that are used in IEC 61968-3 profiles are shown in Table B.92.

Table B.92 – WirePosition payload fragment

AssetInfo: WirePosition				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
xCoord	Displacement	[0..1]		Signed horizontal distance from the wire at this position to a common reference point..
yCoord	Displacement	[0..1]		Signed vertical distance from the wire at this position: above ground (positive value) or burial depth below ground (negative value).
WirePhaseInfo	WirePhaseInfo	[0..*]	See B.99	Information on a wire carrying a single phase.

B.101 WireSpacing fragment

A **WireSpacing** is wire spacing data that associates multiple wire positions with the line segment, and allows to calculate line segment impedances. Number of phases can be derived from the number of associated wire positions whose phase is not neutral.

The attributes of **WireSpacing** that are used in IEC 61968-3 profiles are shown in Table B.93.

Table B.93 – WireSpacing payload fragment

AssetInfo: WireSpacing				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
isCable	Boolean	[0..1]		If true, this spacing data describes a cable.
phaseWireCount	Integer	[0..1]		Number of wire sub-conductors in the symmetrical bundle (typically between 1 and 4).
phaseWireSpacing	Length	[0..*]		Distance between wire sub-conductors in a symmetrical bundle.
usage	WireUsageKind	[0..1]	See C.33	Usage of the associated wires.
WirePositions	WirePosition	[0..*]	See B.100	

B.102 WorkActivityRecord fragment

A **WorkActivityRecord** records information about the status of work or work task at a point in time.

The attributes of **WorkActivityRecord** that are used in IEC 61968-3 profiles are shown in Table B.94.

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Table B.94 – WorkActivityRecord payload fragment

Work: WorkActivityRecord				
Attribute	**Data type**	**Cardinality**	**Comments**	**Description**
mRID	String	[0..1]	GUID	mRID of WorkActivityRecord.
description	String	[0..1]		Free-form description of WorkActivityRecord.
Names	Name	[0..*]	See B.56	Human-readable names for WorkActivityRecord.
createdDateTime	DateTime	[0..1]		Date and time this activity record has been created (different from the 'status.dateTime', which is the time of a status change of the associated object, if applicable).
percentComplete	PerCent	[0..1]		Estimated percentage of completion of this individual work task or overall work order.
reason	String	[0..1]		Reason for event resulting in this activity record, typically supplied when user initiated.
severity	String	[0..1]		Severity level of event resulting in this activity record.
type	String	[0..1]		Type of event resulting in this activity record.
Assets	Assets	[0..*]	See B.9	List of assets that are involved in this WorkActivityRecord
status	Status	[0..1]	See B.79	Information on consequence of event resulting in this activity record.

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Annex C
(normative)

Enumerated classes

Enumerated classes are restricted lists of options. The base class is often a string data type, but instead of allowing any string, restricts the string to a specific value.

C.1 AssetKind enumeration class

Table C.1 shows kinds of assets or asset components.

Table C.1 – AssetKind

Assets: AssetKind		
Attribute	**Data Type**	**Description**
breakerAirBlastBreaker	String = “breakerAirBlastBreaker”	Air blast circuit breaker.
breakerBulkOilBreaker	String = “breakerBulkOilBreaker”	Bulk oil circuit breaker.
breakerMinimumOilBreaker	String = “breakerMinimumOilBreaker”	Minimum oil circuit breaker.
breakerSF6DeadTankBreaker	String = “breakerSF6DeadTankBreaker”	SF6 dead tank breaker.
breakerSF6LiveTankBreaker	String = “breakerSF6LiveTankBreaker”	SF6 live tank breaker.
breakerTankAssembly	String = “breakerTankAssembly”	Breaker tank assembly.
breakerInsulatingStackAssembly	String = “breakerInsulatingStackAssembly”	Breaker insulating stack assembly (for live tank breaker).
transformer	String = “transformer”	Transformer.
transformerTank	String = “transformer”	Transformer tank.
other	String = “other”	Other type of Asset. The type attribute may provide more details in this case.

C.2 AssetLifeCycleStateKind enumeration class

Table C.2 shows lifecycle states an asset can be in.

While the possible lifecycle states are standardized, the allowed transitions are not – they are intended to be defined by the business process requirements of local implementations.

Table C.2 – AssetLifeCycleStateKind

Assets: AssetLifeCycleStateKind		
Attribute	**Data Type**	**Description**
manufactured	String = “manufactured”	Asset manufactured.
purchased	String = “purchased”	Asset purchased.
received	String = “received”	Asset received.
retired	String = “retired”	Asset retired.
disposedOf	String = “disposedOf”	Asset disposed of.

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C.3 AssetModelUsageKind enumeration class

Table C.3 shows usage for an asset model.

Table C.3 – AssetModelUsageKind

Assets: AssetModelUsageKind		
Attribute	**Data Type**	**Description**
customerSubstation	String = “customerSubstation”	Asset model is intended for use in customer substation.
distributionOverhead	String = “distributionOverhead”	Asset model is intended for use in distribution overhead network.
distributionUnderground	String = “distributionUnderground”	Asset model is intended for use in underground distribution network.
other	String = “other”	Other kind of asset model usage.
streetlight	String = “streetlight”	Asset model is intended for use as streetlight.
substation	String = “substation”	Asset model is intended for use in substation.
transmission	String = “transmission”	Asset model is intended for use in transmission network.
unknown	String = “unknown”	Usage of the asset model is unknown.

C.4 ClearanceActionKind enumeration class

Table C.4 shows type of clearance action.

Table C.4 – ClearanceActionKind

Operations: ClearanceActionKind		
Attribute	**Data Type**	**Description**
issue	String = “issue”	Issue clearance.
update	String = “update”	Update clearance.
release	String = “release”	Release clearance.

C.5 CorporateStandardKind enumeration class

Table C.5 shows kind of corporate standard.

Table C.5 – CorporateStandardKind

Assets: CorporateStandardKind		
Attribute	**Data Type**	**Description**
experimental	String = “experimental”	Asset model is used experimentally.
other	String = “other”	Other kind of corporate standard for the asset model.
standard	String = “standard”	Asset model is used as corporate standard.
underEvaluation	String = “underEvaluation”	Asset model usage is under evaluation.

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C.6 CrewStatusKind enumeration class

Table C.6 defines the current status of the crew – assigned, arrived, etc.

Table C.6 – CrewStatusKind

Common: CrewStatusKind		
Attribute	**Data Type**	**Description**
arrived	String = “arrived”	The crew is on site at the outage location
assigned	String = “assigned”	The crew has been assigned to work on a task
awaitingCrewAssignment	String = “awaitingCrewAssignment”	Indicates that the work is awaiting one or more crews to be assigned
enroute	String = “enroute”	The crew has been dispatched to work on an outage
fieldComplete	String = “fieldComplete”	The crew has corrected the outage in the field. The equipment or other devices may not be energized at this time.

C.7 CustomerKind enumeration class

Table C.7 shows kind of customer.

Table C.7 – CustomerKind

Customers: CustomerKind		
Attribute	**Data Type**	**Description**
residential	String = “residential”	Residential customer.
residentialAndCommercial	String = “residentialAndCommercial”	Residential and commercial customer.
residentialAndStreetlight	String = “awaitingCrewAssignment”	Residential and streetlight customer.
residentialStreetlightOthers	String = “residentialAndStreetlight”	Residential streetlight or other related customer.
residentialFarmService	String = “residentialFarmService”	Residential farm service customer.
commercialIndustrial	String = “fieldComplete”	Commercial industrial customer.
pumpingLoad	String = “pumpingLoad”	Pumping load customer.
windMachine	String = “windMachine”	Wind machine customer.
energyServiceSupplier	String = “energyServiceSupplier”	Customer as energy service supplier.
energyServiceScheduler	String = “energyServiceScheduler”	Customer as energy service scheduler.
internalUse	String = “internalUse”	Internal use customer.
enterprise	String = “enterprise”	
regionalOperator	String = “regionalOperator”	
subsidiary	String = “subsidiary”	
other	String = “other”	Other kind of customer.

C.8 ERTConfidenceKind enumeration class

The estimated time of restoration can have a confidence factor applied such as high or low confidence that the ERT will be accomplished. This confidence factor may be updated as

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needed during the outage period – just as the actual ERT can be updated. Table C.8 shows the possible values that ERTConfidenceKind can have.

Table C.8 – ERTConfidenceKind

Operations: ERTConfidenceKind		
Attribute	**Data Type**	**Description**
high	String = “high”	There is a high confidence that the ERT will be accomplished
low	String = “low”	There is a low confidence that the ERT will be accomplished.

C.9 InUseStateKind enumeration class

This enumeration describes possible 'in use' states that an asset can be in, as shown in Table C.9.

Table C.9 – InUseStateKind

Assets: InUseStateKind		
Attribute	**Data Type**	**Description**
inUse	String = “inUse”	Asset is deployed (in use) or is being put into use.
notReadyForUse	String = “notReadyForUse”	Asset is not ready to be put into use.
readyForUse	String = “readyForUse”	Asset is ready to be put into use.

C.10 OutageCauseKind enumeration class

This enumeration describes the primary cause of the outage – planned, unplanned, etc., as shown in Table C.10.

Table C.10 – OutageCauseKind

Operations: OutageCauseKind		
Attribute	**Data Type**	**Description**
lightningStrike	String = “lightningStrike”	
animal	String = “animal”	This outage was caused by an animal and was unplanned. As such it is treated as a forced outage and is probably classified as "trouble" with a Trouble Ticket as well as a work/service order. The primary difference between this and an unplanned outage is the reason for the outage. If an animal caused this and perished as a result, the utility may have other actions that are required to be taken by the EPA or other groups with whom the utility has an agreement.
lineDown	String = “lineDown”	
poleDown	String = “poleDown”	
treeDown	String = “treeDown”	

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C.11 OutageStatusKind enumeration class

This defines if the outage have been predicted or confirmed, as shown in Table C.11.

Table C.11 – OutageStatusKind

Operations: OutageStatusKind		
Attribute	**Data Type**	**Description**
confirmed	String = “confirmed”	The outage has been verified
predicted	String = “predicted”	The outage may not be real since it has not been verified – it is only thought to be an outage.
partiallyRestored	String = “partiallyRestored”	Some of the usage points affected by the outage have been restored but other usage points are still out of power.
restored	String = “restored”	All usage points associated with the outage have been restored
closed	String = “closed”	The outage has been fully restored, the crews have been released and the outage is shown as closed

C.12 PhaseCode enumeration class

An unordered enumeration of phase identifiers. Allows designation of phases for both transmission and distribution equipment, circuits and loads. The enumeration, by itself, does not describe how the phases are connected together or connected to ground. Ground is not explicitly denoted as a phase.

Residential and small commercial loads are often served from single-phase, or split-phase, secondary circuits. For example of s12N, phases 1 and 2 refer to hot wires that are 180 degrees out of phase, while N refers to the neutral wire. Through single-phase transformer connections, these secondary circuits may be served from one or two of the primary phases A, B, and C. For three-phase loads, use the A, B, C phase codes instead of s12N. Table C.12 shows the possible values of PhaseCode.

Table C.12 – PhaseCode

Core: PhaseCode		
Attribute	**Data Type**	**Description**
A	Integer = 128	Phase A
AB	Integer = 132	Phases A and B
ABC	Integer = 224	Phases A, B and C
ABCN	Integer = 225	Phases A, B, C, and N.
ABN	Integer = 193	Phases A, B, and neutral.
AC	Integer = 96	Phases A and C.
ACN	Integer = 41	Phases A, C and neutral.
AN	Integer = 129	Phases A and neutral.
B	Integer = 64	Phase B.
BC	Integer = 66	Phases B and C.
BCN	Integer = 97	Phases B, C, and neutral.
BN	Integer = 65	Phases B and neutral.
C	Integer = 32	Phase C.
CN	Integer = 33	Phases C and neutral.
N	Integer = 16	Neutral phase.

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Core: PhaseCode		
Attribute	**Data Type**	**Description**
X	Integer = 1024	Unknown non-neutral phase.
XN	Integer = 1040	Unknown non-neutral phase plus neutral.
XY	Integer = 3072	Two unknown non-neutral phases.
XYN	Integer = 3088	Two unknown non-neutral phases plus neutral.
none	Integer = 0	No phases specified.
s1	Integer = 512	Secondary phase 1.
s12	Integer = 678	Secondary phase 1 and 2.
s12N	Integer = 784	Secondary phases 1, 2, and neutral.
s1N	Integer = 528	Secondary phase 1 and neutral.
s2	Integer = 256	Secondary phase 2.
s2N	Integer = 272	Secondary phase 2 and neutral.

C.13 **PhaseConnectedFaultKind** enumeration class

Table C.13 shows the type of fault connection among phases.

Table C.13 – PhaseConnectedFaultKind

Faults: PhaseConnectedFaultKind		
Attribute	**Data Type**	**Description**
lineToGround	String = “lineToGround”	The fault connects the indicated phases to ground. The line to line fault impedance is not used and assumed infinite. The full ground impedance is connected between each phase specified in the fault and ground, but not between the phases.
lineToLine	String = “lineToLine”	The fault connects the specified phases together without a connection to ground. The ground impedance of this fault is ignored. The line to line impedance is connected between each of the phases specified in the fault. For example three times for a three phase fault, one time for a two phase fault. A single phase fault should not be specified.
lineToLineToGround	String = “lineToLineToGround”	The fault connects the indicated phases to ground and to each other. The line to line impedance is connected between each of the phases specified in the fault in a full mesh. For example three times for a three phase fault, one time for a two phase fault. A single phase fault should not be specified. The full ground impedance is connected between each phase specified in the fault and ground.
lineOpen	String = “lineOpen”	The fault is when the conductor path is broken between two terminals. Additional coexisting faults may be required if the broken conductor also causes connections to grounds or other lines or phases.

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C.14 **PoleBaseKind** enumeration class

Table C.14 shows the kind of base for poles.

Table C.14 – PoleBaseKind

Assets: PoleBaseKind		
Attribute	**Data Type**	**Description**
asphalt	String = “asphalt”	
cement	String = “cement”	
dirt	String = “dirt”	
other	String = “other”	
unknown	String = “unknown”	

C.15 **RevisionKind** enumeration class

Table C.15 shows the kind of revision made to a **SwitchingStep**.

Table C.15 – RevisionKind

Operations: RevisionKind		
Attribute	**Data Type**	**Description**
added	String = “added”	
void	String = “voidt”	

C.16 **RetiredReasonKind** enumeration class

Table C.16 shows the reason asset retired.

Table C.16 – RetiredReasonKind

Assets: RetiredReasonKind		
Attribute	**Data Type**	**Description**
environmental	String = “environmental”	Retired due to environmental reasons.
excessiveMaintenance	String = “excessiveMaintenance”	Retired due to excessive maintenance issues.
facilitiesUpgrade	String = “facilitiesUpgrade”	Retired due to facility upgrade.
failed	String = “failed”	Retired because of failure.
obselescence	String = “obselescence”	Retired due to obsolescence.
other	String = “other”	Retired due to other reasons.
sold	String = “sold”	Retired and sold.

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C.17 SinglePhaseKind enumeration class

Table C.17 shows the enumeration of single phase identifiers. Allows designation of single phases for both transmission and distribution equipment, circuits and loads.

Table C.17 – SinglePhaseKind

Wires: SinglePhaseKind		
Attribute	**Data Type**	**Description**
A	String = “A”	Phase A.
B	String = “B”	Phase B.
C	String = “C”	Phase C.
N	String = “N”	Neutral.
s1	String = “s1”	Secondary phase 1.
s2	String = “s2”	Secondary phase 2.

C.18 Source enumeration class

Source gives information related to the origin of a value, as shown in Table C.18.

Table C.18 – Source

SCADA: Source		
Attribute	**Data Type**	**Description**
PROCESS	String = “PROCESS”	The value is provided by input from the process I/O or being calculated from some function.
SUBSTITUTED	String = “SUBSTITUTED”	The value is provided by input of an operator or by an automatic source.
DEFAULTED	String = “DEFAULTED”	The value contains a default value.

C.19 StructureMaterialKind enumeration class

Table C.19 shows the kind of material used for structures.

Table C.19 – StructureMaterialKind

Assets: StructureMaterialKind		
Attribute	**Data Type**	**Description**
concrete	String = “concrete”	
steel	String = “steel”	
other	String = “other”	
wood	String = “wood”	

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C.20 SwitchActionKind enumeration class

Table C.20 shows the kind of action on switch.

Table C.20 – SwitchActionKind

Operations: SwitchActionKind		
Attribute	**Data Type**	**Description**
open	String = “open”	Open the switch
close	String = “close”	Close the switch.
disableReclosing	String = “disableReclosing”	Disable (automatic) switch reclosing.
enableReclosing	String = “enableReclosing”	Enable (automatic) switch reclosing.

C.21 TagActionKind enumeration class

Table C.21 shows the kind of action on tag.

Table C.21 – TagActionKind

Operations: TagActionKind		
Attribute	**Data Type**	**Description**
place	String = “place”	Place the tag.
remove	String = “remove”	Remove the tag.
verify	String = “verify”	Verify the tag.

C.22 TempEquipActionKind enumeration class

Table C.22 shows the kind of action on temporary equipment (such as cut, jumper, ground, energy source), or temporary action on permanent equipment (such as disconnecting an energy consumer from its terminals).

Table C.22 – TempEquipActionKind

Operations: TempEquipActionKind		
Attribute	**Data Type**	**Description**
connect	String = “connect”	Connect the equipment back to its terminals.
disconnect	String = “disconnect”	Temporarily disconnect the equipment from its terminals.
place	String = “place”	Place the jumper (close) or the cut (open).
remove	String = “remove”	Remove the jumper (open) or the cut (close).

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C.23 TowerConstructionKind enumeration class

Table C.23 shows the kind of tower construction.

Table C.23 – TowerConstructionKind

Assets: TowerConstructionKind		
Attribute	**Data Type**	**Description**
suspension	String = “suspension”	
tension	String = “tension”	

C.24 TroubleReportingKind enumeration class

Table C.24 shows the kind of trouble reporting.

Table C.24 – TroubleReportingKind

Customers: TroubleReportingKind		
Attribute	**Data Type**	**Description**
call	String = “call”	Trouble call received by customer service representative.
email	String = “email”	Trouble reported by email.
letter	String = “letter”	Trouble reported by letter.
other	String = “other”	Trouble reported by other means.
ivr	String = “ivr”	Trouble reported through interactive voice response system.

C.25 TroubleSymptomsExtentKind enumeration class

Table C.25 shows the kind of trouble symptoms related to the extent of an outage.

Table C.25 – TroubleSymptomsExtentKind

Customers: TroubleSymtomsExtentKind		
Attribute	**Data Type**	**Description**
ok	String = “ok”	There is no extent or the extent is unknown.
singleCustomer	String = “singleCustomer”	Just one customer is impacted by the trouble being reported.
neighbour	String = “neighbour”	More than one customer is impacted by the trouble being reported.
entireNeighbourhood	String = “entireNeighbourhood”	The entire neighbourhood is impacted by the trouble being reported.
other	String = “other”	The trouble being reported does not fit any of the pre-defined enumeration values.

C.26 TroubleSymptomsLightKind enumeration class

Table C.26 shows the kind of trouble symptoms related to the lights of a service.

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Table C.26 – TroubleSymptomsLightKind

Customers: **TroubleSymptomsLightKind**		
Attribute	**Data Type**	**Description**
ok	String = “ok”	There is nothing wrong with the lights.
allOut	String = “allOut”	All of the lights are out for the service being reported.
partOut	String = “partOut”	Some of the lights are out for the service being reported.
flickering	String = “flickering”	The lights are flickering for the service being reported.
dim	String = “dim”	The lights are dim for the service being reported.
other	String = “other”	The trouble being reported does not fit any of the pre-defined enumeration values.

C.27 TroubleSymptomsPoleKind enumeration class

Table C.27 shows the kind of trouble symptoms related to the pole of a service.

Table C.27 – TroubleSymptomsPoleKind

Customers: **TroubleSymptomsPoleKind**		
Attribute	**Data Type**	**Description**
ok	String = “ok”	There is nothing wrong with the pole.
down	String = “down”	Trouble reported by email.
hit	String = “hit”	Trouble reported by letter.
leaning	String = “leaning”	Trouble reported by other means.
other	String = “other”	The trouble being reported does not fit any of the pre-defined enumeration values.

C.28 TroubleSymptomsTransformerKind enumeration class

Table C.28 shows the kind of trouble symptoms related to the transformer of a service.

Table C.28 – TroubleSymptomsTransformerKind

Customers: **TroubleSymptomsTransformerKind**		
Attribute	**Data Type**	**Description**
ok	String = “ok”	There is nothing wrong with the transformer.
burning	String = “burning”	The transformer is reported as burning.
other	String = “other”	The trouble being reported does not fit any of the pre-defined enumeration values.

C.29 TroubleSymptomsTreeKind enumeration class

Table C.29 shows the kind of trouble symptoms related to the tree of a service.

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Table C.29 – TroubleSymptomsTreeKind

Customers: **TroubleSymptomsTreeKind**		
Attribute	**Data Type**	**Description**
ok	String = “ok”	There is nothing wrong with trees.
limbOnWire	String = “limbOnWire”	There is a tree limb on the primary wire.
limbOnService	String = “limbOnService”	There is a tree limb on the service (secondary) wire.
other	String = “other”	The trouble being reported does not fit any of the pre-defined enumeration values.

C.30 TroubleSymptomsWireKind enumeration class

Table C.30 shows the kind of trouble symptoms related to the wire of a service.

Table C.30 – TroubleSymptomsWireKind

Customers: **TroubleSymptomsWireKind**		
Attribute	**Data Type**	**Description**
ok	String = “ok”	There is nothing wrong with the wire.
serviceDown	String = “serviceDown”	The service wire is down.
wireDown	String = “wireDown”	The primary wire is down.
wireBurning	String = “wireBurning”	A wire is burning
digIn	String = “letter”	A wire has been broken due to someone digging in the ground around the area.
other	String = “other”	The trouble being reported does not fit any of the pre-defined enumeration values.

C.31 UndergroundStructureKind enumeration class

Table C.31 shows the kind of underground structure.

Table C.31 – UndergroundStructureKind

Assets: UndergroundStructureKind		
Attribute	**Data Type**	**Description**
burd	String = “burd”	
enclosure	String = “enclosure”	
handhole	String = “handhole”	
manhole	String = “manhole”	
pad	String = “pad”	
pullbox	String = “pullbox”	
subsurfaceEnclosure	String = “subsurfaceEnclosure”	
trench	String = “trench”	
tunnel	String = “tunnel”	
vault	String = “vault”	

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C.32 Validity enumeration class

Table C.32 shows the validity for MeasurementValue.

Table C.32 – Validity

Meas: Validity		
Attribute	**Data Type**	**Description**
GOOD	String = “GOOD”	The value is marked good if no abnormal condition of the acquisition function or the information source is detected.
QUESTIONABLE	String = “QUESTIONABLE”	The value is marked questionable if a supervision function detects an abnormal behaviour, however the value could still be valid. The client is responsible for determining whether or not values marked "questionable" should be used.
INVALID	String = “INVALID”	The value is marked invalid when a supervision function recognises abnormal conditions of the acquisition function or the information source (missing or non-operating updating devices). The value is not defined under this condition. The mark invalid is used to indicate to the client that the value may be incorrect and shall not be used.

C.33 WireUsageKind enumeration class

Table C.33 shows the kind of wire usage.

Table C.33 – WireUsageKind

AssetInfo: WireUsageKind		
Attribute	**Data Type**	**Description**
transmission	String = “transmission”	Wire is used in extra-high voltage or high voltage network.
secondary	String = “secondary”	Wire is used in low voltage circuit.
other	String = “other”	Other kind of wire usage.
distribution	String = “distribution”	Wire is used in medium voltage network.

C.34 WorkKind enumeration class

Table C.34 shows the kinds of work.

Table C.34 – WorkKind

Work: WorkKind		
Attribute	**Data Type**	**Description**
construction	String = “construction”	Construction work.
inspection	String = “inspection”	Inspection work.
maintenance	String = “maintenance”	Maintenance work.
repair	String = “repair”	Repair work.
test	String = “test”	Test work.
service	String = “service”	Service work.
disconnect	String = “disconnect”	Disconnect work.
reconnect	String = “reconnect”	(deprecated) (use 'connect' instead) Reconnect work.

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Work: WorkKind		
Attribute	**Data Type**	**Description**
connect	String = “connect”	Connect work.
other	String = “other”	Other kind of work.
refurbishment	String = “refurbishment”	Work related to asset refurbishment.

C.35 WorkStatusKind enumeration class

Table C.35 shows the kind of status, specific to work.

Table C.35 – WorkStatusKind

Work: WorkStatusKind		
Attribute	**Data Type**	**Description**
waitingOnApproval	String = “waitingOnApproval”	Work approval is pending.
approved	String = “approved”	Work has been approved.
cancelled	String = “cancelled”	Work has been canceled.
waitingToBeScheduled	String = “waitingToBeScheduled”	Work needs to be scheduled.
scheduled	String = “scheduled”	Work has been scheduled.
waitingOnMaterial	String = “waitingOnMaterial”	Work has been waiting on material.
inProgress	String = “inProgress”	Work is in progress.
completed	String = “completed”	Work has been completed, i.e., crew can leave the work location and is available for another work.
closed	String = “closed”	Work has been closed (typically by a person responsible for work management) and is ready for billing.
dispatched	String = “dispatched”	Crew has been dispatched.
enroute	String = “enroute”	Crew is 'en route'.
onsite	String = “onsite”	Crew is on the site.

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C.36 WorkTaskKind enumeration class

Table C.36 shows the kinds of work tasks.

Table C.36 – WorkTaskKind

Work: WorkTaskKind		
Attribute	**Data Type**	**Description**
install	String = “install”	Work task deals with installation of assets.
remove	String = “remove”	Work task deals with removal of assets.
exchange	String = “exchange”	Work task deals with exchange of assets.
investigate	String = “investigate”	Work task deals with investigation about assets.

Annex D
(informative)

Profiles defined in other parts of IEC 61968

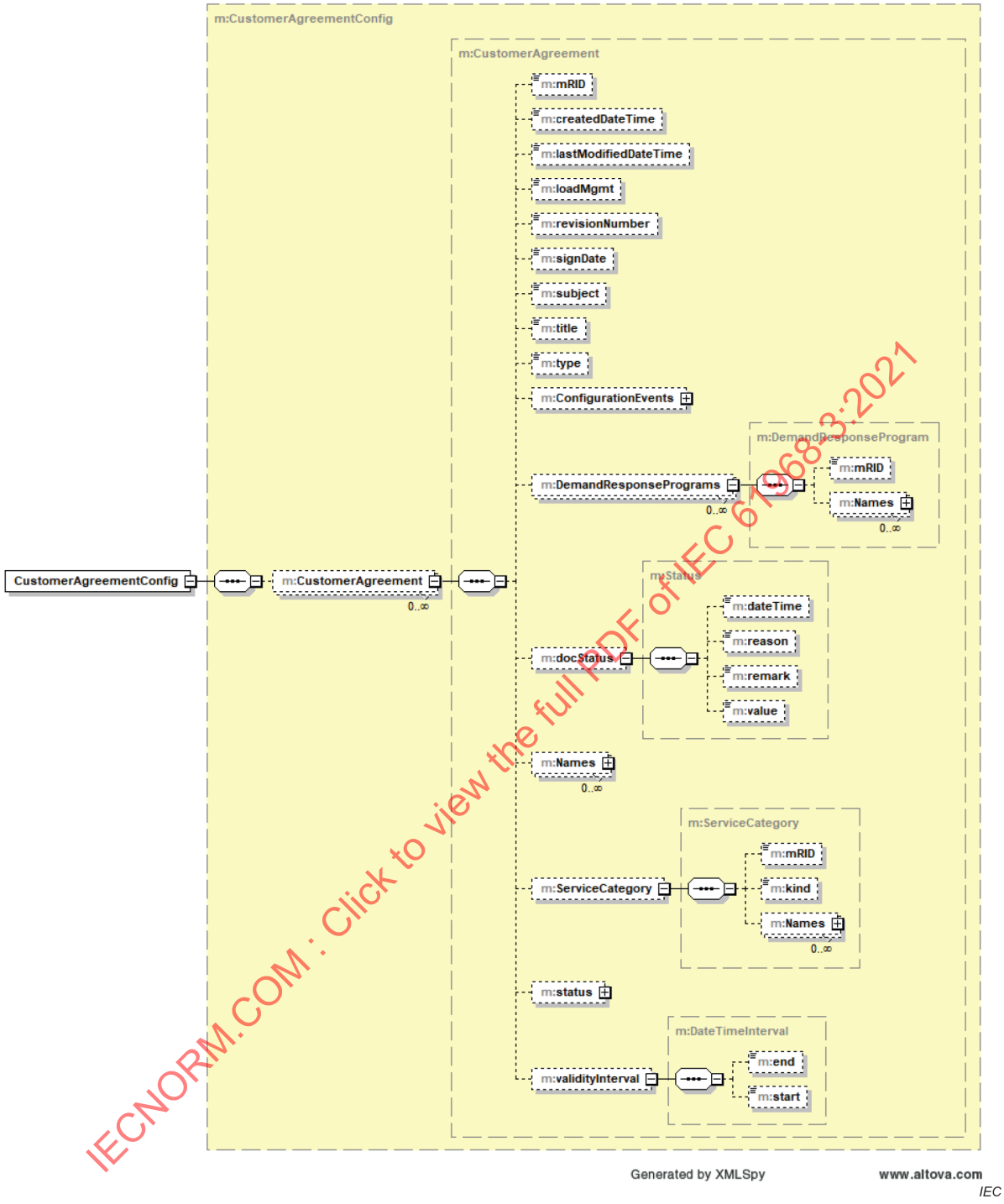
This Annex outlines profiles that are referenced in this document but are defined in other parts of IEC 61968.

D.1 **CustomerAgreementConfig** payload

The **CustomerAgreementConfig** payload shown in Figure D.1 defines zero, one or many **CustomerAgreement**s. Important attributes for the purposes of IEC 61968-3 are the **mRID** and **Names** since this allows the mapping **between** the **mRID**, **Names** and the objects themselves in the messages so that the the entire object instance does not need to be sent in the message.

For further details of the **CustomerAgreementConfig** payload, please see IEC 61968-9.

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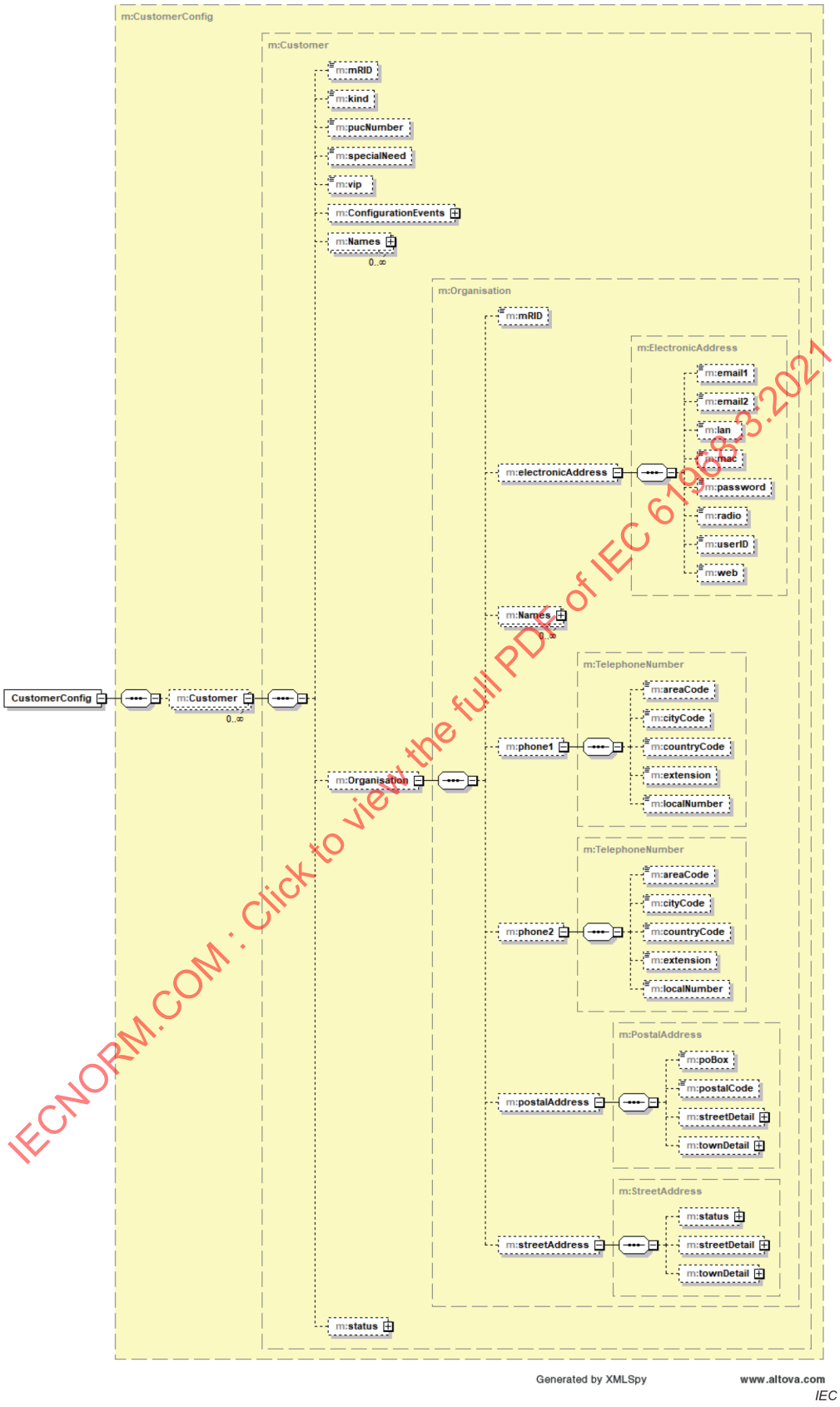


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Figure D.1 – CustomerAgreementConfig payload

D.2 CustomerConfig payload

The **CustomerConfig** payload shown in Figure D.2 defines zero, one or many **Customer**s. Important attributes for the purposes of IEC 61968-3 are the **mRID** and **Names** since this allows the mapping **between** the **mRID**, **Names** and the objects themselves in the messages so that the the entire object instance does not need to be sent in the message. For further details of the **CustomerConfig** payload, please see IEC 61968-9.



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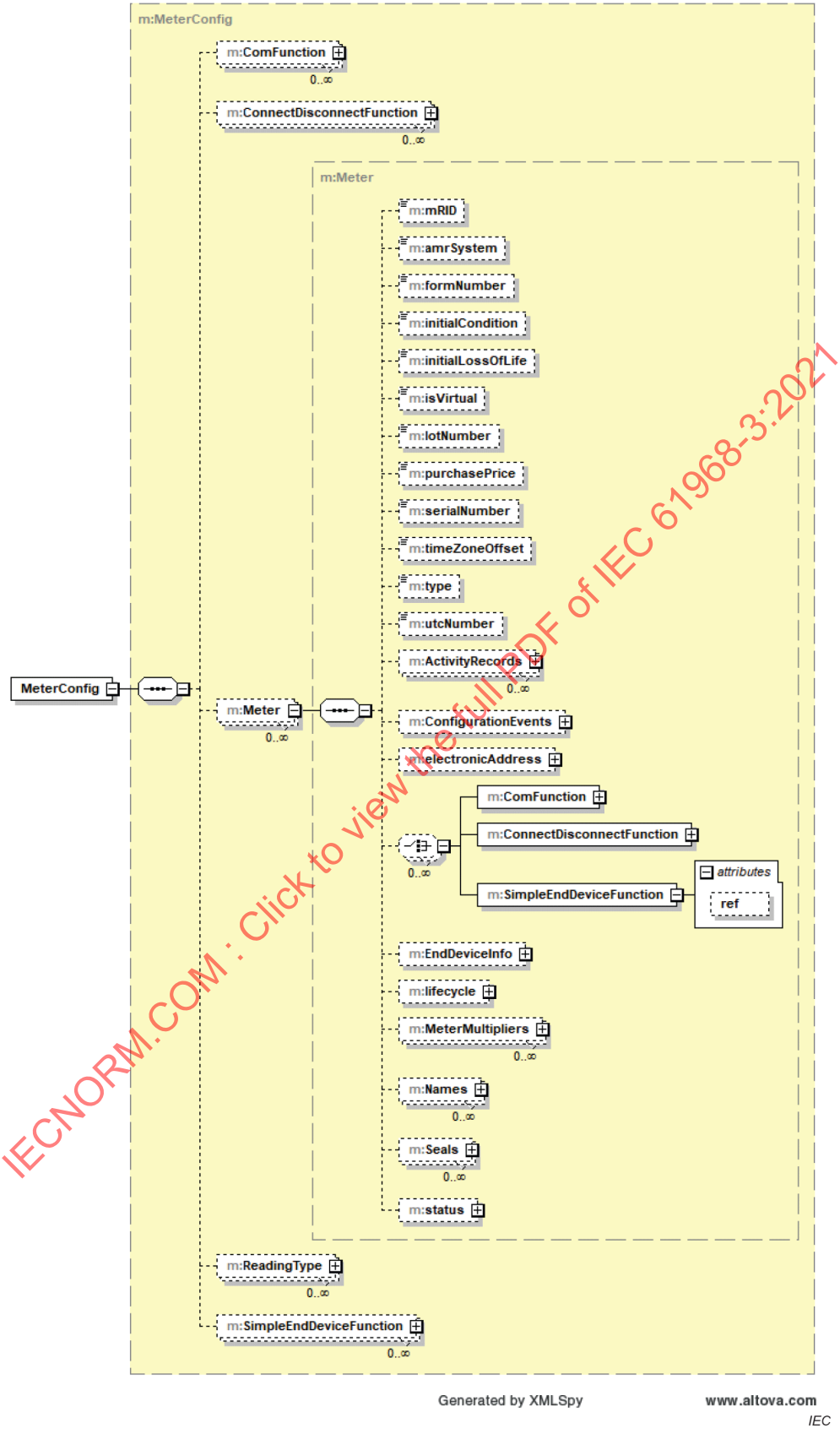
Figure D.2 – CustomerConfig payload

D.3 **MeterConfig** payload

The **MeterConfig** payload shown in Figure D.3 defines zero, one or many **Meter**s. Important attributes for the purposes of IEC 61968-3 are the **mRID** and **Names** since this allows the mapping **between** the **mRID**, **Names** and the objects themselves in the messages so that the the entire object instance does not need to be sent in the message.

For further details of the **MeterConfig** payload, please refer to IEC 61968-9.

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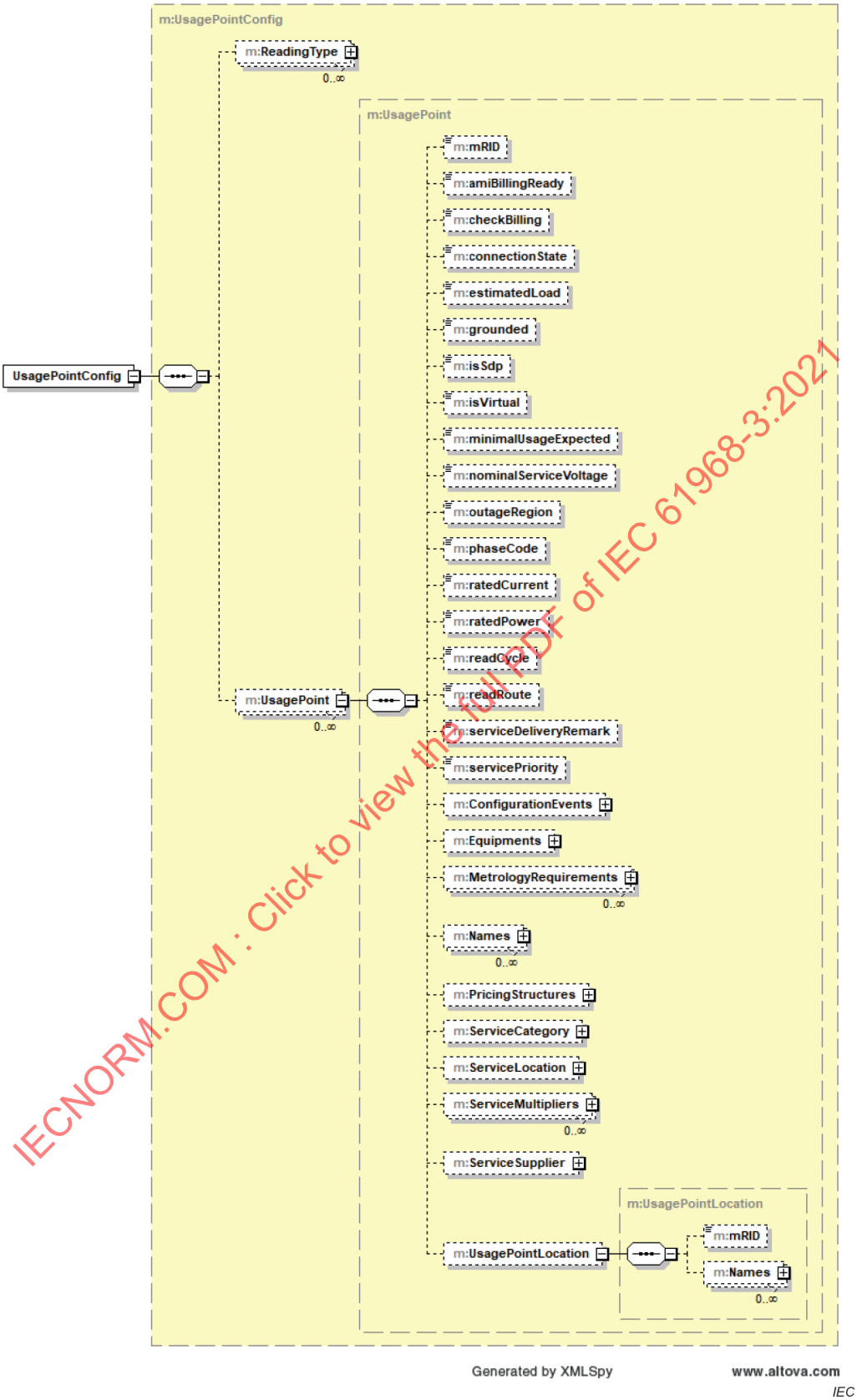
Figure D.3 – MeterConfig payload

D.4 **UsagePointConfig** payload

The **UsagePointConfig** payload shown in Figure D.4 defines zero, one or many **UsagePoint**s. Important attributes for the purposes of IEC 61968-3 are the **mRID** and **Names** since this allows the mapping **between** the **mRID**, **Names** and the objects themselves in the messages so that the the entire object instance does not need to be sent in the message.

For further details of the **UsagePointConfig** payload, please see IEC 61968-9.

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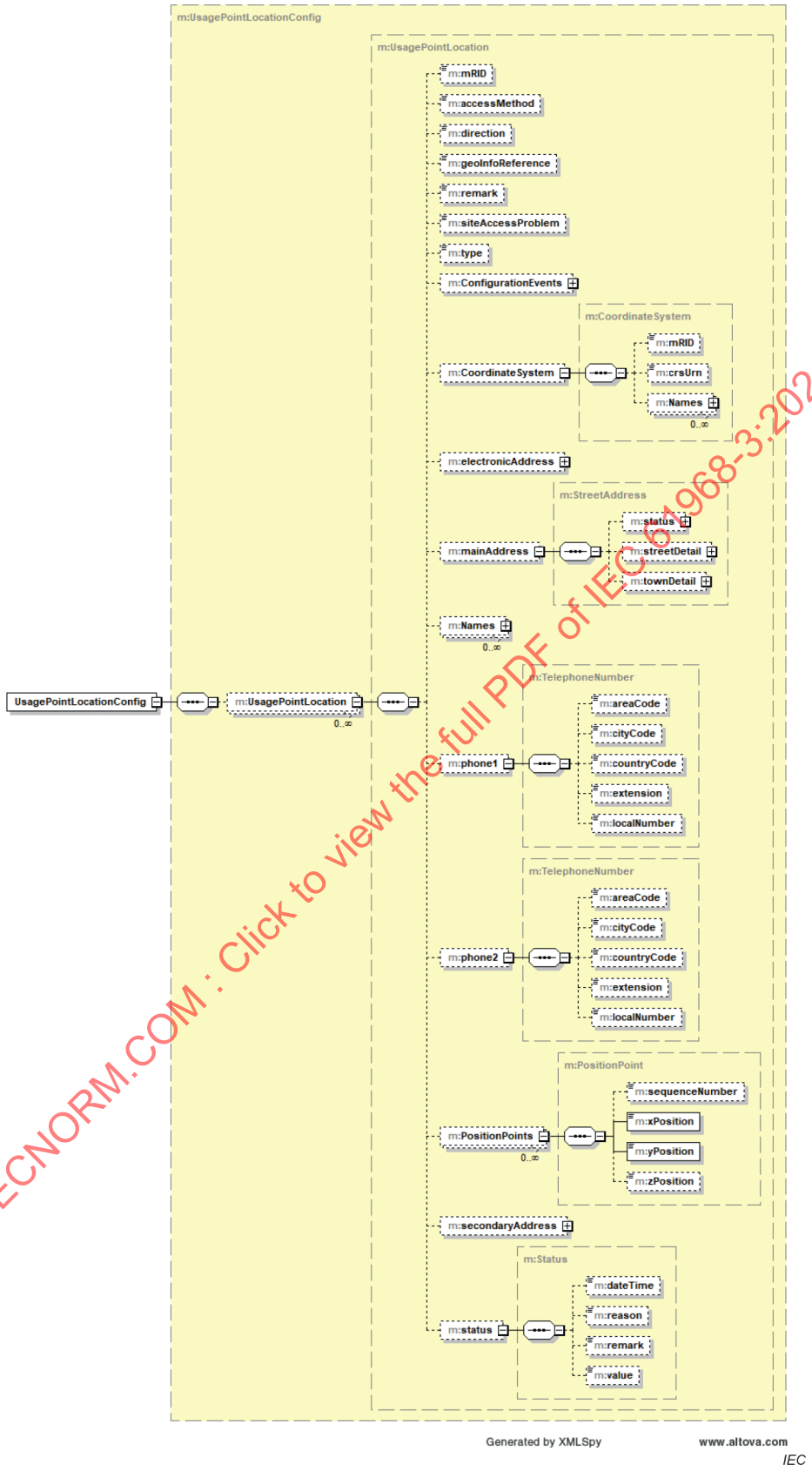
Figure D.4 – UsagePointConfig payload

D.5 **UsagePointLocationConfig** payload

The **UsagePointLocationConfig** payload shown in Figure D.5 defines zero, one or many **UsagePointLocation**s. Important attributes for the purposes of IEC 61968-3 are the **mRID** and **Names** since this allows the mapping **between** the **mRID**, **Names** and the objects themselves in the messages so that the the entire object instance does not need to be sent in the message.

For further details of the **UsagePointLocationConfig** payload, please see IEC 61968-9.

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Figure D.5 – UsagePointLocationConfig payload

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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INTÉGRATION D'APPLICATIONS POUR LES SERVICES ÉLECTRIQUES – INTERFACES SYSTÈME POUR LA GESTION DE LA DISTRIBUTION –

Partie 3: Interface pour l'exploitation du réseau

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La Norme internationale IEC 61968-3 a été établie par le comité d'études 57 de l'IEC: Gestion des systèmes de puissance et échanges d'informations associés.

Cette troisième édition annule et remplace la deuxième édition parue en 2017. Elle constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) important remaniement des profils relatifs à Switch Order et à Outage;
b) profils documentés plus détaillés après l'analyse des cas d'utilisation de bout en bout;
c) profil Measurement et Control séparés en deux profils: PSRMeasurements et PSRControls;

d) profil Temporary Network Change remplacé par le profil SwitchingEvents;

e) profils MeasurementAction, ControlAction, GenericAction et VerificationAction ajoutés au profil SwitchingPlans. Exemples ajoutés;

f) profil SwitchingActions ajouté pour prendre en charge la coordination de l'exécution SwitchingPlan entre la salle de commande et l'équipe sur le terrain;

g) ClampAction ajouté aux profils SwitchingPlan, SwitchingAction et SwitchingEvent pour permettre la pose et le retrait des pinces indépendamment des raccordements;

h) profil OutagesAndFaults séparé en UnplannedOutages, PlannedOutages, EquipmentFaults, LineFaults;

i) liste ajoutée des UsagePoints sous tension et hors tension au profil UnplannedOutages;

j) profil PlannedOutages ajouté;

k) profil PlannedOutageNotifications ajouté;

l) profil SwitchingPlanRequest ajouté pour remplacer le profil OutageSchedules;

m) profil TroubleOrders étendu pour inclure UnplannedOutages et TroubleTickets et permettre aux équipes d'être planifiées en fonction des tâches individuelles dans TroubleOrder;

n) cas d'utilisation et diagrammes de séquence étendus;

o) diagrammes de séquence mis à jour pour utiliser les modèles de message IEC 61968-100;

p) les cas d'utilisations de l'IEC 62559-2 utilisent un modèle de cas;

q) exemple XML ajouté pour les profils;

r) xsd remplacé dans l'Annexe par des tableaux pour documenter les profils sous une forme indépendante de la sérialisation;

s) cas d'utilisation FLISR clarifié pour inclure les interactions entre DSO et TSO selon le réexamen des commentaires de l'Édition 2;

t) OperationalTags supprimé, car il fait désormais partie intégrante de TagAction dans la charge utile SwitchingEvents.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
57/2343/FDIS	57/2364/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

La version française de la norme n'a pas été soumise au vote.

Le présent document a été rédigé selon les Directives ISO/IEC, Partie 2.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Dans la présente norme, les caractères d'imprimerie suivants sont employés:

– **jetons: en arial black**

Une liste de toutes les parties de la série IEC 61968, publiées sous le titre général: *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de la distribution* peut être consultée sur le site web de l'IEC.

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INTRODUCTION

La présente partie de l'IEC 61968 a pour objet de définir une norme relative à l'intégration de systèmes d'exploitation du réseau les uns avec les autres et avec d'autres systèmes, ainsi que les fonctions métier relevant du domaine d'application de l'IEC 61968. Les détails particuliers des protocoles de communication utilisés par ces systèmes sont hors du domaine d'application de la présente partie de l'IEC 61968. La présente partie de l'IEC 61968 prend en considération et modélise plutôt les capacités générales que peuvent potentiellement fournir des systèmes d'exploitation du réseau. Ainsi, la spécification, le développement et/ou le déploiement de la génération suivante de systèmes d'exploitation du réseau n'ont aucune incidence sur la présente partie de l'IEC 61968, tant par l'utilisation de normes que par celle de moyens propriétaires.

La série de normes IEC 61968 est prévue pour faciliter l'intégration interapplications, par opposition à l'intégration intra-applications. L'intégration intra-applications concerne l'interrelation de programmes au sein d'un même système, qui communiquent généralement au moyen de logiciels intermédiaires (intergiciels) intégrés dans leur environnement d'exécution sous-jacent et tendent à être optimisés dans le cadre de connexions proches, en temps réel et synchrone, et des interrogations/réponses interactives ou des modèles de communication conversationnels. Par conséquent, ces normes d'interfaces interapplications sont appropriées pour les applications faiblement couplées avec une plus grande hétérogénéité dans le langage, les systèmes d'exploitation, les protocoles et les outils de gestion. Cette série de normes est prévue pour supporter des applications qui nécessitent l'échange de données toutes les secondes, minutes ou heures, plutôt que d'attendre un traitement de nuit par lot. Cette série de normes, qui est destinée à être mise en œuvre avec des services de logiciels intermédiaires, qui échangent des messages parmi des applications, complète, mais ne remplace pas les centrales de données de l'entreprise de distribution, les passerelles de base de données et les archives opérationnelles.

Au sens de l'IEC 61968, un Système de Gestion de la Distribution (DMS – Distribution Management System) se compose de divers composants d'application distribués permettant à l'entreprise de distribution de gérer les réseaux de distribution électriques. Ces possibilités incluent la surveillance et la commande des équipements de fourniture d'énergie, les processus de gestion qui assurent la fiabilité du système, la gestion de la tension électrique, la gestion de la demande collatérale, la gestion des interruptions de service, la gestion des travaux, la cartographie automatisée et la gestion des équipements. Des interfaces normalisées sont définies pour chaque classe d'applications identifiée dans le Modèle d'Interface de Référence (IRM – Interface Reference Model), qui est décrit dans l'IEC 61968-1.

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INTÉGRATION D'APPLICATIONS POUR LES SERVICES ÉLECTRIQUES – INTERFACES SYSTÈME POUR LA GESTION DE LA DISTRIBUTION –

Partie 3: Interface pour l'exploitation du réseau

1 Domaine d'application

Conformément à l'IEC 61968 Modèle d'Interface de Référence, la Fonction d'exploitation du réseau définie dans la présente partie de l'IEC 61968 donne aux entreprises de distribution les moyens de surveiller la topologie de poste principale (état du disjoncteur et de l'organe de coupure), la topologie de lignes d'alimentation et le statut de l'équipement de commande avec SCADA, AMI et d'autres sources de données. Elle fournit également les moyens pour gérer l'état de charge et de connectivité du réseau. Enfin, elle rend possibles la localisation des plaintes téléphoniques des clients et la coordination des activités des équipes sur le terrain en ce qui concerne les interruptions planifiées et non planifiées.

L'IEC 61968-3 spécifie le contenu d'informations d'un ensemble de charges utiles de messages qui peuvent être utilisées pour prendre en charge la plupart des fonctions métier liées à l'exploitation du réseau. Les utilisations classiques des charges utiles de messages définies dans l'IEC 61968-3 incluent l'acquisition de données par des systèmes externes, l'isolement du défaut, le traitement des défauts, la gestion des dysfonctionnements et la coordination de l'état en temps réel du réseau.

Le diagramme de la Figure 1 représente la possibilité de mise en œuvre de la fonctionnalité de l'IEC 61968-3 soit comme un seul système de gestion de la distribution avancé intégré, soit comme un ensemble de fonctions distinctes (OMS, DMS et SCADA). Les entreprises de distribution peuvent choisir d'acheter ces systèmes auprès de différents fournisseurs et de les intégrer à l'aide des messages de l'IEC 61968-3. D'autre part, un seul fournisseur peut fournir au moins deux de ces composants dans un seul système intégré. Si plusieurs systèmes sont fournis par le même fournisseur, ce dernier peut choisir d'utiliser soit des extensions des messages de l'IEC 61968-3 soit un mécanisme d'intégration propriétaire pour améliorer la fonctionnalité par rapport à ce que la spécification de l'IEC 61968-3 exige/prend en charge. Bien qu'il s'agisse d'une mise en œuvre possible, le paragraphe 4.3 définit le domaine d'application en ce qui concerne les fonctions métier qui sont mises en œuvre dans les offres habituelles du fournisseur.

Les annexes du présent document précisent les scénarii d'intégration ou les cas d'utilisation, afin de représenter les différents moyens d'utiliser les charges utiles de messages définies dans le présent document, ainsi que les charges utiles de messages à définir dans d'autres parties de la série IEC 61968.

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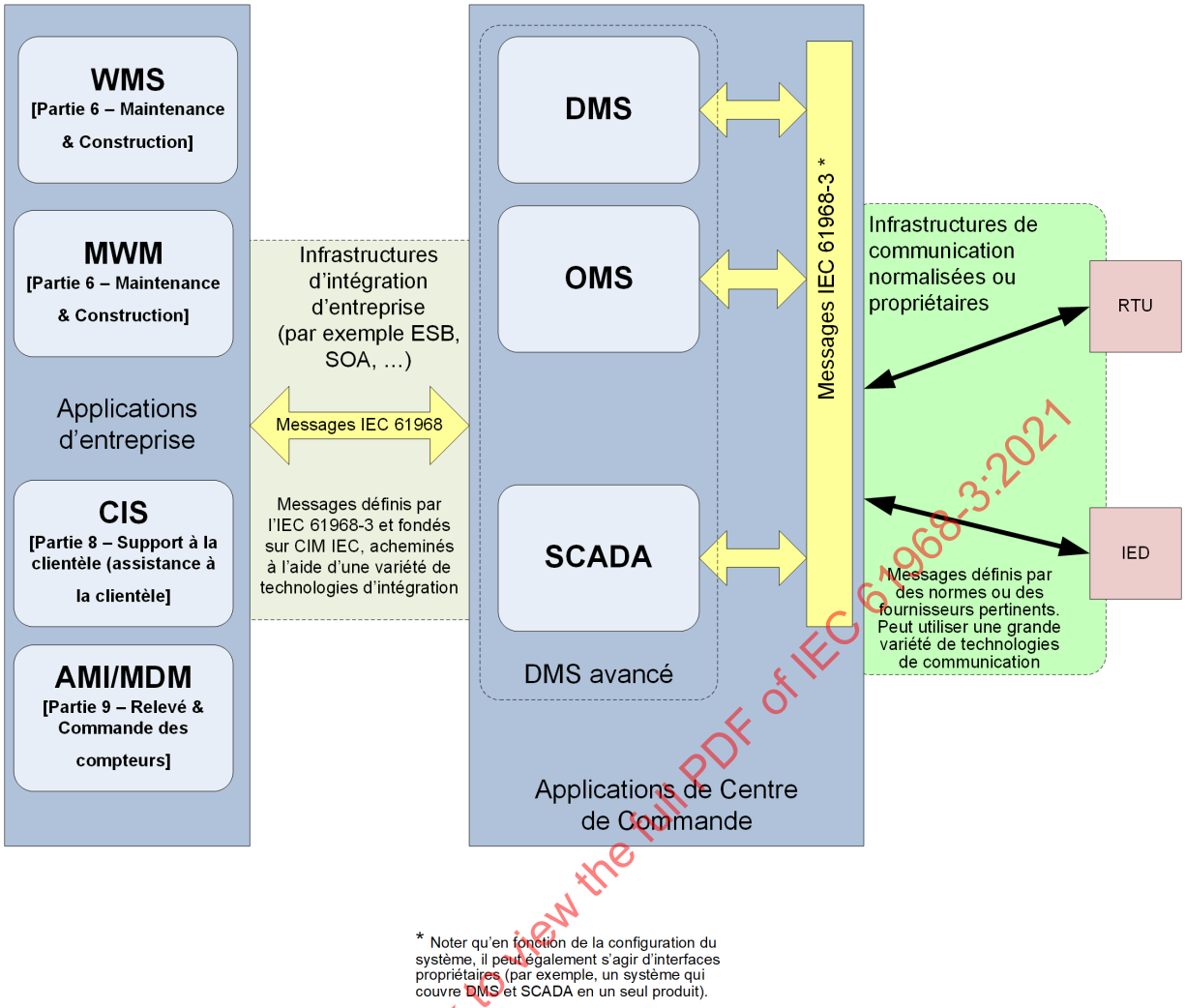


Figure 1 – Domaine d'application de l'IEC 61968-3

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2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 61968-1, *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de la distribution – Partie 1: Architecture des interfaces et recommandations générales*

IEC TS 61968-2, *Application integration at electric utilities – System interfaces for distribution management – Part 2: Glossary* (disponible en anglais seulement)

IEC 61968-100, *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de distribution – Partie 100: Profils de mise en œuvre*

IEC 61970-301, *Energy management system application program interface (EMS-API) – Part 301: Common information model (CIM) base* (disponible en anglais seulement)

3 Termes, définitions et termes abrégés

3.1 Termes et définitions

Aucun terme n'est défini dans le présent document.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse https://www.iso.org/obp/ui/fr/

3.2 Termes abrégés

Pour les besoins du présent document, les abréviations données dans l'IEC 61968-2 ainsi que les suivantes s'appliquent.

NOTE Voir l'IEC 60050, *Vocabulaire électrotechnique international,* pour les définitions générales du glossaire.

FLISR Fault Location, Isolation and Service Restoration (localisation de défaut, isolement et restauration de services)

WMS Work Management System (système de gestion des travaux)

4 Modèles de référence et d'informations

4.1 Approche générale de l'exploitation du réseau

Traditionnellement, il existe deux types de systèmes de gestion des opérations de distribution: les systèmes de gestion de la distribution (DMS) et les systèmes de gestion des interruptions (OMS). La plupart du temps, un DMS fait office d'extension d'un système SCADA, mais certains DMS peuvent être un ensemble autonome d'applications de distribution sans SCADA.

Les systèmes de gestion des interruptions sont très largement utilisés dans le monde entier (souvent dans des territoires de service étendus et avec une grande quantité de conducteurs aériens primaires) pour gérer leurs systèmes de distribution. Ces systèmes de distribution sont généralement configurés de manière radiale et couvrent des distances importantes. C'est la raison pour laquelle la surveillance de l'état du système de distribution s'est révélée historiquement onéreuse, particulièrement à l'extérieur du poste. Dans les populations plus denses, les coûts liés à la télémétrie et à l'automatisation sont inférieurs et peuvent être justifiés sur une base coût/client.

Par conséquent, une entreprise de distribution n'est souvent avertie d'un problème avec le système que lorsqu'un client appelle pour signaler une interruption. L'entreprise collecte ensuite un ensemble d'appels sur défaut, et selon les appels reçus, détermine l'emplacement probable et la cause de l'interruption. Une équipe est alors envoyée sur place pour procéder à une enquête approfondie et aux réparations.

Les systèmes de gestion de la distribution trouvent leur origine dans les systèmes SCADA de transmission. L'automatisation s'étant déplacée vers le bas et dans les postes de distribution, le besoin d'assurer la fonctionnalité des applications de distribution s'est intensifié. Les systèmes de gestion de la distribution se sont étendus au système SCADA de transmission existant, en ajoutant des points pour couvrir les disjoncteurs d'alimentation ou en ajoutant un système SCADA de distribution autonome. En général, ces deux types de systèmes sont équipés de terminaux à distance (RTU), de systèmes frontaux de communication, de systèmes d'alarme et d'écrans.

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Ces systèmes de gestion de la distribution se caractérisent comme tels par la possibilité qu'ils offrent d'ajouter des fonctions (la possibilité d'ajouter des dispositifs temporaires, comme des séparations de ligne et des lignes de raccordement. Ces dispositifs temporaires sont rarement utilisés dans les systèmes de transmission, mais le sont très fréquemment dans les systèmes de distribution. La plupart des systèmes de distribution fonctionnant dans le cadre d'une configuration radiale, il est souvent nécessaire d'utiliser des commutateurs de ligne d'alimentation pour reconfigurer les lignes d'alimentation, soit pour assurer la restauration après interruption soit pour s'adapter à différentes situations de charge. Cela impose d'être en mesure de colorier les lignes de manière dynamique selon la direction dans laquelle elles sont alimentées, mais également de les colorier selon qu'elles sont alimentées ou pas. De plus, dans certaines régions du monde, ces systèmes peuvent être asymétriques, ce qui implique que chaque phase électrique fonctionne de manière indépendante. Autre caractéristique d'un système de distribution: la modification est la norme. Les nouvelles constructions résidentielles et l'entretien courant impliquent de modifier fréquemment le modèle de réseau. Il n'est pas inhabituel de constater 10 000, voire 100 000 modifications par semaine dans un seul système de distribution.

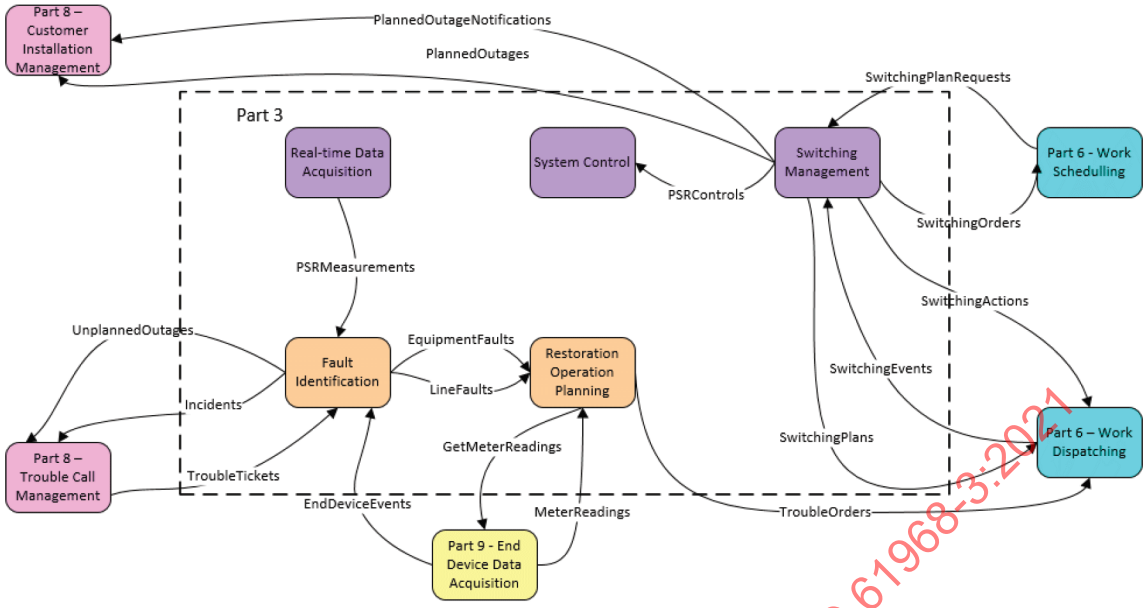
Le DMS et l'OMS ont en commun d'avoir tous deux besoin d'un modèle de réseau en fonctionnement quasiment en temps réel. Par conséquent, la présente partie de l'IEC 61968 inclut l'aptitude à échanger des modèles de réseau de distribution entre ces deux types de systèmes et à les maintenir synchronisés. Les fournisseurs comprennent de plus en plus que cette intégration n'est pas sans importance pour la mise en œuvre et l'entretien, et proposent donc des systèmes DMS/OMS intégrés (voire des systèmes DMS/OMS/SCADA intégrés) afin de réduire le coût total de propriété et avoir une vision cohérente du réseau de distribution en temps réel. Le terme ADMS (Advanced Distribution Management System – système de gestion de la distribution avancé) a été choisi pour décrire ces systèmes.

4.2 Modèle de référence

La Figure 2 sert de modèle de référence et donne des exemples de composants logiques et de flux de données liés au présent document. L'Article 3 fait référence aux termes définis par le CIM.

Le diagramme de la Figure 2 décrit les flux entre les composants du modèle de référence. L'étiquette de chaque flux est le nom d'un profil de message IEC 61968.

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Anglais	Français
Part 8 – Customer Installation Management	Parte 8 - Gestion de l'installation du client
Part 8 – Trouble Call Management	Parte 8 – Gestion des appels sur incident
Real-Time Data Acquisition	Acquisition de données en temps réel
Fault identification	Identification des défauts
System Control	Contrôle du système
Restoration Operation Planning	Planification de l'opération de restauration
Switching Management	Gestion de la commutation
Part 6 – Work Scheduling	Partie 6 – Programmation du travail
Part 6 – Work Dispatching	Partie 6 - Répartition du travail
Part 9 – End Device Data Acquisition	Partie 9 – Acquisition de données du dispositif terminal
Part 3	Partie 3

Figure 2 – Modèle de référence de l'IEC 61968-3

L'architecture de référence présente quatre principaux composants logiques (potentiellement réalisés en systèmes ou sous-systèmes) liés à l'exploitation du réseau:

IEC 61968-9, *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de distribution – Partie 9: Interfaces pour le relevé et la commande des compteurs*

IEC 61968-8, *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de distribution – Partie 8: Interfaces pour l'assistance à la clientèle*

IEC 61968-6, *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de distribution – Partie 6: Interfaces de maintenance et de construction*

IEC 61968-5, *Intégration d'applications pour les services électriques – Interfaces système pour la gestion de distribution – Partie 5: Optimisation de l'énergie distribuée*

4.3 Modèle d'interface de référence

Le présent document n'a pas pour objet de définir les applications et les systèmes qu'il convient que les fournisseurs produisent. Une application (physique) concrète est réputée fournir la

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fonctionnalité d'un ou de plusieurs composants (logiques) abstraits, comme cela est mentionné dans le présent document. Ces composants abstraits sont groupés par fonctions métier du modèle d'Interface de référence.

Dans le présent document, le terme "composant abstrait" est utilisé en référence à la partie d'un système logiciel qui prend en charge une ou plusieurs des interfaces définies de la présente partie de l'IEC 61968, de l'IEC 61968-6, de l'IEC 61968-8 et de l'IEC 61968-9. Il ne signifie pas nécessairement que le logiciel conforme soit livré ni en tant que modules séparés ni en tant que système unique.

L'IEC 61968-1 décrit le modèle d'interface de référence, tandis que l'IEC 61968-3 à l'IEC 61968-9 définissent les détails des informations échangées pour des types spécifiques de composants abstraits.

4.4 Fonctions métier et sous-fonctions métiers d'exploitation du réseau

Il convient de noter que les charges utiles de messages définies dans le présent document, IEC 61968-3, *Intégration d'application pour les services électriques - Interfaces système pour la gestion de la distribution – Partie 3: Interface pour l'exploitation du réseau*, peuvent être envoyées ou reçues par tous les types de composants au sein d'un système de gestion de la distribution (DMS) ou d'un système de gestion des interruptions (OMS).

Le Tableau 1 indique les fonctions métier et sous-fonctions métier habituelles réputées être des sources d'informations pour ces charges utiles de messages. La liste fournie des fonctions métier et sous-fonctions métier n'est pas exhaustive, elle n'est donnée qu'à titre d'exemple. Les consommateurs habituels d'informations comprennent, sans toutefois s'y limiter, les autres fonctions métier mentionnées dans l'IEC 61968-1.

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Tableau 1 – Fonctions métier et sous-fonctions métier

Fonctions métier	Sous-fonctions métier
Exploitation en temps réel (RTO) La fonction métier Exploitation en temps réel (RTO) inclut l'exécution des actions planifiées en matière de modification de l'état opérationnel du réseau. En outre, elle surveille l'état du réseau afin de garantir le fonctionnement sécurisé et équilibré du réseau électrique. Les actions correctives prédéfinies et activées sont exécutées lorsque les conditions préalables sont remplies. Un système sécurisé et équilibré signifie que l'offre et la demande sont équilibrées et que le système peut gérer une perte non anticipée prédéfinie d'équipements système, sans enfreindre les exigences opérationnelles pour la tension, la fréquence et les limites de stabilité opérationnelle. Acquisition des données en temps réel (RTDA - Real-Tile Data Acquisition)	Acquisition des données en temps réel (RTDA) La fonction métier Acquisition des données en temps réel (RTDA, Real-Time Data Acquisition) inclut la collecte et la validation de mesures et d'observations utilisées pour déterminer l'état actuel du système sous la commande des entités. Cela peut inclure l'acquisition de mesurages et d'observations ne relevant pas de la responsabilité de l'entité, mais pour lesquels l'équipement est défini comme pertinent pour déterminer l'état du système responsable. Les mesurages et observations peuvent inclure: • les points de SCADA classiques et analogues; • les données collectées et saisies manuellement; • les données du phaseur; • les données générées par d'autres systèmes, à savoir: – les usines de production d'énergie; – les systèmes IEC 61850; – les activités d'exploitation de niveau inférieur ou supérieur. Le dénominateur commun de ces données est qu'il s'agit de données échantillonnées, traitées sous forme de données d'entrée brutes, par opposition à un réglage, une instruction ou une demande provenant d'un autre système. En d'autres termes, la source des données fait totalement abstraction de l'acquisition et de l'utilisation des données. Il ne s'agit pas d'une intégration coordonnée des connaissances homologues.
	Gestion de la commutation (SM) La fonction métier Gestion de la commutation (SM, Switching Management) comprend l'ensemble des activités impliquées dans la surveillance de l'exécution des ordres de commutation et du rétablissement de l'alimentation. • L'exécution des étapes de commutation peut comprendre le fonctionnement à distance de dispositifs par le biais de SCADA et/ou la modification de réglages sur les commandes système. • L'exécution comprend des procédures indispensables à la sécurité. • Chaque fois que l'impact de la commutation sur le réseau pose problème, il est d'usage de réaliser une analyse de la sécurité de l'état établi par la commutation. Les types d'analyses sont similaires à l'évaluation de l'état en temps réel, excepté que le flux d'énergie ou le flux d'énergie optimal remplace l'estimation de l'état.

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<table>
<tr><th>Fonctions métier</th><th>Sous-fonctions métier</th></tr>
<tr><td rowspan="2"></td><td>Contrôle du système (SC)

La fonction métier Contrôle du système (SC, System Control) comprend toute activité (autre que celles impliquées dans la Gestion de la commutation) qui émet des instructions aux commandes sur le terrain afin de changer le régime du réseau. Ces contrôles peuvent être réalisés en boucle fermée ou nécessiter une intervention humaine. Les contrôles peuvent être divisés en domaines actifs et réactifs. Ils utilisent généralement des mesures brutes ou l'état évalué comme données d'entrée de la logique de contrôle, qui déploie ensuite la modification suggérée. Cette logique de contrôle peut être assez complexe, voire impliquer des analyses fondées sur des algorithmes, comme le flux d'énergie optimal. Les fonctions de contrôle peuvent également inclure une logique de suivi pour confirmer qu'un contrôle émis a été exécuté sur le terrain et/ou pour évaluer si l'impact du contrôle était conforme aux prévisions.

Les contrôles sont importants pour la simulation analytique. Ils se distinguent principalement par le fait qu'ils peuvent être représentés sous forme de composants du schéma fonctionnel normalisé ou qu'ils doivent intégrer le logiciel de commande pour réaliser la simulation.

Les contrôles actifs incluent ce qui suit:
• contrôle de la production automatique (AGC, Automatic Generation Control) et contrôle de la fréquence de charge (LFC, Load-Frequency Control);
• gestion des réserves actives;
• gestion de la charge modulable;
• paramètres du plan d'action corrective;
• répartition des contraintes de sécurité.

Les contrôles réactifs incluent ce qui suit:
• gestion des réserves réactives;
• optimisation de la tension et de la puissance réactive (VVO, Volt-Var Optimization);
• réglage des ressources énergétiques réparties (DER);
• localisation des défauts, isolation et restauration des services (FLISR, Fault Location, Isolation and Service Restoration).</td></tr>
<tr><td rowspan="2">Gestion des défauts (FM)

La fonction métier Gestion des défauts (FM, Fault Management) reçoit des notifications relatives aux défauts affectant le réseau électrique, puis les analyse afin d'identifier l'emplacement du défaut. Elle suit le défaut tout au long des étapes de sa localisation réelle en réduisant le plus possible la zone impactée par le défaut, en rétablissant le service sur l'ensemble des parties du réseau impactées et en coordonnant les réparations définitives. Elle garantit que la durée des défauts et les temps de restauration sont correctement enregistrés pour générer les rapports réglementaires.</td><td>Identification des défauts (FI)

La fonction métier Identification des défauts (FI, Fault Identification) utilise un grand nombre de données d'entrée pour identifier l'emplacement où s'est produit le défaut réel. Elle identifie également la cause du défaut, si elle est connue.</td></tr>
<tr><td>Planification de l'opération de restauration (ROP)

La fonction métier Planification de l'opération de restauration (ROP, Restoration Operation Planning) génère un plan de gestion des interruptions de service non planifiées ou forcées, afin de revenir à un état de fonctionnement acceptable. Elle inclut également un plan de restauration du réseau à son état antérieur au défaut après réparations.</td></tr>
</table>

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Les diagrammes de séquences de cas d'utilisation présentés dans le présent document sont fondés sur l'hypothèse d'une interprétation simplifiée des fonctions métier mentionnées dans le Tableau 1. Il s'agit de simplifier le mapping des fonctions métier en fonction des systèmes auxquels sont familiarisés les parties mettant en œuvre la norme.

4.5 Modèle statique d'informations

4.5.1 Généralités

Le modèle d'informations concernant l'exploitation du réseau se compose de classes qui fournissent un canevas relatif aux attributs de chaque charge utile de message.

Les classes sont détaillées dans l'IEC 61968-11, Extensions du modèle d'information commun (CIM) pour la distribution ou dans l'IEC 61970-301, Interface de programmation d'application pour système de gestion d'énergie (EMS-API) – Base de modèle d'information commun (CIM).

4.5.2 Classes pour l'exploitation du réseau

Le Tableau 2 répertorie les classes utilisées à l'intérieur des types de messages. En général, tous les attributs de ces classes sont définis dans un type de message. Les descriptions décrivent l'usage selon l'IEC 61968-3.

Les classes qui sont utilisées pour spécifier le modèle de réseau sont définies dans l'IEC 61970.

Les classes décrites comme étant de type "Asset" sont définies dans l'IEC 61968/paquet Assets du CIM.

Les classes décrites comme étant de type "Work" sont définies dans l'IEC 61968/paquet Work du CIM.

Les classes décrites comme étant de type "Customer" sont définies dans l'IEC 61968/paquet Customer du CIM.

Les classes décrites comme étant de type "Metering" sont définies dans l'IEC 61968/paquet Metering du CIM.

Les classes décrites comme étant de type "Profile" sont des profils contextuels définis dans l'IEC 61968-3 qui décrivent les définitions de messages à l'aide d'objets CIM.

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Tableau 2 – Classes pour l'exploitation du réseau

Classe	Type	Description
AreaKind	Class	Énumération du type de zone définie, par exemple, pays, état, paroisse, code postal, etc.
ClearanceAction	Class	Action réalisée sur un document d'habilitation dans le cadre d'une étape de commutation.
ClearanceActionKind	Class	Type d'action d'habilitation.
ClearanceDocument	Class	Document de sécurité utilisé pour autoriser le travail sur l'équipement de conduite sur le terrain. L'équipement balisé ne peut pas fonctionner.
ControlAction	Class	Contrôle exécuté dans le cadre d'une étape de commutation.
CutAction	Class	Action réalisée sur une séparation dans le cadre d'une étape de commutation.
EnergySourceAction	Class	Action réalisée sur une source d'énergie dans le cadre d'une étape de commutation.
ERTConfidenceKind	Class	Un facteur de crédibilité peut être appliqué au temps de restauration estimé de manière à assurer la réalisation de l'ERT selon un niveau de confiance élevé ou faible. Ce facteur de crédibilité peut être mis à jour en fonction des besoins pendant la période d'interruption (comme peut l'être l'ERT réel).
EstimatedRestorationTime	Class	Temps de restauration estimé pour une seule interruption
FieldSafetySupervisor	Class	Membre de l'équipe sur site responsable des mesures de sécurité locales pour l'équipe procédant aux opérations de maintenance, de construction et de réparation dans un poste ou sur une ligne/un câble électrique.
GenericAction	Class	Étape de commutation arbitraire.
GroundAction	Class	Action réalisée sur le sol dans le cadre d'une étape de commutation.
Incident	Class	Description d'un problème sur le terrain qui peut être consigné dans une fiche d'incident ou provenir d'une autre source. Cela peut avoir un lien avec une interruption.
JumperAction	Class	Action réalisée sur un raccordement dans le cadre d'une étape de commutation.
MeasurementAction	Class	Mesurage réalisé dans le cadre d'une étape de commutation.
OperationalTag	Class	Balise opérationnelle placée sur une ressource ou un bien du système de puissance dans le contexte de l'exécution du plan de commutation ou d'un autre travail sur le terrain.
OperationsSafetySupervisor	Class	Opérateur chargé de vérifier que le travail dans une installation haute tension est réalisé de manière sûre et conformément aux règlements en matière de sécurité.
Outage	Class	Document décrivant les détails d'une interruption active ou planifiée dans une partie du réseau électrique. Une interruption non planifiée peut être créée lors: – d'un arrêt rapide du disjoncteur; – d'un changement d'état de l'indicateur de défaut; – d'un événement du compteur indiquant une interruption du client; – de la réception d'au moins un appel sur incident de la part du client; ou – d'une commande de l'opérateur, reflétant les informations obtenues de la part de l'équipe sur le terrain. Le rétablissement de l'alimentation peut être réalisé à l'aide d'un plan de commutation qui complète les informations d'interruption par des activités de commutation détaillées, y compris les relations avec l'équipe et le travail. Une interruption planifiée peut être créée lors: – d'une demande de service, de maintenance ou d'un travail de construction sur le terrain; ou – d'une interruption définie par l'opérateur pour l'analyse par simulation/de contingence du réseau.

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Classe	Type	Description
OutageArea	Class	Définit la zone couverte par l'interruption.
OutageCauseKind	Class	Cette énumération décrit la cause principale de l'interruption - planifiée, non planifiée, etc.
OutageOrder	Class	Transmet un plan d'interruption à une équipe afin d'exécuter l'interruption planifiée.
OutagePlan	Class	Document contenant la définition des interruptions planifiées de l'équipement et/ou des points d'utilisation. Il fait référence aux plans de commutation qui sont utilisés pour exécuter l'interruption planifiée.
OutageStatusKind	Class	Définit si l'interruption a été prédite ou confirmée
PlannedOutage	Class	Interruption créée par l'entreprise de distribution ayant un impact sur l'utilisateur. Elle peut être créée pour mettre en œuvre un plan de commutation ou mettre sous tension une nouvelle ligne ou un nouveau dispositif. Le client peut ou peut ne pas en être préalablement informé.
PlannedOutageNotification	Class	Informe les clients d'une interruption planifiée qui va avoir un impact sur eux.
PSREvent	Class	Événement consignant le changement de l'état opérationnel d'une ressource du système de puissance. Peut concerner un événement qui s'est déjà produit ou une activité planifiée.
PSREventKind	Class	Type d'événement de ressource du système de puissance.
SafetyDocument	Class	Document limitant ou autorisant le travail sur un matériel électrique (par exemple, un permis de travail, une pénalité d'essai, une limitation d'accès ou un certificat d'isolement) défini en fonction des pratiques organisationnelles.
ServicePointOutageSummary	Class	Comptages récapitulatifs des points de service affectés par une interruption. Ces comptages sont parfois appelés comptages clients totaux ou critiques.
SwitchAction	Class	Action réalisée sur un commutateur dans le cadre d'une étape de commutation.
SwitchActionKind	Class	Type d'action réalisée sur un commutateur.
SwitchingAction	Class	Action de commutation atomique.
SwitchingEvent	Class	Événement indiquant l'exécution (succès ou échec) d'une action de commutation (action du raccordement, action de coupure, action de balise, etc.). L'action de commutation peut ou peut ne pas être un événement découlant d'une demande d'exécuter l'action.
SwitchingOrder	Class	Transmet un plan de commutation à une équipe afin d'exécuter le plan.
SwitchingPlan	Class	Suite d'étapes groupées ou atomiques destinée: – à mettre hors tension l'équipement ou une partie du réseau pour assurer un travail en toute sécurité; et/ou – à remettre en service l'équipement préalablement mis hors tension ou une partie du réseau.
SwitchingPlanRequest	Class	Document utilisé pour demander de créer un plan de commutation particulier pour un besoin particulier.
SwitchingStep	Class	Étape de commutation atomique. Peut faire partie intégrante d'un groupe d'étapes de commutation ou d'un plan de commutation.
SwitchingStepGroup	Class	Etape logique, groupement d'étapes de commutation atomique importantes pour déterminer à quel moment elles peuvent modifier la topologie (placement d'un raccordement entre deux séparations, par exemple).
TagAction	Class	Action réalisée sur une balise opérationnelle dans le cadre d'une étape de commutation.
TagActionKind	Class	Type d'action réalisée sur une balise.
TempEquipActionKind	Class	Type d'action réalisée sur un équipement provisoire (séparation, raccordement, sol, source d'énergie, par exemple).
TroubleOrder	Class	Le bon d'incident envoie un incident à une équipe pour déclencher une réponse à une interruption non planifiée.

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Classe	Type	Description
UnplannedOutage	Class	Document décrivant les conséquences d'une interruption non planifiée dans une partie du réseau électrique. Pour les besoins de ce modèle, une interruption non planifiée fait référence à un état dans lequel l'énergie n'est pas délivrée (clients hors service, éclairage public non desservi, etc.). Une interruption non planifiée peut être créée: – d'impacts sur le calcul SAIDI; – d'un arrêt rapide du disjoncteur; – d'un changement d'état de l'indicateur de défaut; – d'un événement du compteur indiquant une interruption du client; – de la réception d'au moins un appel sur incident de la part du client; ou – d'une commande de l'opérateur, reflétant les informations obtenues de la part de l'équipe sur le terrain. Le rétablissement de l'alimentation peut être réalisé à l'aide d'un plan de commutation qui complète les informations d'interruption par des activités de commutation détaillées, y compris les relations avec l'équipe et le travail.
VerificationAction	Class	Vérification de la position d'un commutateur ou d'un autre état (une étape de commutation, par exemple)

4.5.3 Classes connexes à l'exploitation du réseau

Le Tableau 3 répertorie les classes souvent associées aux classes d'exploitation du réseau. Leurs attributs ou un de leur sous-ensemble sont utilisés dans les messages définis dans la présente norme. Les attributs détaillés de ces classes sont définis dans l'IEC 61968-11.

Tableau 3 – Classes connexes à l'exploitation du réseau

Classe connexe	Référence	Description
AccountNotification	Customer	Notifications d'entrée, de sortie, des impayés, etc.
Agreement	Common	Accord formel entre deux parties définissant les termes et conditions d'un ensemble de services. Les éléments spécifiques des services sont, à leur tour, définis par l'intermédiaire d'un ou de plusieurs accords de service.
Approver	Common	Personne qui a accepté/signé ou rejeté le document.
Asset	Asset	Ressource tangible de l'entreprise de distribution, y compris l'équipement du système de puissance, les divers dispositifs terminaux, les armoires, les bâtiments, etc. Pour l'équipement du réseau électrique, le rôle du bien est défini par PowerSystemResource et ses subAssetes, définis principalement dans le modèle Wires (se référer à l'IEC 61970-301 et au paquetage du modèle IEC61970::Wires). La description du bien met l'accent sur les caractéristiques physiques de l'équipement remplissant le rôle en question.
AssetContainer	Asset	Bien qui est le regroupement d'autres biens tels que conducteurs, transformateurs, dispositifs de commutation, terrain, clôtures, bâtiments, équipements, véhicules, etc.
AssetFunction	Asset	Fonction réalisée par un bien.
AssetInfo	Asset	Ensemble d'attributs d'un bien (asset), représentant les informations de feuille de données types d'un dispositif physique qui peut être instancié et partagé dans différents contextes d'échange de données: – comme attributs d'une instance d'un bien (installé ou en stock); – comme attributs d'un modèle de biens (produit d'un fabricant); – comme attributs d'un type de bien (type générique d'un bien utilisé pour les conceptions/la planification des extensions).

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Classe connexe	Référence	Description
AssetKind	Asset	Types de biens ou de composants de bien.
Author	Common	Personne qui a créé le document ou l'enregistrement d'activité.
BaseWork	Class	Représentation commune du travail ou des tâches liées au travail.
ConfigurationEvent	Common	Utilisé pour consigner les détails relatifs à la création, la modification ou la suppression d'une entité ou sa configuration.
CoordinateSystem	Common	Système de coordonnées de référence.
Crew	Common	Groupe de personnes ayant des compétences, des outils et des véhicules particuliers.
CrewMember	Common	Membre d'une équipe.
CrewStatusKind	Common	Définit l'état actuel de l'équipe (attribué, arrivé, etc.)
CrewType	Common	Description personnalisée du type d'équipe. Peut être utilisé pour déterminer le type de travail qui peut être attribué à l'équipe. Il s'agit, par exemple, de l'élagage, d'une commutation, etc.
Customer	Customer	Organisme recevant des services rendus par un fournisseur de services.
CustomerAccount	Customer	Attribution d'un groupe de produits et de services achetés par le client dans le cadre d'un accord client, utilisé comme mécanisme de facturation client et de paiement. Contient les informations habituelles provenant de différents types d'accords client pour la facturation (création de factures) destinée à un client et pour recevoir un paiement.
CustomerAgreement	Customer	Accord entre le client et le fournisseur de services pour payer le service à un point de service particulier. Consigne certaines informations de facturation relatives au type de service fourni au point de service, et est utilisé lors de la création de la facture pour déterminer le type de service.
CustomerKind	Customer	Type de client.
CustomerNotification	Customer	Conditions relatives à la notification du client par rapport aux changements de statut de leur service (par exemple, rétablissement d'une interruption de service, changement du temps de rétablissement estimé, du tarif ou du niveau de service, etc.)
Document	Common	Classe parente pour différents regroupements d'informations collectées et gérées dans le cadre d'un processus métier. Elle contient souvent des références à d'autres objets, tels que des biens, des personnes et des ressources du système de puissance.
DocumentPersonRole	Common	Rôle d'une personne en fonction des documents.
Editor	Common	Personne qui a modifié le document.
ElectronicAddress	Common	Informations relatives à l'adresse électronique.
FieldDispatchHistory	Common	Historique des états de répartition sur le terrain pour ce travail.
FieldDispatchStep	Common	Détails de l'étape dans l'historique de répartition de champ.
Hazard	Common	Objet ou condition qui est un danger et provoquant la perte ou menaçant un bien et/ou des personnes.
Issuer	Common	Personne qui a publié le document et qui est responsable de son contenu.
Location	Common	Lieu, scène ou point où une personne ou un objet se trouvait, se trouve et/ou est amené à se trouver à un moment donné. Peut être défini par au moins un point de position (coordonnées) dans un système de coordonnées précis.

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Classe connexe	Référence	Description
NotificationTriggerKind	Customer	Type de déclencheur utilisé pour les notifications du client.
OperationPersonRole	Common	Rôle d'une personne dans le cadre des opérations de l'entreprise de distribution.
Operator	Common	Opérateur de la salle de commande.
Organisation	Common	Organisme qui peut jouer le rôle d'entreprise de distribution, de prestataire, de fournisseur, de fabricant, de client, etc.
Ownership	Common	Propriété, par exemple, d'un bien.
Person	Common	Informations d'ordre général concernant le nom, et autres informations permettant de contacter les personnes.
PositionPoint	Common	Ensemble de coordonnées spatiales qui détermine un point, défini dans le système de coordonnées spécifié dans "Location.CoordinateSystem". Utiliser une instance à un seul point de position pour décrire un emplacement orienté par point. Utiliser une séquence de points de position pour décrire un objet orienté en ligne (emplacement physique d'objets orientés sans point tels que des câbles ou des lignes) ou une zone d'un objet (un poste ou une zone géographique, par exemple, auquel cas le premier point et le dernier point de position ont les mêmes valeurs).
Priority	Common	Définition de propriété.
ServiceCategory	Customer	Catégorie du service fourni au client.
ServiceKind	Customer	Type de service.
ServiceLocation	Customer	Emplacement immobilier, souvent appelé "locaux".
Status	Common	Informations relatives au statut courant pertinentes pour une entité.
StreetAddress	Common	Informations générales relatives à la rue et à l'adresse postale.
StreetDetail	Common	Détails de la rue, dans le cadre de l'adresse.
TelephoneNumber	Common	Numéro de téléphone.
TownDetail	Common	Détails de la ville, dans le cadre de l'adresse.
TroubleCallKind	Customer	Décrit le type d'incident en fonction des informations du client.
TroubleReportingKind	Customer	Type de signalement d'incidents.
TroubleTicket	Customer	Appel du client pour signaler un problème avec leur service.
Work	Work	Document utilisé pour demander, initier, suivre et enregistrer le travail.
WorkActivityRecord	Work	Consigne les informations relatives au statut du travail ou d'une tâche liée au travail à un instant donné.
WorkAsset	Work	Bien utilisé pour réaliser le travail.
WorkKind	Work	Types de travaux.
WorkLocation	Work	Informations relatives à un emplacement particulier pour différentes formes de travaux.
WorkStatusKind	Work	Type de statut, spécifique à un travail.
WorkTask	Work	Tâche à l'intérieur d'un ensemble de travaux.
WorkTaskKind	Work	Types de tâches liées au travail.

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5 Charges utiles de messages d'exploitation du réseau

5.1 Généralités

Le présent Article 5 a pour objet de décrire les charges utiles de messages liées à l'IEC 61968-3. Il est important de noter que certaines de ces charges utiles de messages peuvent également être utilisées par d'autres parties de l'IEC 61968. L'approche générale quant à la réalisation des structures de messages et des schémas XML pour les charges utiles de messages de l'IEC 61968 est spécifiée dans l'IEC 61968-100.

Même s'ils peuvent être représentés dans des diagrammes de séquences pour des raisons de contexte et d'exhaustivité, le présent document ne décrit pas les formats de messages définis par d'autres parties de l'IEC 61968. Les structures des charges utiles de messages définies par la présente partie de l'IEC 61968 sont décrites à l'Article 5.

Les structures de messages sont présentées sous forme de diagramme à l'Article 5. Noter que ces diagrammes sont donnés à titre d'exemple et ne sont pas exhaustifs. La convention de notation caractérise les éléments exigés par un trait plein, et les éléments facultatifs par une ligne en pointillés.

Il est également important de noter que les cas d'utilisation et les diagrammes de séquences fournis à l'Annexe A sont par nature informatifs, et sont destinés à donner des exemples d'utilisation pour les définitions normatives de la charge utile de message. Le présent document n'a pas vocation à normaliser les processus métier spécifiques.

Les éléments suivants sont des conventions générales dans les définitions de messages fournies dans le présent document:

– Les objets sont identifiés par l'un des éléments suivants:
  - **mRID** hérité de **IdentifiedObject**;
  - une ou plusieurs instances **Name.name**. Les systèmes de transaction peuvent utiliser un ou plusieurs des attributs pour identifier sans équivoque les objets échangés;
  - une combinaison du **mRID** et d'une ou plusieurs instances **Name.name**.
– Plusieurs classes CIM ont un attribut appelé **type** permettant de fournir une description de chaîne d'une instance de la classe. Certaines classes CIM (**Asset**, par exemple) ont également un attribut appelé "**kind**". Cela permet une meilleure interopérabilité. Les messages du présent document qui intègrent ces types de classes incluent les attributs "**type**" et "**kind**". Si une valeur appropriée n'est pas disponible pour "**kind**", les systèmes de transaction peuvent utiliser la valeur "**other**" pour "**kind**" afin d'indiquer qu'il convient d'utiliser la description de chaîne dans l'attribut "**type**".
– La majorité des attributs des charges utiles de messages sont facultatifs. Il revient au système de transaction de mettre en œuvre la logique pour les champs exigés.

5.2 Récapitulatifs des profils de messages de l'IEC 61968-3

Le Tableau 4 présente un récapitulatif de tous les messages définis dans le présent document et leur objet.

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Tableau 4 – Récapitulatifs des profils de messages de l'IEC 61968-3

Nom de profil	Objet
PSRMeasurements	Contient les valeurs de l'accumulateur, les valeurs analogiques, les valeurs discrètes et les valeurs de chaîne provenant de SCADA. Les horodatages et codes de qualité sont également inclus. Le cas échéant, inclut une référence à la **PowerSystemResource** à laquelle est associé le mesurage.
PSRControls	Demande à SCADA de modifier une valeur dans le champ. La modification peut être la réinitialisation d'un accumulateur, une commande analogique, une commande, une commande de levage/abaissement ou un point de consigne. Le cas échéant, inclut une référence à la **PowerSystemResource** associée à la demande de commande.
SwitchingPlanRequests	Une **SwitchingPlanRequest** est utilisée pour acheminer une demande entre la gestion des travaux (ou une autre fonction métier) et les opérations de réseau pour lesquelles la commutation doit être réalisée (par exemple, une partie du réseau doit être isolée) afin de procéder à des opérations de maintenance ou à des travaux de construction. La charge utile inclut le type de travaux à réaliser et le moment auquel il convient de le commencer. Le résultat classique d'une **SwitchingPlanRequest** est la création d'un **SwitchingPlan**.
SwitchingPlans	Les charges utiles de messages **SwitchingPlans** sont conçues pour communiquer un ensemble de **SwitchingActions** qui forment une suite d'opérations permettant de gérer une tâche opérationnelle complète. Les **SwitchingPlans** peuvent également être créés afin de réaliser une commutation d'urgence.
SwitchingOrders	Les charges utiles de messages **SwitchingOrders** sont conçues pour communiquer des demandes de planification de l'exécution d'un **SwitchingPlan** pour une commutation d'urgence ou planifiée.
SwitchingActions	Les **SwitchingActions** sont utilisées pour coordonner l'exécution manuelle des étapes à l'intérieur des **SwitchingPlans** entre la salle de commande et les équipes sur le terrain. L'exécution automatisée de l'étape est coordonnée avec les messages **PSRControls**.
SwitchingEvents	Les **SwitchingEvents** sont utilisés pour communiquer les modifications temporaires de réseau après l'exécution d'une étape dans un **SwitchingPlan** initiée par l'intermédiaire d'une **SwitchingAction.** Les **SwitchingEvents** sont également utilisés pour communiquer les modifications temporaires de réseau entre des systèmes d'entreprise. Les résultats des **PSRControls** sont coordonnés avec les messages **PSRMeasurements**.
PlannedOutageNotifications	Les **PlannedOutageNotifications** sont utilisées pour informer les clients qu'ils vont être impactés par une **PlannedOutage**, avant l'exécution d'un **SwitchingPlan**. La charge utile inclut la date/l'heure de début et de fin prévues et une liste des clients qui vont être impactés.
PlannedOutages	Les charges utiles de messages **PlannedOutages** sont conçues pour communiquer la création et les changements de statut des **PlannedOutages** dès qu'un ou plusieurs clients sont mis hors tension après la réalisation d'actions de commutation planifiées. La charge utile inclut une liste des clients concernés et l'heure de début/fin réelle.
UnplannedOutages	Les charges utiles de messages **UnplannedOutages** sont conçues pour communiquer la création et les changements de statut des **UnplannedOutages** dès qu'un ou plusieurs clients sont mis hors tension. Cela peut être le résultat de défauts tels que des courts-circuits, des lignes non alimentées de défauts, des erreurs de commutation ou d'autres causes.
TroubleOrders	Les charges utiles de messages **TroubleOrders** sont conçues pour communiquer des demandes de travaux aux équipes sur le terrain afin de réaliser un travail en réponse à un **Incident ou** à un **UnplannedOutage**, et de suivre le statut du travail.
Incidents	Les charges utiles de messages **Incidents** sont conçues pour communiquer un problème sur le terrain. En règle générale, mais pas toujours, un **Incident** est associé à une **UnplannedOutage**.

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Nom de profil	Objet
EquipmentFaults	Les charges utiles de messages **EquipmentFaults** sont conçues pour communiquer les informations détaillées relatives au défaut dans le cadre des messages **UnplannedOutages**. Un **EquipmentFault** est un défaut appliqué au niveau de la borne, externe à l'équipement. Cette classe n'est pas utilisée pour spécifier les défauts internes à l'équipement.
LineFaults	Les messages **LineFaults** sont conçus pour communiquer les informations détaillées relatives au défaut dans le cadre des messages **UnplannedOutages**. Les **LineFaults** définissent tous les types de défauts qui se produisent sur des segments de ligne en courant alternatif ou en courant continu.

5.3 Profils Config

5.3.1 Généralités

Les profils Config sont utilisés pour partager un sous-ensemble du modèle de manière à éviter de partager l'ensemble du modèle et d'envoyer des données de configuration au moment de l'exécution. Il est envisagé que les messages config soient échangés entre les systèmes uniquement lorsque cela est exigé.

Par exemple, un Système d'information client peut envoyer des messages **CustomerConfig**, **UsagePointConfig** et **OperationsDataLinkageConfig** à un Système de gestion des interruptions de service. En recevant ces messages et en instanciant les informations relatives au client, les informations relatives au point d'utilisation, l'association entre les clients et les points d'utilisation et les informations présentes dans sa base de données, l'OMS peut produire des listes de contact client correspondant à une interruption.

Tous les messages s'appuient uniquement sur des identifiants uniques (**mRIDs**) pour tous les objets faisant partie du modèle de réseau commun, en l'occurrence le modèle de réseau de distribution commun défini dans le cadre du CIM. Afin de publier ces identifiants uniques, le système concerné a besoin d'importer ce modèle de réseau ou de charger les identifiants nécessaires dans le cadre de l'étape de configuration du système.

Deux mécanismes sont pris en charge pour le transfert de messages entre les systèmes: l'un est un modèle "push" (pousser) et l'autre un modèle "pull" (tirer). Le mécanisme choisi dépend des capacités des systèmes impliqués dans l'échange de messages et de l'opportunité des données échangées. Un exemple d'échange de messages "push" (pousser) est donné à la Figure 3. Dans cet exemple, un nouveau client est créé dans le CIS, et les informations sont envoyées à l'OMS.

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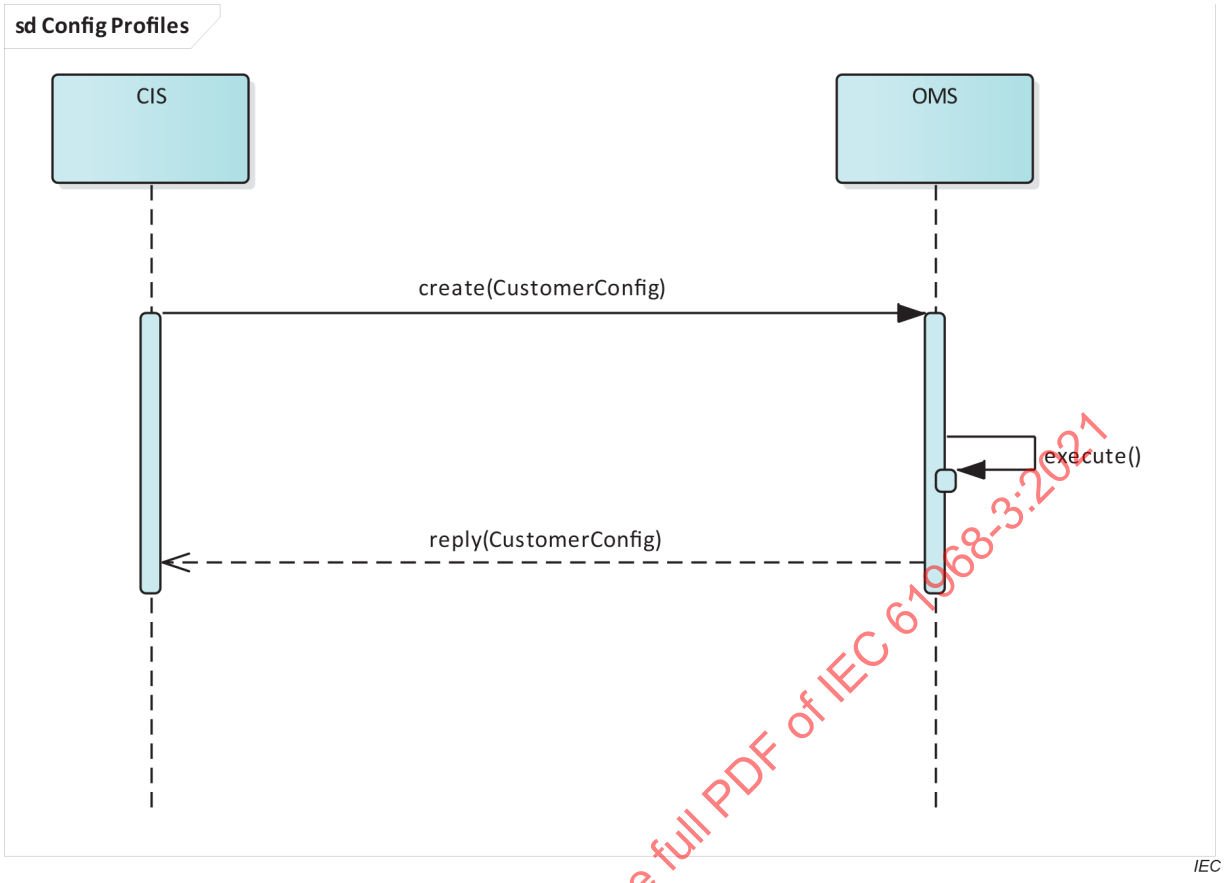
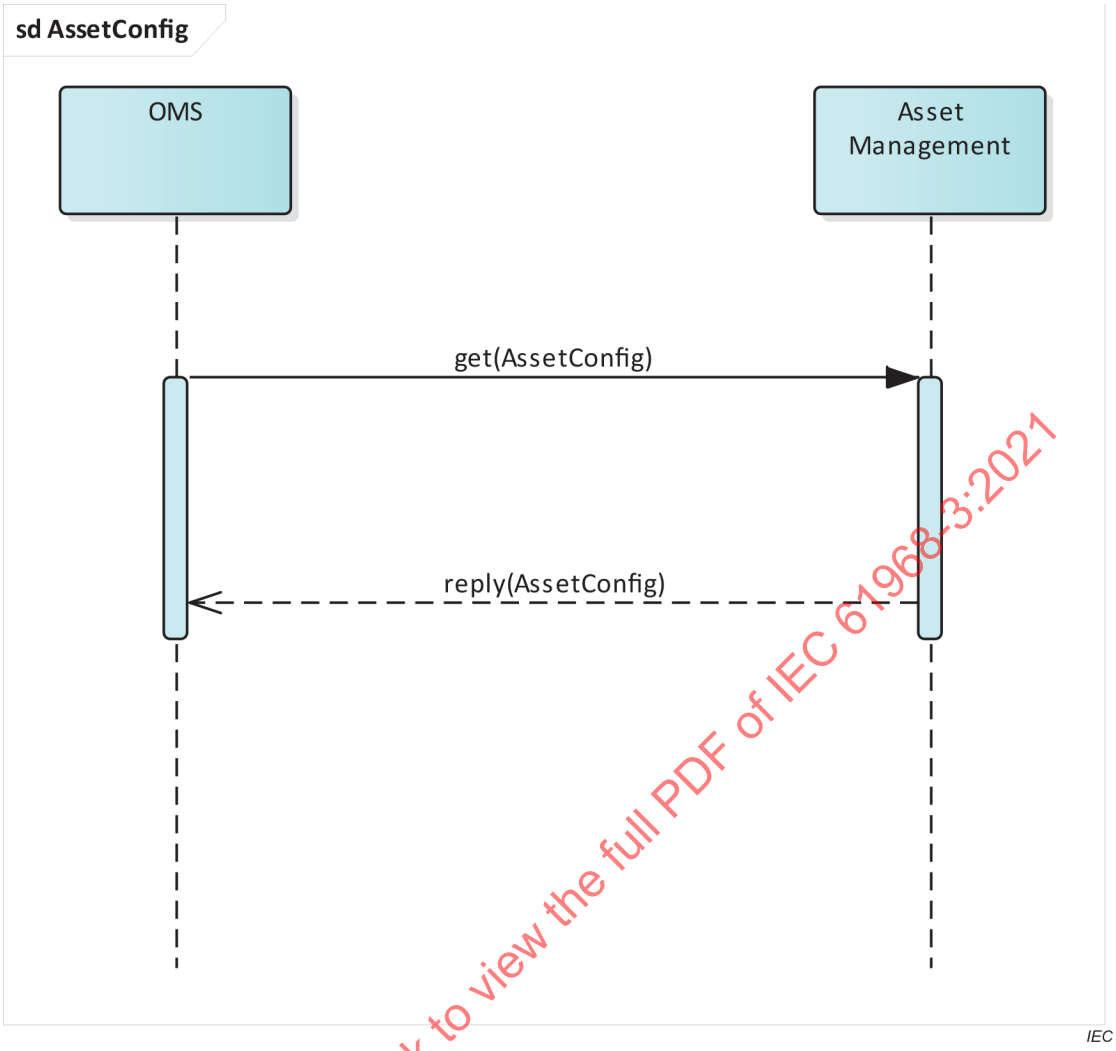


Figure 3 – Exemple d'échange de message Push

Un exemple d'échange de messages "Pull" (tirer) est donné à la Figure 4.

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Anglais	Français
Asset Management	Gestion des biens

Figure 4 – Exemple d'échange de message Pull

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5.3.2 Charges utiles de messages

Il existe plusieurs messages Config, y compris:

- **AssetConfig** – voir 5.3.4;
- **CustomerAgreementConfig** – voir Article D.1;
- **CustomerConfig** – voir Article D.2;
- **FaultCauseTypeConfig** – voir 5.3.5;
- **LocationConfig** – voir 5.3.6;
- **MeterConfig** – voir Article D.3;
- **PowerSystemResourceConfig** – voir 5.3.7;
- **UsagePointConfig** – voir Article D.4;
- **UsagePointLocationConfig** – voir Article D.5.

Les messages config ci-dessus sont associés à l'aide du message **OperationsDataLinkageConfig** pour assurer les relations entre les différents messages config à définir.

5.3.3 Charge utile **AssetConfig**

La charge utile **AssetConfig** présentée à la Figure 5 et à la Figure 6 définit zéro, un ou plusieurs **Asset**s. Les attributs importants pour les besoins du présent document sont **mRID** et **Names**, car cela permet le mapping entre le **mRID**, **Names** et les objets eux-mêmes dans les messages, de sorte qu'il n'est pas nécessaire d'envoyer l'ensemble de l'instance d'objet dans le message.

Les attributs du profil **AssetConfig** sont décrits dans le Tableau 5.

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Tableau 5 – Profil AssetConfig

AssetConfig				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
AssetConfig	Asset	[1..*]		
Attributs de profil pour Asset				
mRID	String	[0..1]	GUID	mRID de l'Asset
description	String	[0..1]		Champ textuel au format libre qui décrit l'**Asset**
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour l'Asset.
baselineCondition	String	[0..1]		Etat du bien à la dernière référence. Par exemple: nouveau, reconstruit, révision exigée, autre. Voir les données d'examen pour des informations relatives à l'état le plus actuel du bien.
baselineLossOfLife	PerCent	[0..1]		Pourcentage de l'espérance de vie qui a été perdu par rapport à la dernière référence en la matière. Représente (espérance de vie initiale - espérance de vie actuelle) / espérance de vie initiale.
critique	Boolean	[0..1]		True si le bien est considéré comme critique pour certaines raisons (un poteau avec des fixations critiques , par exemple).
inUseState	inUseStateKind	[0..1]	Voir l'Article C.9	Indication si le bien est déjà déployé (en cours d'utilisation), prêt à être mis en service ou indisponible à l'utilisation.
kind	AssetKind	[0..1]	Voir l'Article C.1	Type de bien. Utilisé dans la description des composants du bien dans les modèles d'instance de bien.
lifecycleState	AssetLifecycleStateKind	[0..1]	Voir l'Article C.2	Statut actuel du cycle de vie du bien.
lotNumber	String	[0..1]		Numéro de lot de ce bien. Même pour les mêmes modèle et numéro de version, de nombreux biens sont fabriqués en lots.
position	String	[0..1]		Position du bien ou du composant de bien. Peut souvent être associé à d'autres biens ou composants.
purchasePrice	Money	[0..1]		Prix d'achat du bien.
retiredReason	RetiredReasonKind	[0..1]	Voir l'Article C.16	Raison pour laquelle le bien a été retiré.
serialNumber	String	[0..1]		Numéro de série de ce bien.

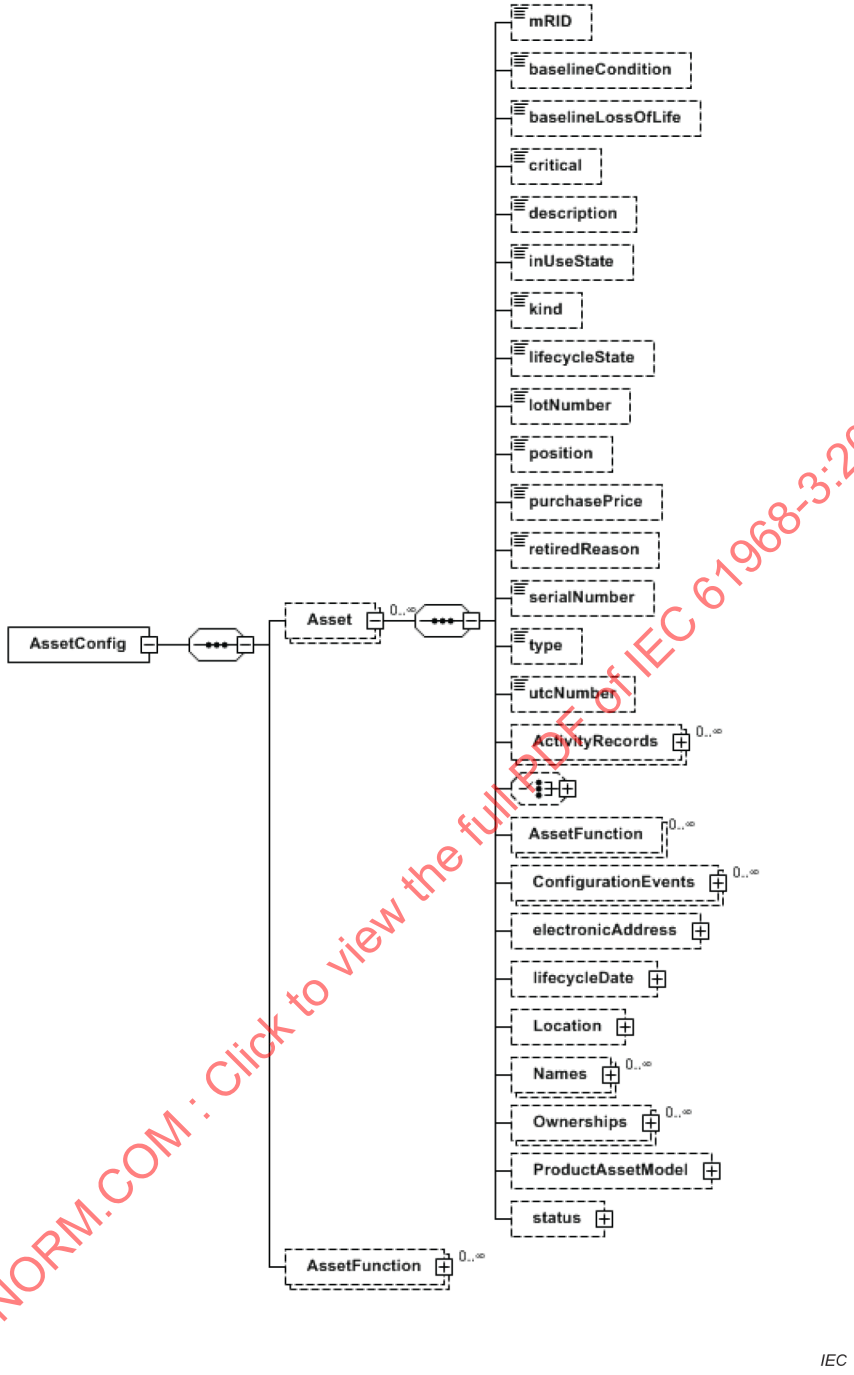
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AssetConfig				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
type	String	[0..1]		Classification spécifique aux entreprises de distribution du bien et de ses sous-types, conformément à leurs normes et pratiques professionnelles et aux systèmes informatiques existants (par exemple: gestion de biens, maintenance, travaux, interruptions de service, clients, etc.).
utcNumber	String	[0..1]		Numéro UTC (Uniquely Tracked Commodity – Marchandises suivies de manière unique).
ActivityRecords	ActivityRecord	[0..*]	Voir l'Article B.5	
AssetContainer	Choix de: Cabinet DuctBank Pole Structure Tower UndergroundStructure	[0..1]	Pour Cabinet, voir l'Article B.14 Pour DuctBank, voir l'Article B.30 Pour Pole, voir l'Article B.66 Pour Structure, voir l'Article B.84 Pour Tower, voir l'Article B.91 Pour UndergroundStructure, voir l'Article B.96	
AssetFunction	AssetFunction	[0..*]	Référence à AssetFunction dans cette charge utile	Contient le mRID ou Names.name de l'AssetFunction référencée
ConfigurationEvents	ConfigurationEvent	[0..*]	Voir l'Article B.19	Tous les événements de configuration créés pour ce bien.
electronicAddress	ElectronicAddress	[0..1]	Voir l'Article B.32	Adresse électronique de ce bien (une adresse MAC, par exemple).
lifecycleDate	LifeCycleDate	[0..1]	Voir l'Article B.50	Dates du cycle de vie de ce bien.
Location	Location	[0..1]	Voir l'Article B.52	Emplacement de ce bien
Ownerships	Ownership	[0..1]	Voir l'Article B.64	Toutes les propriétés de ce bien.
ProductAssetModel	ProductAssetModel	[0..1]	Voir l'Article B.70	Le modèle de ce bien.
status	Status	[0..1]	Voir l'Article B.79	Statut de ce bien.

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AssetConfig				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
Attributs de profil pour AssetFunction				
mRID	String	[0..1]	GUID	mRID de l'AssetFunction.
description	String	[0..1]		Champ textuel au format libre qui décrit l'**AssetFunction**
Names	Name	[0..*]	Voir l'Article B.56	Noms visibles par l'homme pour l'AssetFunction.
configID	String	[0..1]		Configuration indiquée pour cette fonction.
firmwareID	String	[0..1]		Version micrologicielle.
hardwareID	String	[0..1]		Version matérielle.
password	String	[0..1]		Mot de passe nécessaire pour accéder à cette fonction.
programID	String	[0..1]		Nom du programme.

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Figure 5 – Charge utile AssetConfig (1)

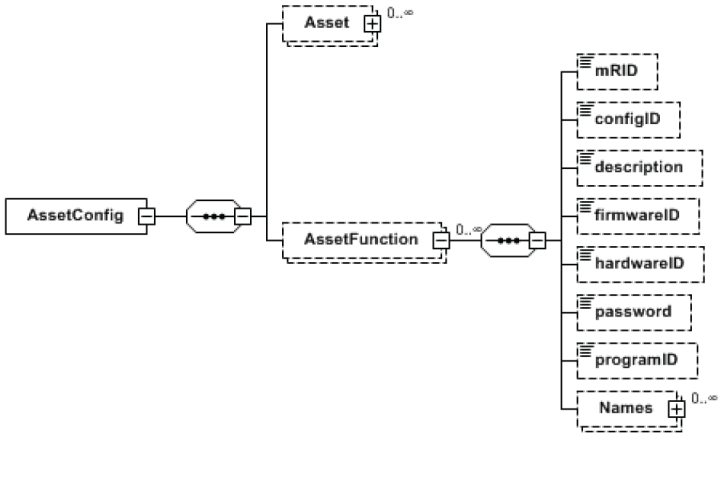


Figure 6 – Charge utile AssetConfig (2)

5.3.4 Charge utile FaultCauseTypeConfig

La charge utile **FaultCauseTypeConfig** présentée à la Figure 7 définit zéro, un ou plusieurs **FaultCauseType**s. Les attributs importants pour les besoins du présent document sont **mRID** et **Names**, car cela permet le mapping entre le **mRID**, **Names** et les objets eux-mêmes dans les messages, de sorte qu'il n'est pas nécessaire d'envoyer l'ensemble de l'instance d'objet dans le message.

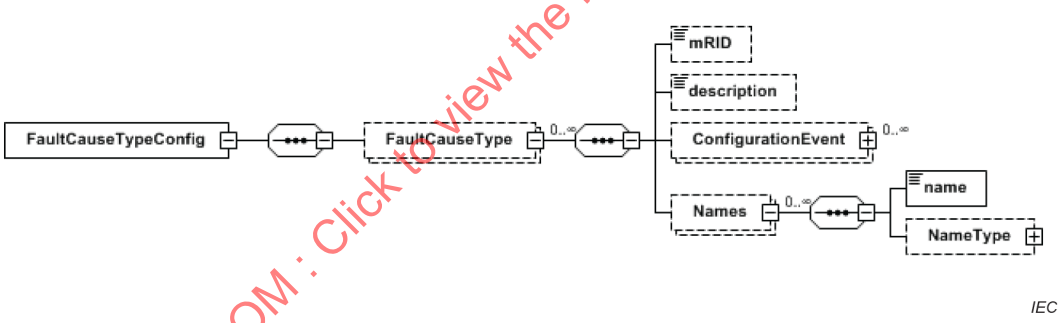


Figure 7 – Charge utile FaultCauseTypeConfig

5.3.5 Charge utile LocationConfig

La charge utile **LocationConfig** présentée à la Figure 8 définit zéro, un ou plusieurs **Location**s. Les attributs importants pour les besoins du présent document sont **mRID** et **Names**, car cela permet le mapping entre le **mRID**, **Names** et les objets eux-mêmes dans les messages, de sorte qu'il n'est pas nécessaire d'envoyer l'ensemble de l'instance d'objet dans le message.

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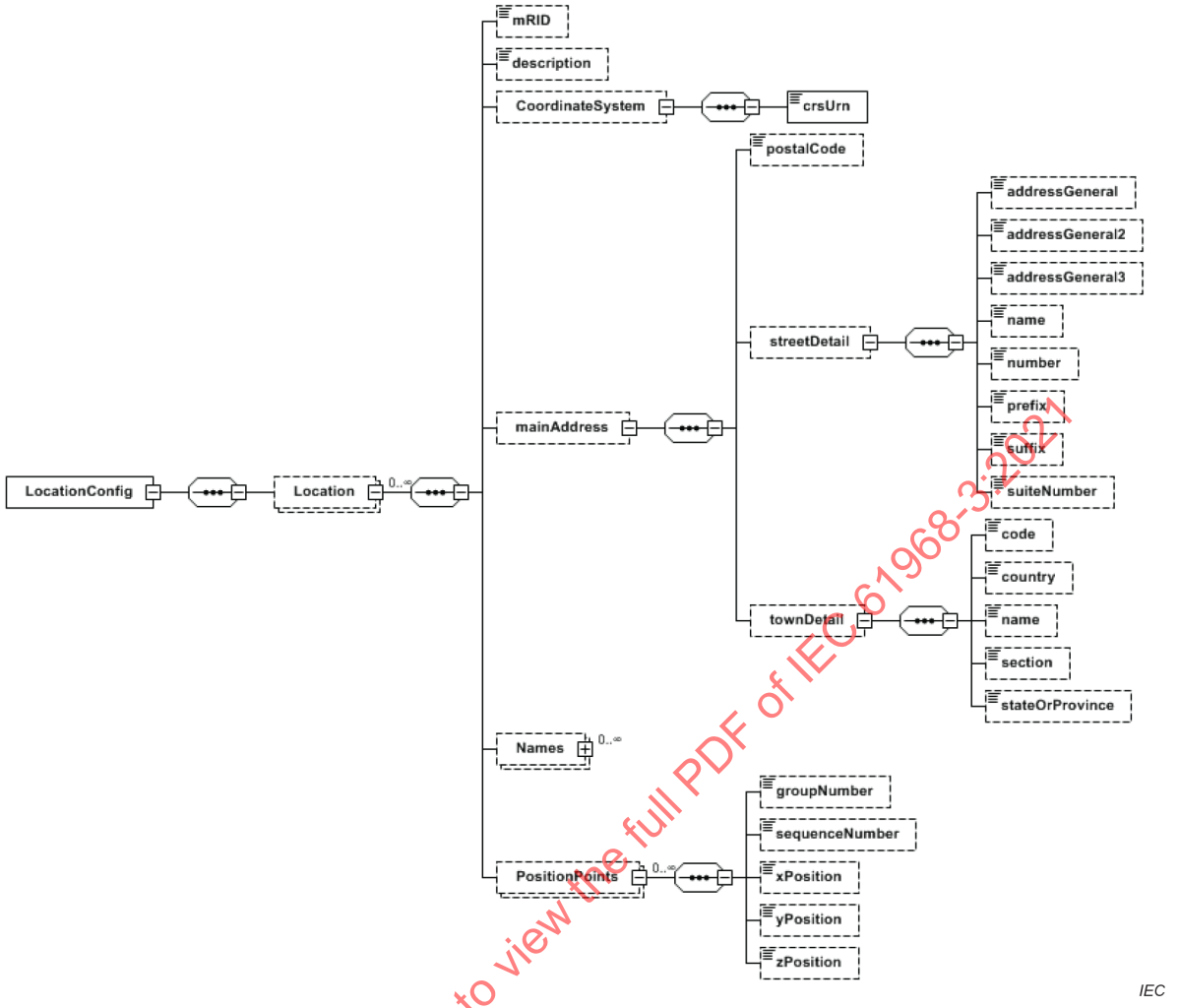


Figure 8 – Charge utile LocationConfig

5.3.6 Charge utile PowerSystemResourceConfig

La charge utile **PowerSystemResourceConfig** présentée à la Figure 9 définit zéro, une ou plusieurs **PowerSystemResource**s. Les attributs importants pour les besoins du présent document sont **mRID** et **Names**, car cela permet le mapping entre le **mRID**, **Names** et les objets eux-mêmes dans les messages, de sorte qu'il n'est pas nécessaire d'envoyer l'ensemble de l'instance d'objet dans le message.

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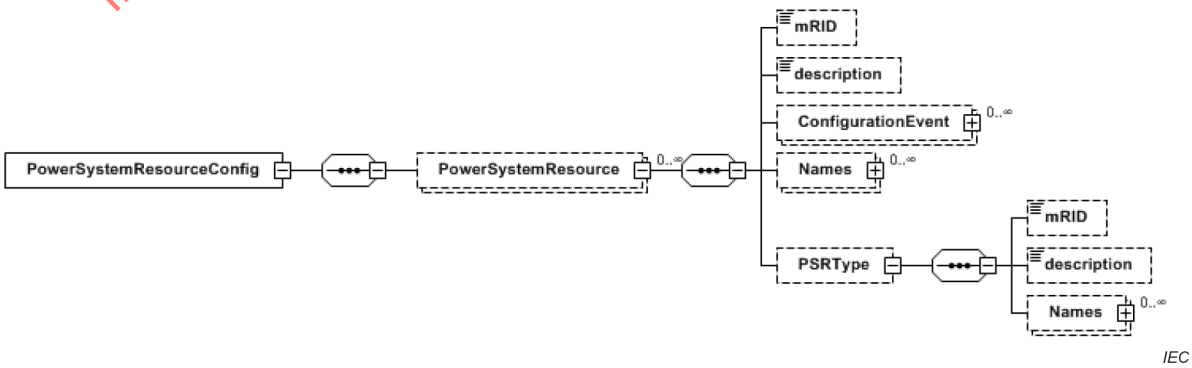


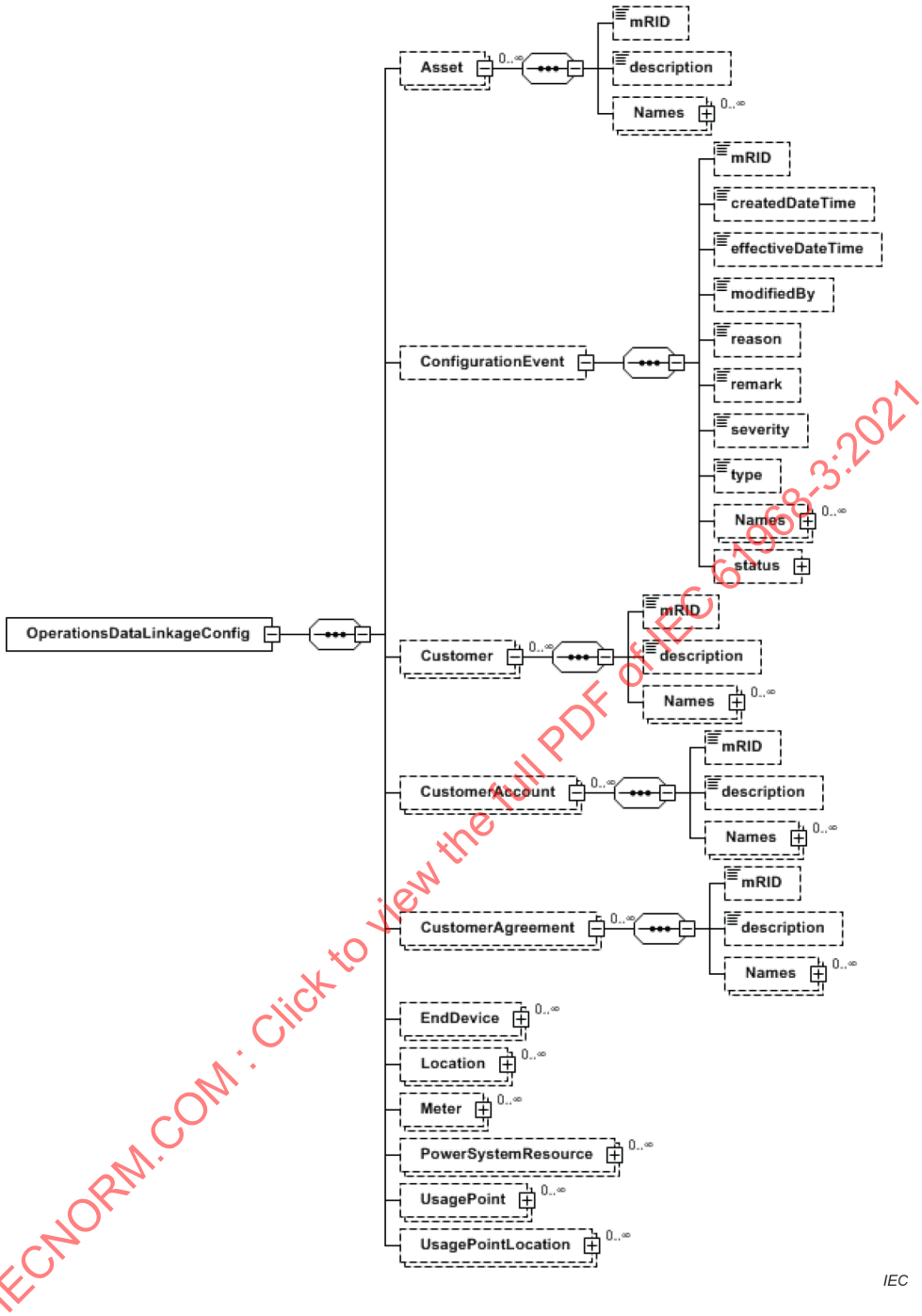
Figure 9 – Charge utile PowerSystemResourceConfig

5.3.7 Charge utile **OperationsDataLinkageConfig**

La charge utile **OperationsDataLinkageConfig** présentée à la Figure 10 et à la Figure 11 définit zéro, un ou plusieurs **OperationsDataLinkage**s. Ce message relie les différents objets utilisés dans les messages config. En particulier, il relie éventuellement un ou plusieurs objets suivants:

- Asset;
- ConfigurationEvent;
- Customer;
- CustomerAccount;
- CustomerAgreement;
- EndDevice;
- Location;
- Meter;
- PowerSystemResourceConfig;
- UsagePoint;
- UsagePointLocation.

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Figure 10 – Charge utile OperationsDataLinkageConfig (1)

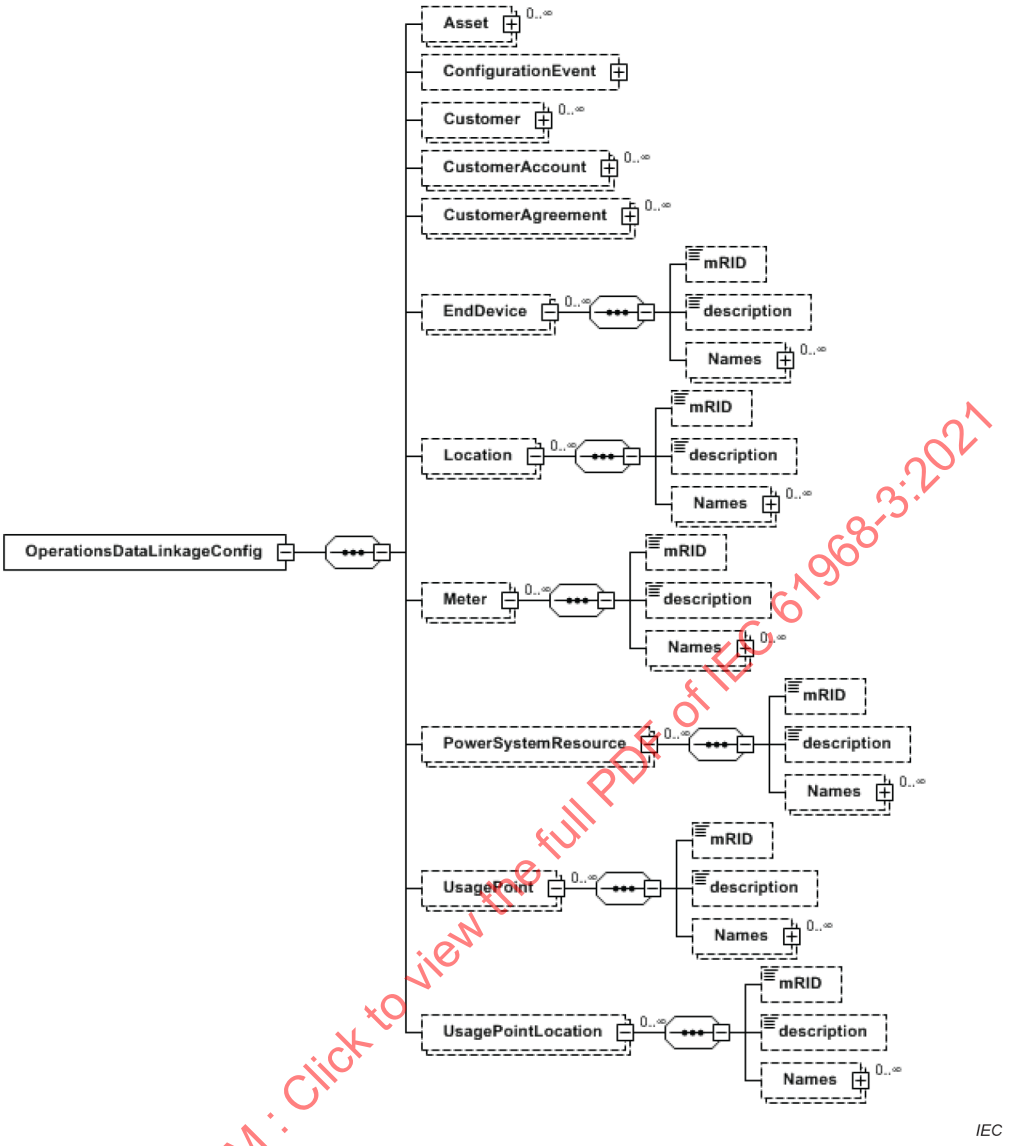


Figure 11 – Charge utile OperationsDataLinkageConfig (2)

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Les cas d'utilisation possibles pour ce message incluent:

- la liaison d'un client à un compteur;
- la liaison d'un client à une ressource du système de puissance, telle qu'une charge (energyConsumer);
- la liaison d'un client à son accord client, afin de déterminer la participation dans un programme de réponse à la demande.

5.3.8 Exemple – Liaison d'un Customer à une PowerSystemResource

Une exigence commune pour les systèmes de gestion des interruptions et les systèmes de gestion de la distribution consiste à associer les clients au réseau. Pour ce faire, un **Customer** peut être associé à un **EnergyConsumer**. Dans ce cas, un message **OperationsDataLinkageConfig** peut être envoyé par le système d'enregistrement (CIS ou GIS, par exemple) et contenir le **Customer mRID** ou **name** et le **PowerSystemResource mRID** ou **name**.

Dans cet exemple, il n'est pas obligatoire de recevoir un message **CustomerConfig** ou **PowerSystemResourceConfig** tant que **mRID** ou **name** du **Customer** et **PowerSystemResource** sont connus du système de réception. Toutefois, l'échantillon **CustomerConfig** et **PowerSystemResourceConfig** XML sont inclus.

Modèle XML **CustomerConfig**. Cela définit les informations pour un client:

```
<?xml version="1.0" encoding="UTF-8"?>
<m:CustomerConfig xmlns:m="http://iec.ch/TC57/2019/CustomerConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/CustomerConfig# CustomerConfig.xsd ">
  <m:Customer>
    <m:mRID>fd393766-f408-4ef8-8d83-d9f17fddf931</m:mRID>
    <m:kind>commercialIndustrial</m:kind>
    <m:locale>m:en</m:locale>
    <m:Names>
      <m:name>Michael B Higgins</m:name>
        <m:NameType>
          <m:name>Customer Name</m:name>
        </m:NameType>
    </m:Names>
    <m:Names>
        <m:name>02100045112314</m:name>
        <m:NameType>
          <m:name>Account Number</m:name>
        </m:NameType>
    </m:Names>
    <m:Organisation>
      <m:electronicAddress>
        <m:email1>michaelbhiggins31427@gmail.com</m:email1>
      </m:electronicAddress>
      <m:Names>
        <m:name>02100045112314</m:name>
        <m:NameType>
          <m:name>Account Number</m:name>
        </m:NameType>
      </m:Names>
      <m:phone1>
        <m:areaCode>919</m:areaCode>
        <m:cityCode>555</m:cityCode>
        <m:localNumber>1212</m:localNumber>
      </m:phone1>
      <m:postalAddress>
        <m:postalCode>27606</m:postalCode>
        <m:streetDetail>
          <m:addressGeneral>Main Campus Drive</m:addressGeneral>
          <m:number>901</m:number>
        </m:streetDetail>
        <m:townDetail>
          <m:name>Raleigh</m:name>
          <m:stateOrProvince>NC</m:stateOrProvince>
        </m:townDetail>
      </m:postalAddress>
      <m:streetAddress>
        <m:postalCode>27606</m:postalCode>
        <m:streetDetail>
          <m:addressGeneral>Main Campus Drive</m:addressGeneral>
          <m:number>901</m:number>
        </m:streetDetail>
        <m:townDetail>
          <m:name>Raleigh</m:name>
          <m:stateOrProvince>NC</m:stateOrProvince>
        </m:townDetail>
      </m:streetAddress>
    </m:Organisation>
  </m:Customer>
</m:CustomerConfig>
```

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Modèle XML **PowerSystemResourceConfig** . Définit un transformateur monté sur socle auquel le client ci-dessus est associé:

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PowerSystemResourceConfig xmlns:m="http://iec.ch/TC57/2019/PowerSystemResourceConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PowerSystemResourceConfig#
PowerSystemResourceConfig.xsd ">
  <m:PowerSystemResource>
    <m:mRID>ffb7f838-1eef-4297-83b4-59a2e431551d</m:mRID>
  </m:PowerSystemResource>
</m:PowerSystemResourceConfig>
```

Modèle XML **OperationsDataLinkage**. Associe le client au transformateur monté sur socle:

```
<?xml version="1.0" encoding="UTF-8"?>
<m:OperationsDataLinkageConfig xmlns:m="http://iec.ch/TC57/2017/OperationsDataLinkageConfig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2017/OperationsDataLinkageConfig#
OperationsDataLinkageConfig.xsd ">
  <m:Customer>
    <m:mRID>fd393766-f408-4ef8-8d83-d9f17fddf931</m:mRID>
  </m:Customer>
  <m:PowerSystemResource>
    <m:mRID> ffb7f838-1eef-4297-83b4-59a2e431551d </m:mRID>
  </m:PowerSystemResource>
</m:OperationsDataLinkageConfig>
```

5.4 Charge utile PSRMeasurements

5.4.1 Généralités

L'état du réseau est surveillé par SCADA ou d'autres dispositifs/systèmes de surveillance de réseau et signalé aux autres systèmes qui ont besoin de tenir compte de l'état en cours du réseau pour procéder à des traitements et analyses supplémentaires, c'est-à-dire un système OMS (pour la fonction Gestion de défauts) ou DMS (pour la fonction Surveillance de l'exploitation du réseau).

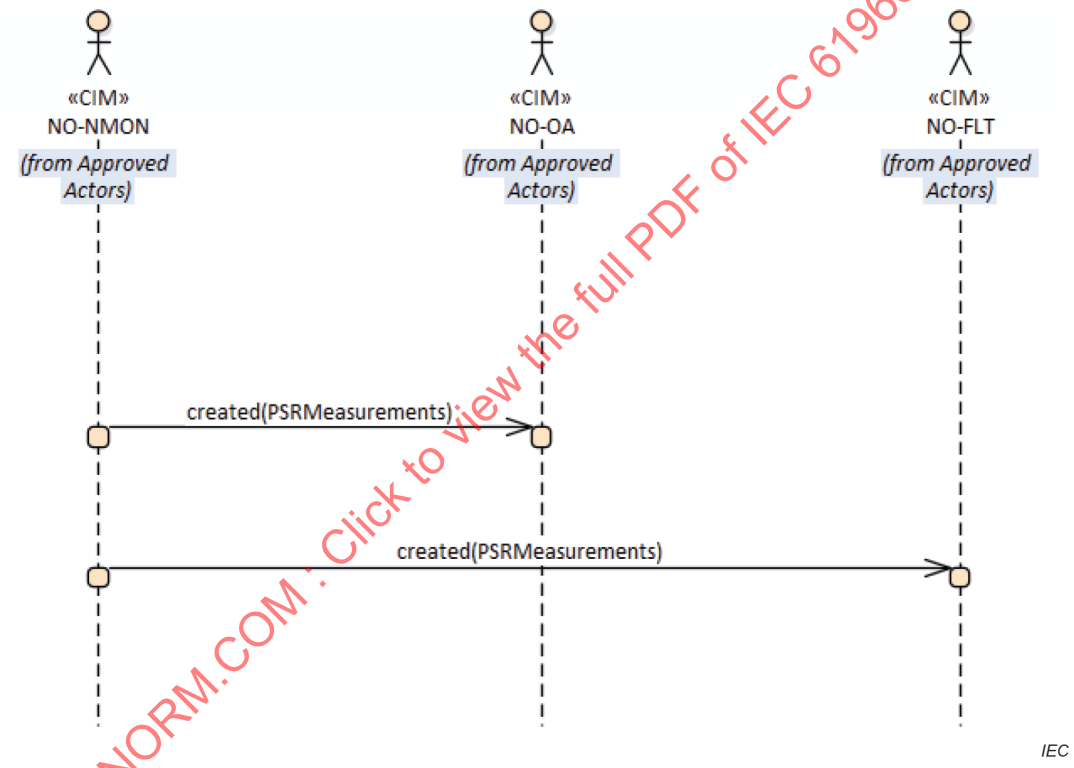
Un Measurement du présent document s'apparente à un MeterReading de l'IEC 61969-9. Dans l'IEC 61968-9, un MeterReading est plutôt utilisé pour acheminer une valeur en cours d'informations numériques (position du commutateur, par exemple) ou analogiques (tension, par exemple). Toutefois, un EndDeviceEvent est utilisé pour acheminer un changement d'état (le passage d'un commutateur en position ouverte, par exemple). Par conséquent, dans l'exemple, si un système reçoit un MeterReading indiquant qu'un commutateur est ouvert à un moment particulier, le système doit s'appuyer sur sa connaissance préalable de la position du commutateur pour déterminer si l'état ouvert représente un changement d'état (de la position fermée à la position ouverte) à un instant donné ou s'il s'agit simplement d'une confirmation que le commutateur est toujours ouvert à cet instant précis. Inversement, si un système reçoit un EndDeviceEvent indiquant qu'un commutateur est ouvert à un instant donné, il n'a pas besoin de connaître préalablement l'état du commutateur pour comprendre que ce dernier avait été fermé jusqu'à cet instant.

De nombreux systèmes de mesure existants (SCADA, par exemple) ne font aucune distinction similaire entre les états et les événements. En effet, ce type de systèmes a été conçu pour recevoir des données provenant de dispositifs de terrain soit par interrogation régulière soit par exception. En général, les événements ne sont pas disponibles. Cela est également vrai pour les mesurages calculés dans un système SCADA ou par une application (un estimateur d'état ou un flux d'énergie, par exemple). Il est donc pris pour hypothèse qu'une fonction métier recevant des PSRMeasurements a la possibilité de déterminer si une valeur a changé depuis la dernière fois qu'elle a été reçue. Dans certains cas, la fonction de réception peut rechercher un changement qui dépasse un certain seuil avant de mener une action.

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La Figure 12 est un diagramme de séquences représentant comment les **PSRMeasurements** sont utilisés pour communiquer des valeurs entre différents acteurs. Il est également possible pour un acteur de demander la valeur en cours d'un mesurage, à l'aide du profil GetPSRMeasurements défini en 5.4.7. Le diagramme de séquences est présenté à la Figure 13.

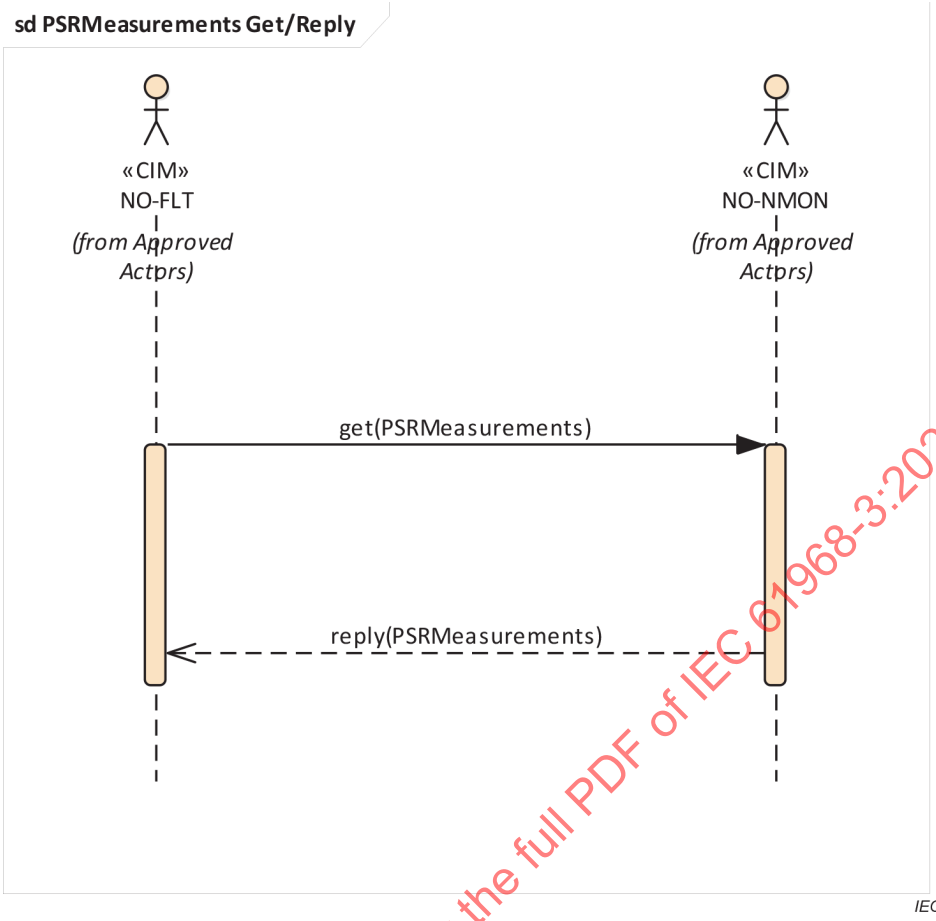
Les charges utiles de messages **PSRMeasurements** sont conçues pour signaler les informations sur l'état du réseau (état du commutateur, état d'un relais de défaut, position de la prise de courant d'un transformateur ou valeur du courant d'un mesurage de tension, par exemple). Les messages peuvent contenir les valeurs de l'accumulateur, les valeurs analogiques, les valeurs discrètes et les valeurs de chaîne provenant de SCADA ou d'autres systèmes de mesure. Les horodatages et codes de qualité sont également inclus. Le message inclut également la ou les phases associées au mesurage, définies par **phases** (de type **PhaseCode**). Si aucune phase n'est spécifiée, trois phases sont prises pour hypothèse. Pour les mesurages asymétriques (monophasés), un **PSRMeasurement** par phase est exigé. Chaque **PSRMeasurement** inclut une référence à la ressource du système de puissance à laquelle est associé le mesurage.



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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)

Figure 12 – Diagramme de séquences PSRMeasurements



Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)

Figure 13 – Modèle de message Get/Reply pour PSRMeasurements

5.4.2 Charge utile de messages

Les objets de valeur **PSRMeasurement** sont les suivants:

- **Accumulator**Value;
- **Analog**Value (puissance active et réactive, par exemple);
- **Discrete**Value (état d'un disjoncteur, par exemple);
- Valeur **StringMeasurement**.

Les attributs du profil **PSRMeasurements** sont décrits dans le Tableau 6.

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Tableau 6 – Profil PSRMeasurements

PSRMeasurements				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
PSRMeasurements	Accumulator	[0..*]	Voir l'Article B.2	Choix en fonction du type de mesurage
PSRMeasurements	Analog	[0..*]	Voir l'Article B.6	Choix en fonction du type de mesurage
PSRMeasurements	Discrete	[0..*]	Voir l'Article B.28	Choix en fonction du type de mesurage
PSRMeasurements	StringMeasurement	[0..*]	Voir l'Article B.81	Choix en fonction du type de mesurage

5.4.3 Charge utile PSRMeasurements – Accumulator

La Figure 14 présente la charge utile de message pour **PSRMeasurements Accumulator**. **Accumulator** représente un Measurement cumulé (compté), comme une valeur énergétique.

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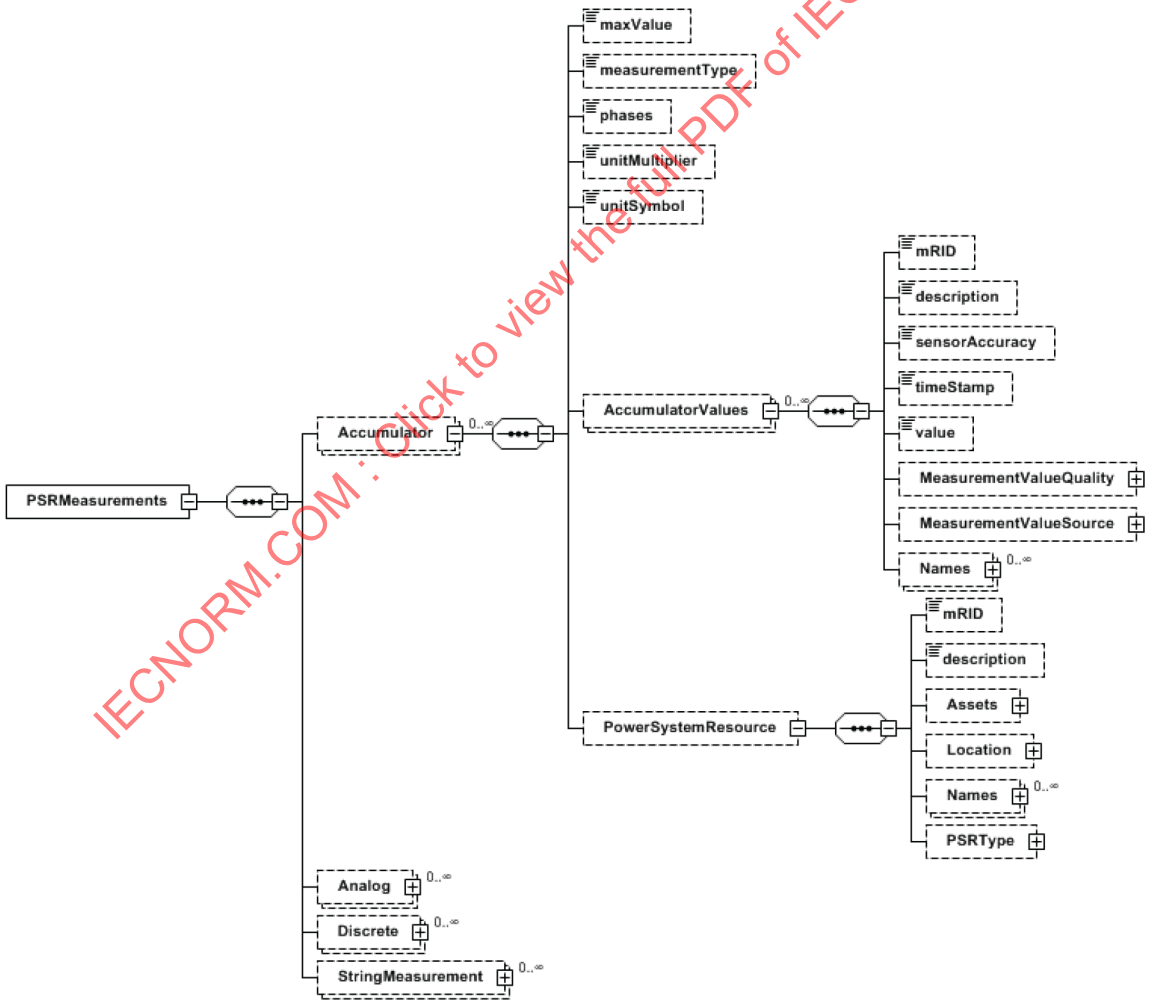


Figure 14 – Charge utile PSRMeasurements – Accumulator

5.4.4 Charge utile **PSRMeasurements – Analog**

5.4.4.1 Généralités

La Figure 15 présente la charge utile de message pour **PSRMeasurements Analog**. **Analog** représente un Measurement analogique, c'est-à-dire contenant des valeurs continues à virgule flottante.

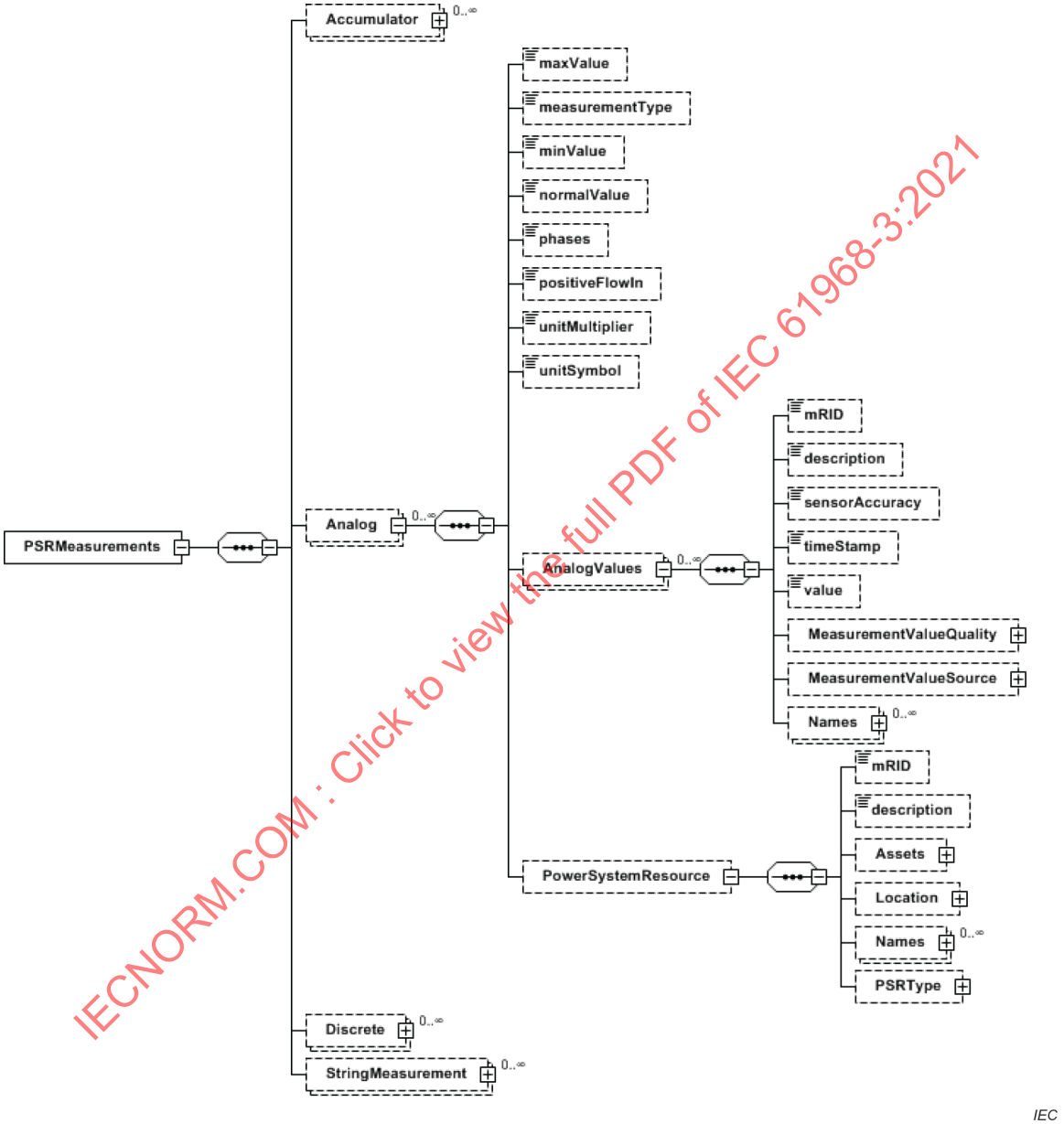


Figure 15 – Charge utile PSRMeasurements – Analog

5.4.4.2 Exemple XML d'Analog Measurement

L'exemple ci-dessous présente un mesurage en ampères de phase B associé à un disjoncteur à réenclenchement de ligne.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRMeasurements xmlns:m="http://iec.ch/TC57/2019/PSRMeasurements#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2017/PSRMeasurements# PSRMeasurements.xsd ">
  <m:Analog>
    <m:measurementType>Line Flow</m:measurementType>
```

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```
    <m:phases>B</m:phases>
    <m:positiveFlowIn>true</m:positiveFlowIn>
    <m:unitMultiplier>none</m:unitMultiplier>
    <m:unitSymbol>A</m:unitSymbol>
    <m:AnalogValues>
      <m:mRID>4d9ae2fa-37c0-42b0-90ca-0cefc141d5e8</m:mRID>
      <m:timeStamp>2019-03-08T12:03:01-06:00</m:timeStamp>
      <m:value>210,14</m:value>
      <m:MeasurementValueQuality>
        <m:badReference>false</m:badReference>
        <m:estimatorReplaced>false</m:estimatorReplaced>
        <m:failure>false</m:failure>
        <m:oldData>false</m:oldData>
        <m:operatorBlocked>false</m:operatorBlocked>
        <m:oscillatory>false</m:oscillatory>
        <m:outOfRange>false</m:outOfRange>
        <m:overFlow>false</m:overFlow>
        <m:source>SCADA</m:source>
        <m:suspect>false</m:suspect>
        <m:test>true</m:test>
        <m:validity>GOOD</m:validity>
      </m:MeasurementValueQuality>
      <m:Names>
        <m:name> Recloser D102 Phase B Amps </m:name>
      </m:Names>
    </m:AnalogValues>
    <m:PowerSystemResource>
      <m:mRID>4d9ae2fa-37c0-42b0-90ca-0cefc141d5e8</m:mRID>
      <m:description>m:description</m:description>
      <m:Names>
        <m:name> Recloser D102</m:name>
      </m:Names>
      <m:PSRType>
        <m:mRID>75240e31-89b4-40c0-a1eb-27629e726110</m:mRID>
        <m:description> Recloser Unganged 23kV </m:description>
        <m:Names>
          <m:name> Recl Ug 23kV </m:name>
        </m:Names>
      </m:PSRType>
    </m:PowerSystemResource>
  </m:Analog>
</m:PSRMeasurements>
```

5.4.5 Charge utile **PSRMeasurements – Discrete**

5.4.5.1 Généralités

La Figure 16 présente la charge utile de message pour **PSRMeasurements Discrete**. **Discrete** représente un Measurement discret, c'est-à-dire un Measurement représentant des valeurs discrètes (la position d'un disjoncteur, par exemple).

Les valeurs valides de **DiscreteValue.value** dépendent de **measurementType** (voir le Tableau 7 ci-dessous).

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Tableau 7 – Valeurs valides de DiscreteValue.value

measurementType	Valeurs valides
Single Point Status	False ou ouvert (0), true ou fermé (1)
Double Point Status	Non valide ou transitoire (0), false ou fermé (1), true ou ouvert (2), non valide (3).
Integer Status	Entier

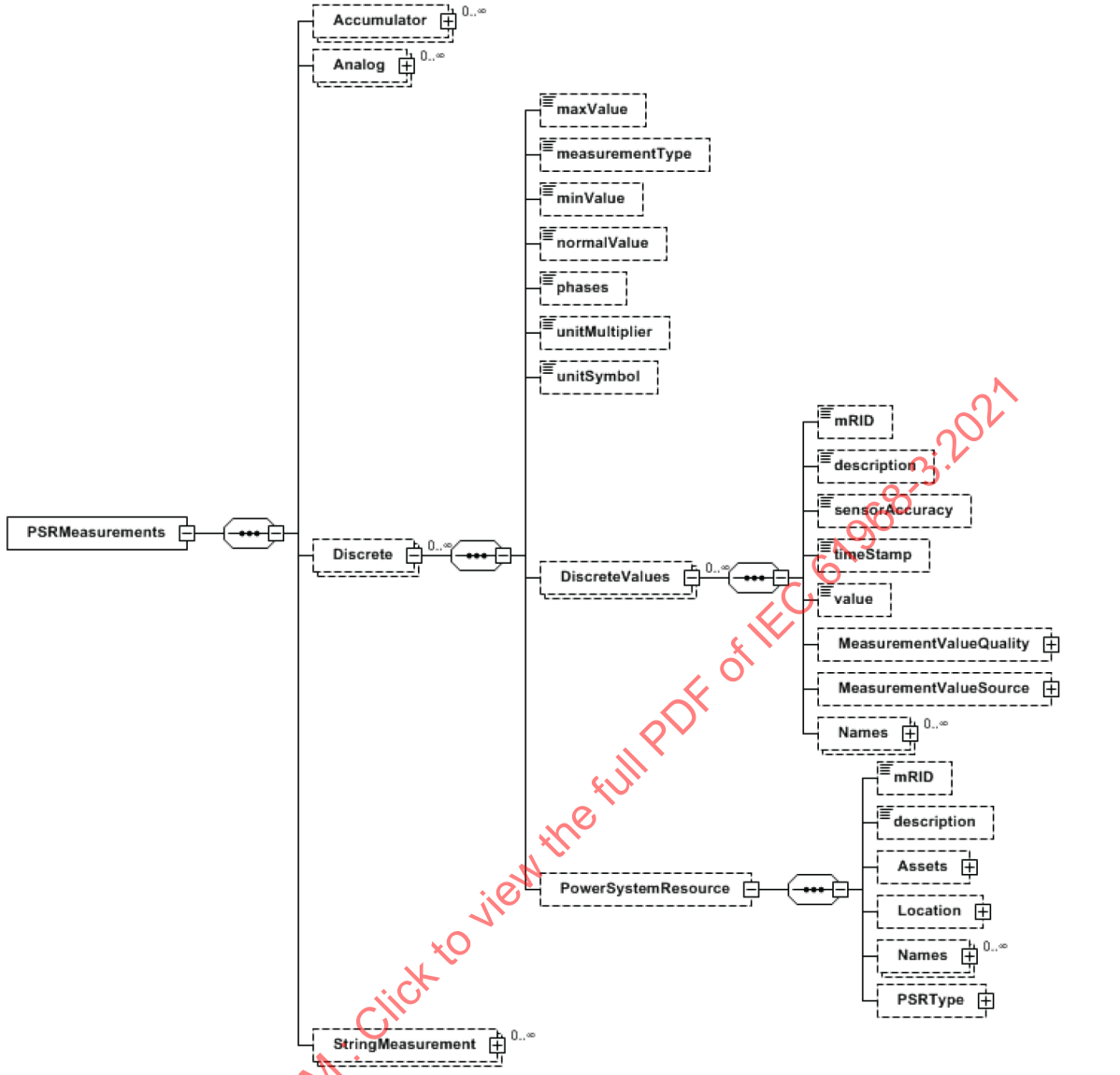


Figure 16 – Charge utile PSRMeasurements – Discrete

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5.4.5.2 Exemple XML de Discrete Measurement

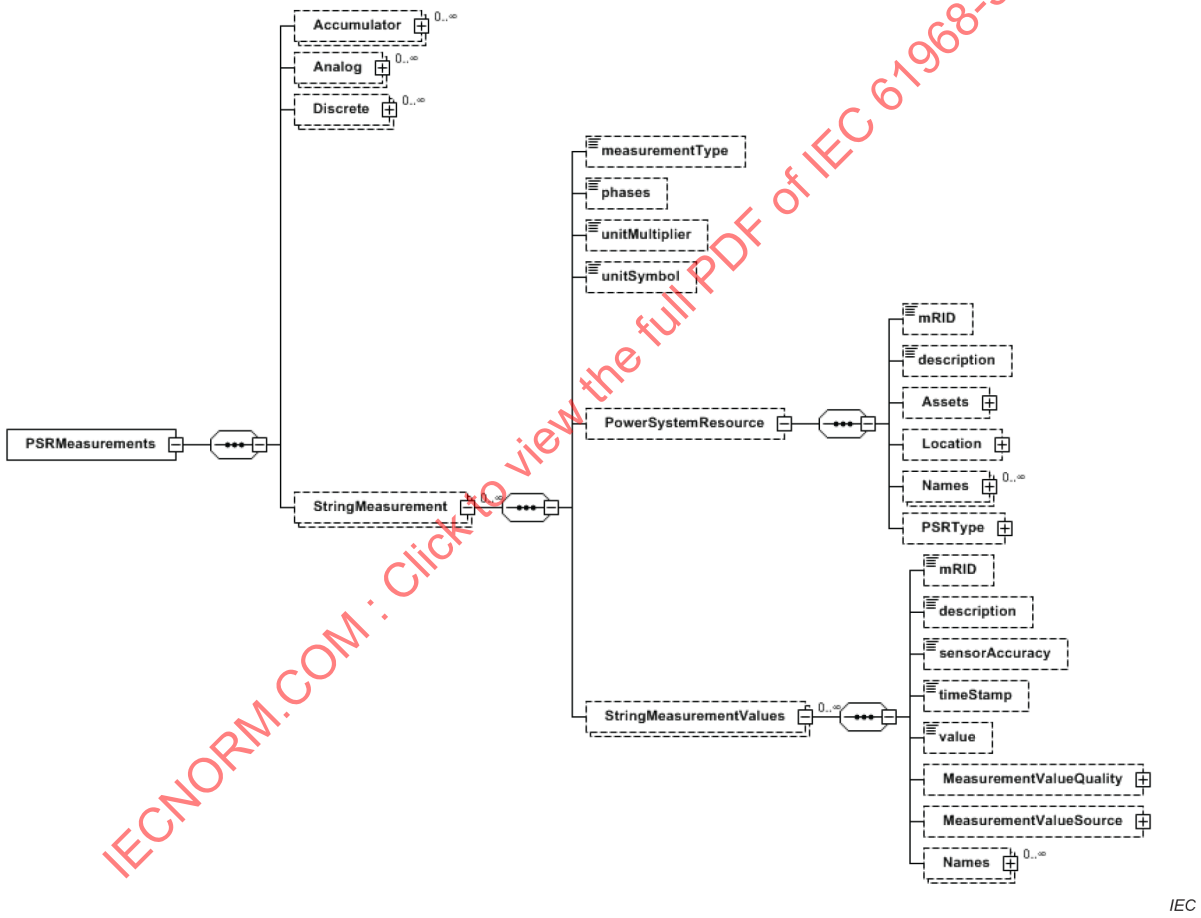
Ci-après un exemple XML de statut d'un disjoncteur à réenclenchement asymétrique de Phase A.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRMeasurements xmlns:m="http://iec.ch/TC57/2019/PSRMeasurements#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2017/PSRMeasurements# PSRMeasurements.xsd ">
<m:Discrete>
    <m:measurementType> Unganged Recloser Status </m:measurementType>
    <m:normalValue>1</m:normalValue>
    <m:phases>A</m:phases>
    <m:DiscreteValues>
      <m:description> Lizard Lick Feeder-324 Recloser 4267 Phase A Status </m:description>
      <m:timeStamp>2019-04-10T12:12:12</m:timeStamp>
      <m:value>1</m:value>
      <m:MeasurementValueQuality>
        <m:estimatorReplaced>false</m:estimatorReplaced>
        <m:validity>GOOD</m:validity>
      </m:MeasurementValueQuality>
      <m:MeasurementValueSource>
        <m:Names>
```

```
          <m:name>SCADA</m:name>
        </m:Names>
      </m:MeasurementValueSource>
      <m:Names>
        <m:name> Lizard Lick-324 R-4267 A Status </m:name>
      </m:Names>
    </m:DiscreteValues>
    <m:PowerSystemResource>
      <m:mRID>7c584905-8c89-4810-98f5-f73d47521cbf </m:mRID>
    </m:PowerSystemResource>
  </m:Discrete>
</m:PSRMeasurements>
```

5.4.6 Charge utile **PSRMeasurements – StringMeasurement**

La Figure 17 présente la charge utile de message pour **PSRMeasurements StringMeasurement**. **StringMeasurement** représente un mesurage avec des valeurs de type chaîne (string).



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Figure 17 – Charge utile PSRMeasurements – StringMeasurement

5.4.7 Charge utile **GetPSRMeasurements**

Le profil **GetPSRMeasurements** est utilisé pour demander un ou plusieurs **Measurement**s. La charge utile est présentée sous forme graphique à la Figure 18.

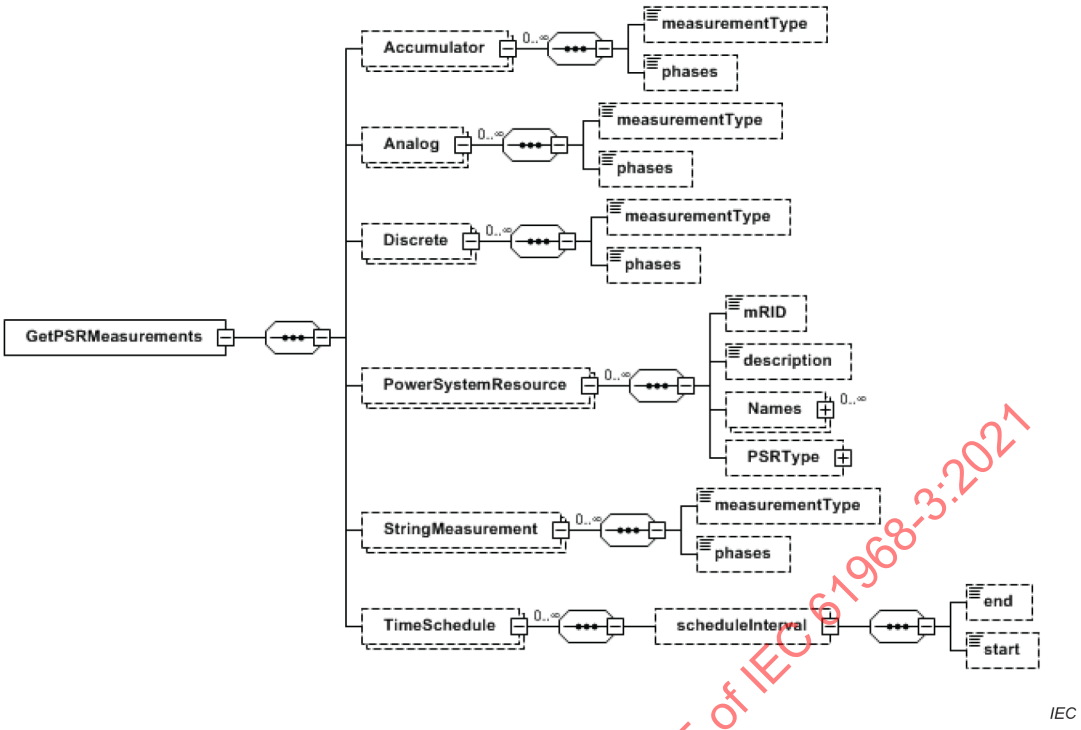


Figure 18 – Charge utile GetPSRMeasurements

Les attributs du profil **getPSRMeasurements** sont décrits dans le Tableau 8.

Tableau 8 – Profil getPSRMeasurements

PSRMeasurements				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
Accumulator	Accumulator	[0..*]	Voir l'Article B.2	measurementType et phases des mesurages demandés.
Analog	Analog	[0..*]	Voir l'Article B.6	measurementType et phases des mesurages demandés.
Discrete	Discrete	[0..*]	Voir l'Article B.28	measurementType et phases des mesurages demandés.
PowerSystemResource	PowerSystemResource	[0..*]	Voir l'Article B.68	Les PowerSystemResources pour lesquelles les mesurages sont demandés.
StringMeasurement	StringMeasurement	[0..*]	Voir l'Article B.82	measurementType et phases des mesurages demandés.
TimeSchedule	TimeSchedule	[0..*]	Voir l'Article B.91	Plage de temps des mesurages demandés. Si aucune plage de temps n'est spécifiée, la demande concerne uniquement les derniers mesurages.

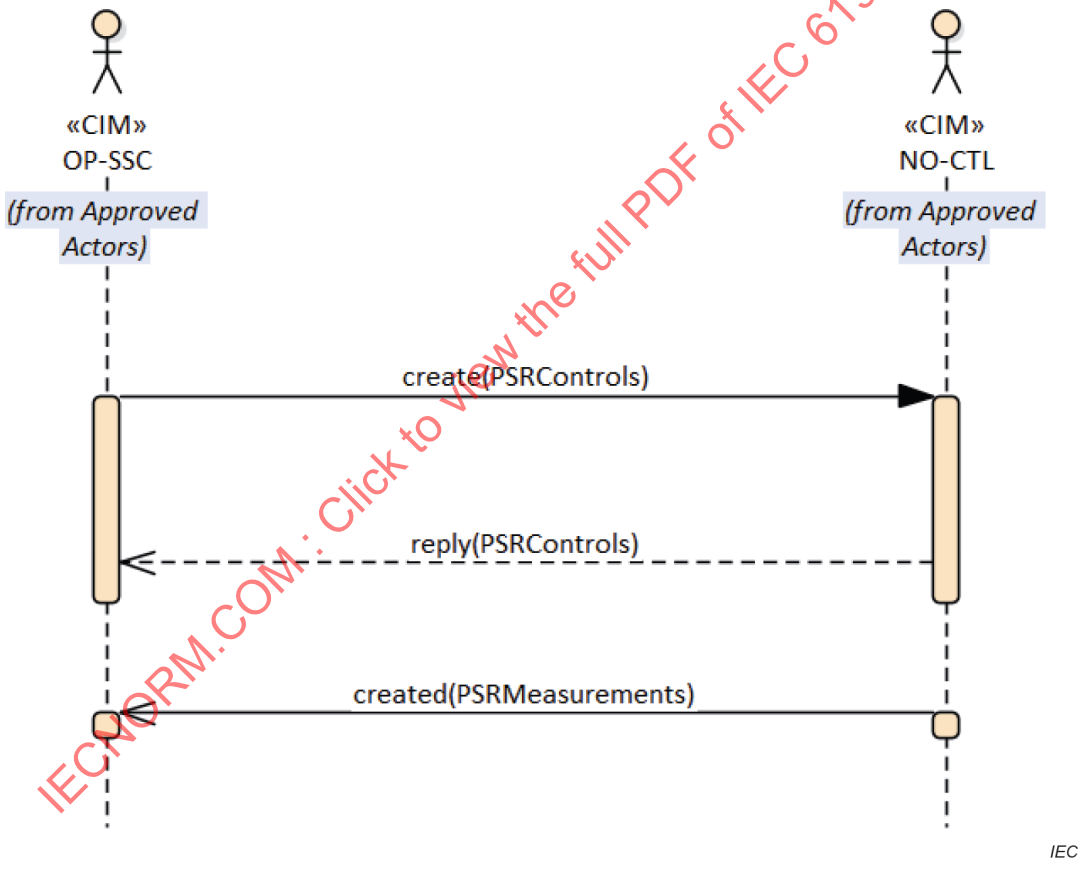
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5.5 Charge utile **PSRControls**

5.5.1 Généralités

Les charges utiles de messages **PSRControls** sont conçues pour communiquer les demandes de changement de l'état du réseau. La modification peut être la réinitialisation d'un accumulateur, une commande analogique, une commande, une commande de levage/abaissement ou un point de consigne. Il s'agit, par exemple, d'une demande d'ouverture ou de fermeture d'un commutateur, d'une commande de la position d'une prise de transformateur ou d'une définition d'un nouveau point de consigne d'un contrôleur local. Chaque **PSRControl** inclut une référence à la **PowerSystemResource** associée la demande de commande.

Les commandes sont en général envoyées par un système DMS à un système SCADA. La Figure 19 est un diagramme de séquences qui présente la manière dont un acteur peut demander une commande à réaliser. Le diagramme présente également une réponse qui confirme que la demande de commande a été reçue. Il indique également que lorsqu'une valeur change après l'envoi de la commande, un **PSRMeasurements** est envoyé au demandeur.



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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)

Figure 19 – Diagramme de séquences PSRControls

5.5.2 Charge utile de message **PSRControls**

Cette charge utile de message peut être utilisée pour échanger des données de mesure, y compris de 0 à plusieurs objets de commande.

Les objets de commande sont les suivants:

- **AccumulatorReset**;
- **AnalogControl**;
- **Command** (ouverture ou fermeture d'un commutateur, par exemple);
- **RaiseLowerCommand** (soulever ou abaisser une prise de transformateur, par exemple);
- **SetPoint** (point de consigne pour la commande de tension locale, par exemple);

Les attributs du profil **PSRControls** sont décrits dans le Tableau 9.

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Tableau 9 – Profil PSRControls

PSRControls				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
PSRControls	AccumulatorReset	[0..*]	Choix en fonction du type de commande	Cette commande remet à zéro la valeur du compteur.
PSRControls	AnalogControl	[0..*]	Choix en fonction du type de commande	Commande analogique utilisée pour le contrôle de la surveillance.
PSRControls	Command	[0..*]	Choix en fonction du type de commande	Command est un contrôle discret utilisé pour le contrôle de la surveillance.
PSRControls	RaiseLowerCommand	[0..*]	Choix en fonction du type de commande	Commande analogique qui augmente ou diminue une valeur de point de consigne avec des impulsions. Sauf spécification contraire, une impulsion déplace le point de consigne de un (1).
PSRControls	SetPoint	[0..*]	Choix en fonction du type de commande	Commande analogique qui émet une valeur de point de consigne.
Attributs de profil d'AccumulatorReset				
controlType	String	[0..1]		Spécifie le type de commande (par exemple: BreakerOn/Off, GeneratorVoltageSetPoint, TieLineFlow, etc.). ControlType.name doit être unique parmi tous les types spécifiés et doit décrire le type.
operationInProgress	Boolean	[0..1]		Indique qu'un client envoie des commandes de contrôle qui ne sont pas terminées.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Spécifie les phases à contrôler. Si aucune phase n'est spécifiée, toutes les phases disponibles sont prises pour hypothèse. Par exemple, pour une commande triphasée, trois phases sont par hypothèse à commander.
timeStamp	DateTime	[0..1]		La dernière fois qu'une sortie de commande a été envoyée.
PowerSystemResource	PowerSystemResource	[0..1]	Voir l'Article B.68	

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PSRControls				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
Attributs de profil d'AnalogControl				
controlType	String	[0..1]		Spécifie le type de commande (par exemple: BreakerOn/Off, GeneratorVoltageSetPoint, TieLineFlow, etc.). ControlType.name doit être unique parmi tous les types spécifiés et doit décrire le type.
maxValue	Float	[0..1]		Plage maximale de valeurs normale pour l'un des Control.value. Utilisé pour la mise à l'échelle (dans les graphiques à barres, par exemple).
minValue	Float	[0..1]		Plage minimale de valeurs normale pour l'un des Control.value. Utilisé pour la mise à l'échelle (dans les graphiques à barres, par exemple).
operationInProgress	Boolean	[0..1]		Indique qu'un client envoie des commandes de contrôle qui ne sont pas terminées.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Spécifie les phases à contrôler. Si aucune phase n'est spécifiée, toutes les phases disponibles sont prises pour hypothèse. Par exemple, pour une commande triphasée, trois phases sont par hypothèse à commander.
timeStamp	DateTime	[0..1]		La dernière fois qu'une sortie de commande a été envoyée.
unitMultiplier	UnitMultiplier	[0..1]		Multiplicateur d'unité de la grandeur mesurée.
unitSymbol	UnitSymbol	[0..1]		Unité de mesure de la grandeur mesurée.
AnalogValue	AnalogValue	[0..*]	Voir l'Article B.7	
PowerSystemResource	PowerSystemResource	[0..1]	Voir l'Article B.68	
Attributs de profil de Command				
controlType	String	[0..1]		
normalValue	Integer	[0..1]		Valeur normale de Control.value, utilisée par exemple pour la mise à l'échelle en pourcentage.
operationInProgress	Boolean	[0..1]		Indique qu'un client envoie des commandes de contrôle qui ne sont pas terminées.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Spécifie les phases à contrôler. Si aucune phase n'est spécifiée, toutes les phases disponibles sont prises pour hypothèse. Par exemple, pour une commande triphasée, trois phases sont par hypothèse à commander.
timeStamp	DateTime	[0..1]		La dernière fois qu'une sortie de commande a été envoyée.
unitMultiplier	UnitMultiplier	[0..1]		Multiplicateur d'unité de la grandeur commandée.
unitSymbol	UnitSymbol	[0..1]		Unité de mesure de la grandeur commandée.

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PSRControls				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
DiscreteValue	DiscreteValue	[0..*]	Voir l'Article B.29	
PowerSystemResource	PowerSystemResource	[0..1]	Voir l'Article B.68	
Attributs de profil de RaiseLowerCommand				
controlType	String	[0..1]		Valeurs de "Raise" ou de "Lower"
maxValue	Float	[0..1]		Plage maximale de valeurs normale pour l'un des Control.value. Utilisé pour la mise à l'échelle (dans les graphiques à barres, par exemple).
minValue	Float	[0..1]		Plage minimale de valeurs normale pour l'un des Control.value. Utilisé pour la mise à l'échelle (dans les graphiques à barres, par exemple).
operationInProgress	Boolean	[0..1]		Indique qu'un client envoie des commandes de contrôle qui ne sont pas terminées.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Spécifie les phases à contrôler. Si aucune phase n'est spécifiée, toutes les phases disponibles sont prises pour hypothèse. Par exemple, pour une commande triphasée, trois phases sont par hypothèse à commander.
timeStamp	DateTime	[0..1]		La dernière fois qu'une sortie de commande a été envoyée.
unitMultiplier	UnitMultiplier	[0..1]		Multiplicateur d'unité de la grandeur mesurée.
unitSymbol	UnitSymbol	[0..1]		Unité de mesure de la grandeur mesurée.
AnalogValue	AnalogValue	[0..*]	Voir l'Article B.7	AnalogValue.value est utilisée pour spécifier le nombre d'impulsions. Si elle n'est pas spécifiée, une valeur de 1 est prise pour hypothèse.
PowerSystemResource	PowerSystemResource	[0..1]	Voir l'Article B.68	

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PSRControls				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
Attributs de profil de SetPoint				
controlType	String	[0..1]		Spécifie le type de commande (par exemple: BreakerOn/Off, GeneratorVoltageSetPoint, TieLineFlow, etc.). ControlType.name doit être unique parmi tous les types spécifiés et doit décrire le type.
maxValue	Float	[0..1]		Plage maximale de valeurs normale pour l'un des Control.value. Utilisé pour la mise à l'échelle (dans les graphiques à barres, par exemple).
minValue	Float	[0..1]		Plage minimale de valeurs normale pour l'un des Control.value. Utilisé pour la mise à l'échelle (dans les graphiques à barres, par exemple).
normalValue	Float	[0..1]		Valeur normale de Control.value, utilisée par exemple pour la mise à l'échelle en pourcentage.
operationInProgress	Boolean	[0..1]		Indique qu'un client envoie des commandes de contrôle qui ne sont pas terminées.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Spécifie les phases à contrôler. Si aucune phase n'est spécifiée, toutes les phases disponibles sont prises pour hypothèse. Par exemple, pour une commande triphasée, trois phases sont par hypothèse à commander.
timeStamp	DateTime	[0..1]		La dernière fois qu'une sortie de commande a été envoyée.
unitMultiplier	UnitMultiplier	[0..1]		Multiplicateur d'unité de la grandeur mesurée.
unitSymbol	UnitSymbol	[0..1]		Unité de mesure de la grandeur mesurée.
AnalogValue	AnalogValue	[0..*]	Voir l'Article B.7	AnalogValue.value est utilisée pour spécifier la valeur analogique souhaitée sur laquelle il convient que le dispositif commandé soit réglé. Par exemple, pour un régulateur de tension, il convient de spécifier la tension souhaitée.
PowerSystemResource	PowerSystemResource	[0..1]	Voir l'Article B.68	

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5.5.3 Charge utile **PSRControls – AccumulatorReset**

5.5.3.1 Généralités

La Figure 20 présente la charge utile de message de commande AccumulatorReset. Cette commande remet à zéro la valeur du compteur.

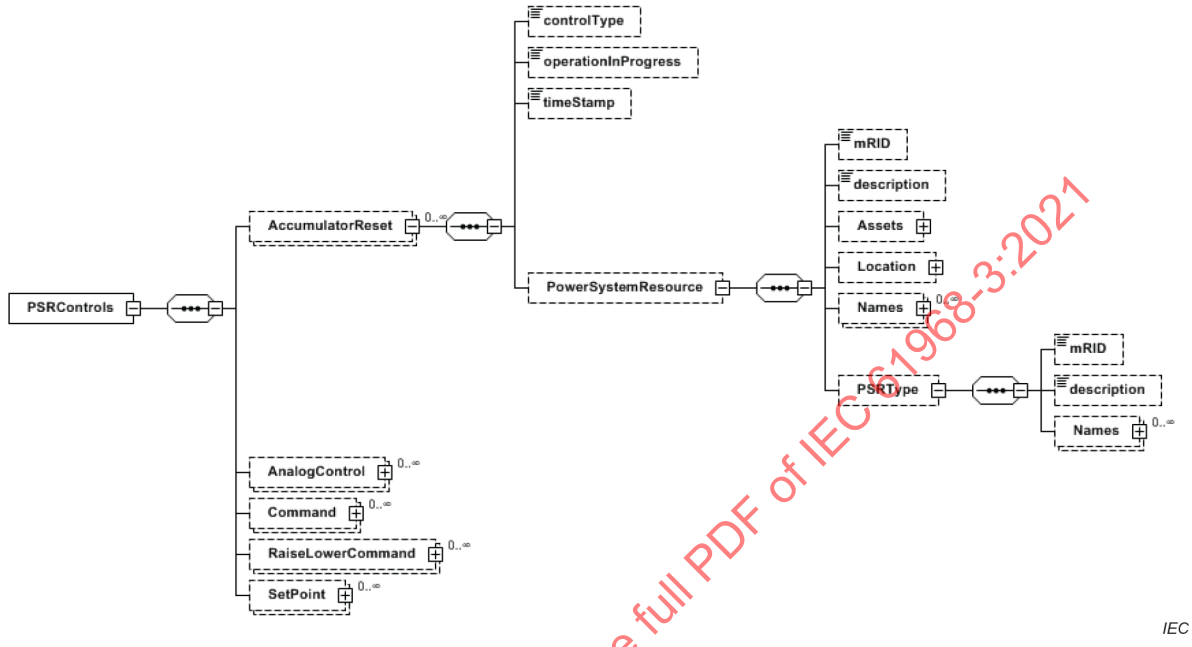


Figure 20 – Charge utile PSRControls – AccumulatorReset

5.5.3.2 Exemple XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRControls xmlns:m="http://iec.ch/TC57/2019/PSRControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PSRControls# PSRControls.xsd ">
  <m:AccumulatorReset>
    <m:controlType>Accumulator Reset</m:controlType>
    <m:phases>ABC</m:phases>
    <m:timeStamp>2019-06-03T09:00:00</m:timeStamp>
    <m:PowerSystemResource>
      <m:mRID>d738d1b0-a5ec-472b-bc74-11aaf22af7fd</m:mRID>
    </m:PowerSystemResource>
  </m:AccumulatorReset>
</m:PSRControls>
```

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5.5.4 Charge utile **PSRControls – AnalogControl**

5.5.4.1 Généralités

La Figure 21 présente la charge utile de message de commande **AnalogControl**. Cette commande est un contrôle analogique utilisé pour le contrôle de la surveillance.

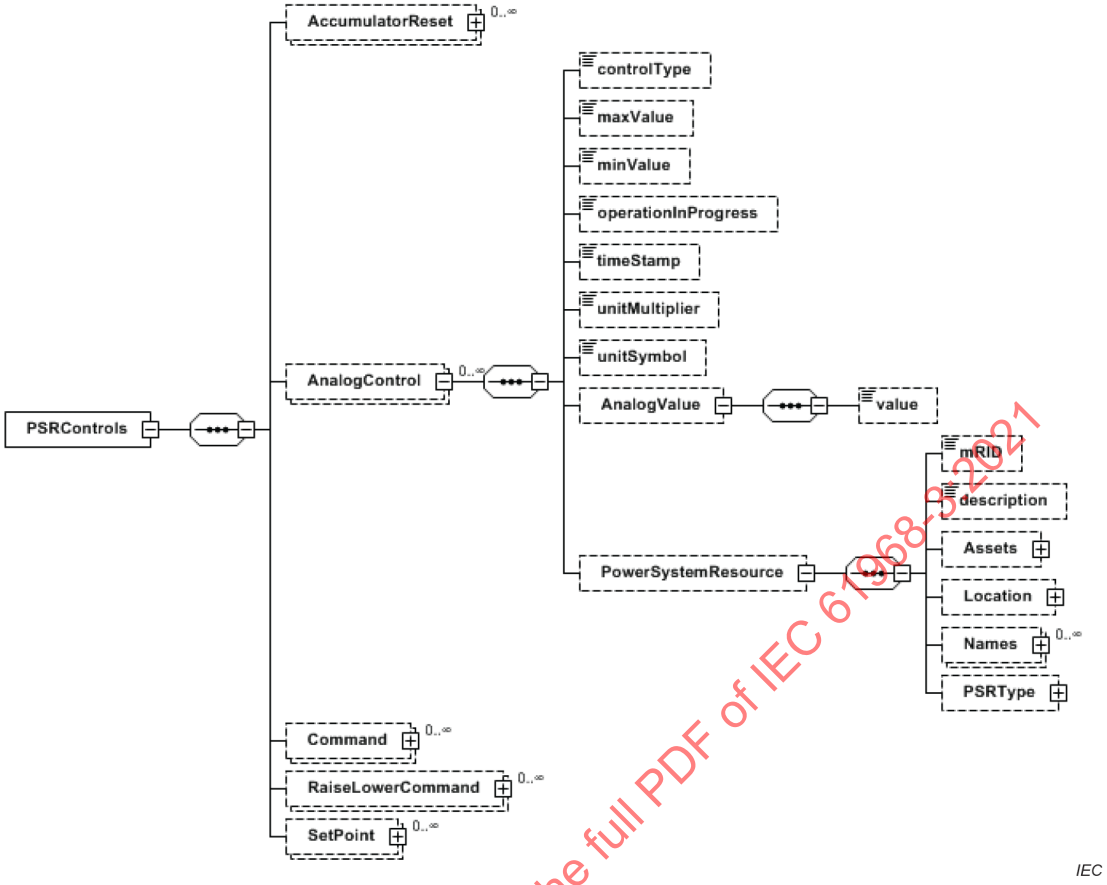


Figure 21 – Charge utile PSRControls – AnalogControl

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5.5.4.2 Exemple XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRControls xmlns:m="http://iec.ch/TC57/2019/PSRControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PSRControls# PSRControls.xsd ">
  <m:AnalogControl>
    <m:controlType>Analog Output</m:controlType>
    <m:timeStamp>2019-06-03T09:47:00</m:timeStamp>
    <m:AnalogValue>
      <m:value>0,0</m:value>
    </m:AnalogValue>
    <m:PowerSystemResource>
      <m:mRID>6093b77b-0e82-4a9c-9a8d-aa79bd926972</m:mRID>
    </m:PowerSystemResource>
  </m:AnalogControl>
</m:PSRControls>
```

5.5.5 Charge utile PSRControls – Command

5.5.5.1 Généralités

La Figure 22 présente la charge utile de message de commande **Command**. Command est un contrôle discret utilisé pour le contrôle de la surveillance.

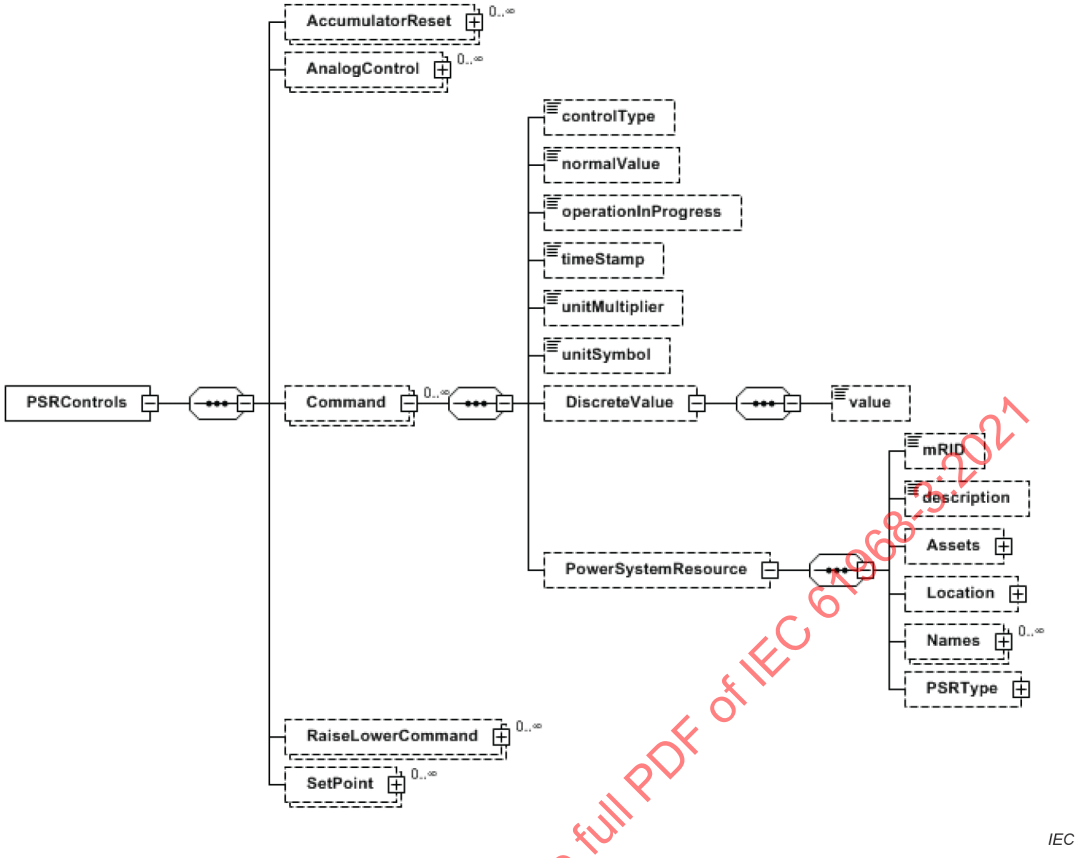


Figure 22 – Charge utile PSRControls – Command

5.5.5.2 Exemple XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRControls xmlns:m="http://iec.ch/TC57/2019/PSRControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PSRControls# PSRControls.xsd ">
  <m:Command>
    <m:controlType>Breaker Open/Close</m:controlType>
    <m:phases>A</m:phases>
    <m:timeStamp>2019-06-03T09:54:00</m:timeStamp>
    <m:DiscreteValue>
      <m:value>01</m:value>
    </m:DiscreteValue>
    <m:PowerSystemResource>
      <m:mRID>d1e7a6fe-9270-4f33-8f7e-04a00965b4e4</m:mRID>
      <m:Assets>
        <m:description>Wicker 12kV Substation Feeder 02 Breaker</m:description>
        <m:Names>
          <m:name>Wick F-02 CB</m:name>
        </m:Names>
      </m:Assets>
      <m:Names>
        <m:name>Wick F-02 CB</m:name>
      </m:Names>
      <m:PSRType>
        <m:Names>
          <m:name>12kV Circuit Breaker</m:name>
        </m:Names>
      </m:PSRType>
    </m:PowerSystemResource>
  </m:Command>
</m:PSRControls>
```

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5.5.6 Charge utile **PSRControls – RaiseLowerCommand**

5.5.6.1 Généralités

La Figure 23 présente la charge utile de message de commande **RaiseLowerCommand**. Commande analogique qui augmente ou diminue une valeur de point de consigne avec des impulsions.

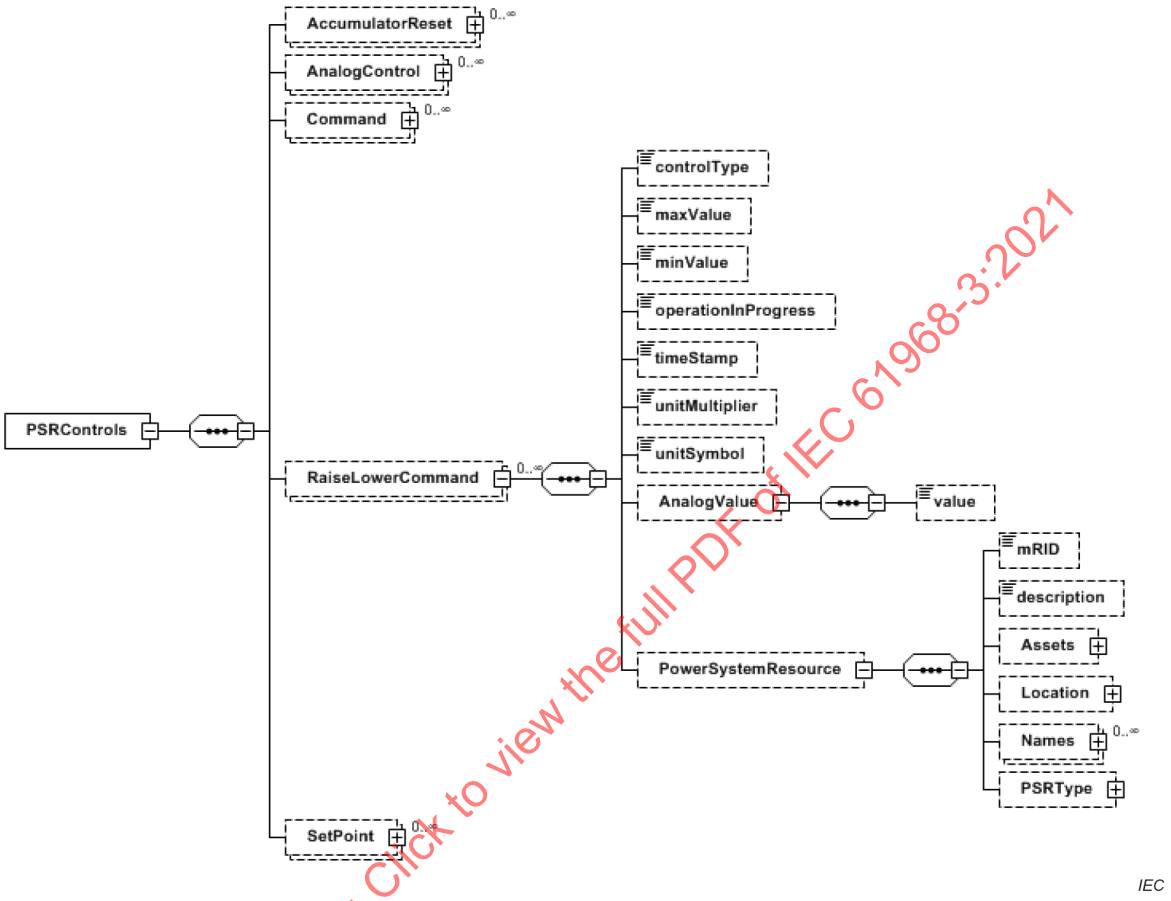


Figure 23 – Charge utile PSRControls – RaiseLowerCommand

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5.5.6.2 Exemple XML

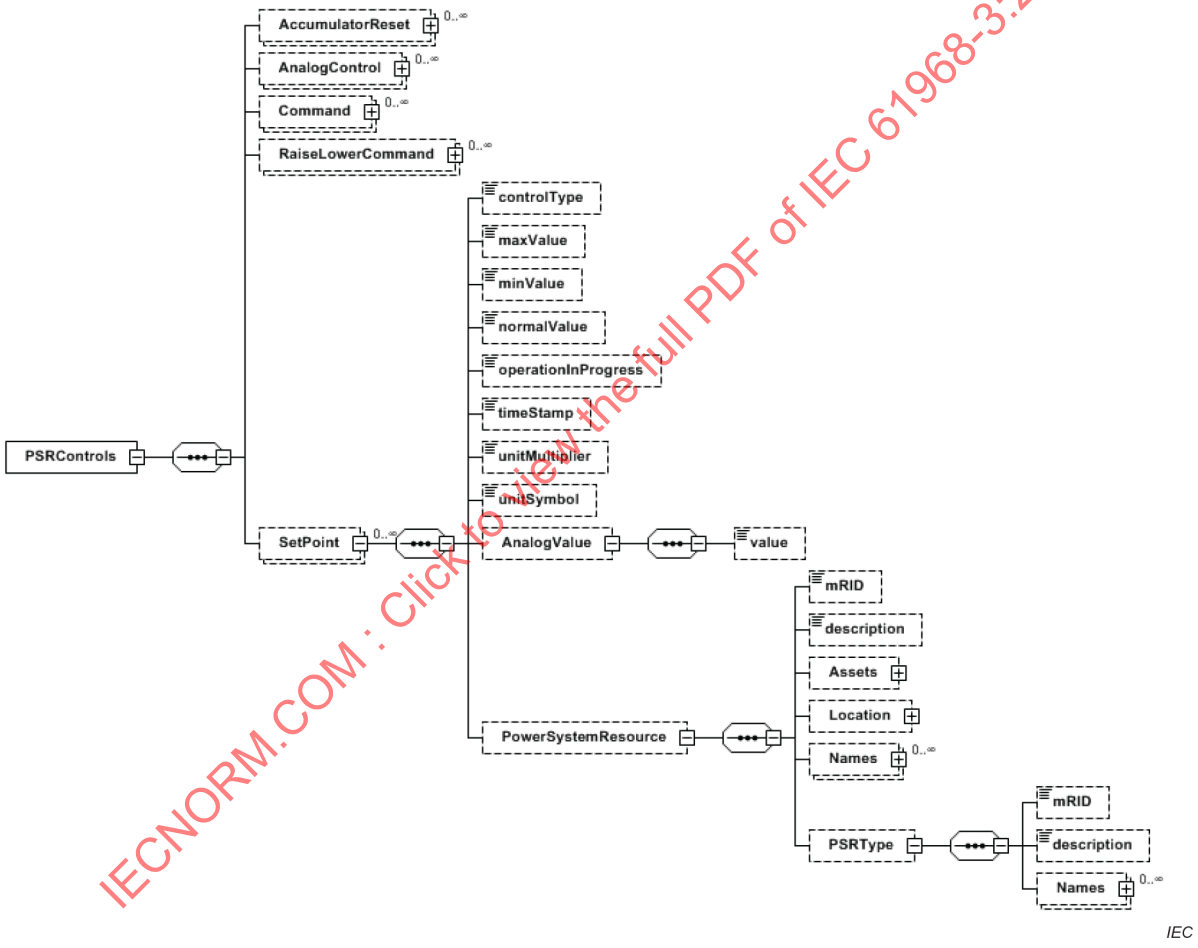
```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRControls xmlns:m="http://iec.ch/TC57/2019/PSRControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PSRControls# PSRControls.xsd ">
  <m:RaiseLowerCommand>
    <m:controlType>Load Tap Changer Control</m:controlType>
    <m:maxValue>16</m:maxValue>
    <m:minValue>-16</m:minValue>
    <m:phases>ABC</m:phases>
    <m:timeStamp>2019-06-03T10:00:00</m:timeStamp>
    <m:AnalogValue>
      <m:value>8,0</m:value>
    </m:AnalogValue>
    <m:PowerSystemResource>
      <m:mRID>b50d893b-b44e-4895-8924-658c862ee75f</m:mRID>
      <m:Assets>
        <m:Names>
          <m:name>Wick 12kV Substation Transformer Bank 01 LTC</m:name>
        </m:Names>
      </m:Assets>
      <m:Names>
        <m:name> Wick 12kV Substation Transformer Bank 01 LTC </m:name>
      </m:Names>
      <m:PSRType>
```

```
        <m:Names>
          <m:name>Load Tap Changer</m:name>
        </m:Names>
      </m:PSRType>
    </m:PowerSystemResource>
  </m:RaiseLowerCommand>
</m:PSRControls>
```

5.5.7 Charge utile **PSRControls – SetPoint**

5.5.7.1 Généralités

La Figure 24 présente la charge utile de message de commande **SetPoint**. Un **SetPoint** est une commande analogique qui émet une valeur cible qu'un contrôleur doit attribuer à une variable commandée.



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Figure 24 – Charge utile PSRControls – SetPoint

5.5.7.2 Exemple XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PSRControls xmlns:m="http://iec.ch/TC57/2019/PSRControls#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PSRControls# PSRControls.xsd ">
  <m:SetPoint>
    <m:controlType>Single Phase Voltage Setpoint, Per Unit</m:controlType>
    <m:maxValue>1,05</m:maxValue>
    <m:minValue>0,95</m:minValue>
    <m:normalValue>1,0</m:normalValue>
    <m:phases>B</m:phases>
    <m:timeStamp>2019-06-03T10:05:00</m:timeStamp>
    <m:unitMultiplier>none</m:unitMultiplier>
    <m:AnalogValue>
      <m:value>1,02</m:value>
    </m:AnalogValue>
    <m:PowerSystemResource>
      <m:mRID>13dd1b33-71fe-48e7-859c-887edf017399</m:mRID>
      <m:Assets>
        <m:description>Wick 12kV F02 VREG-1029</m:description>
        <m:Names>
          <m:name>VREG-1029</m:name>
        </m:Names>
      </m:Assets>
      <m:Names>
        <m:name>Wick 12-F02 VREG-1029</m:name>
      </m:Names>
      <m:PSRType>
        <m:Names>
          <m:name>Voltage regulator PU tap</m:name>
        </m:Names>
      </m:PSRType>
    </m:PowerSystemResource>
  </m:SetPoint>
</m:PSRControls>
```

5.6 Charge utile **SwitchingPlanRequests**

5.6.1 Généralités

La Figure 25 est un diagramme de séquences qui est un exemple d'interaction entre la gestion des travaux et la planification de séquence de commutation.

Dans cet exemple, la séquence commence par une **SwitchingPlanRequest**, qui permet d'acheminer une demande entre la fonction Gestion des travaux (ou une autre fonction métier) et la fonction Exploitation du réseau, selon laquelle une commutation doit être réalisée. Il peut s'agir d'une demande d'isolation d'une partie du réseau afin de procéder à des travaux de maintenance ou de construction. La charge utile inclut le type de travaux à réaliser et le moment auquel il convient de le commencer. Le résultat classique d'une **SwitchingPlanRequest** est la création d'un **SwitchingPlan**. Un **SwitchingPlan** est une suite d'étapes préalablement définies qui, en règle générale, exécutent des opérations de changement de l'état du réseau (une séquence d'opérations d'ouverture et de fermeture du commutateur, par exemple).

La Programmation des actions de commutation (OP-SSC) accuse réception de la demande avec un message de réponse. Le **SwitchingPlan** est ensuite développé par la création manuelle ou automatique d'étapes.

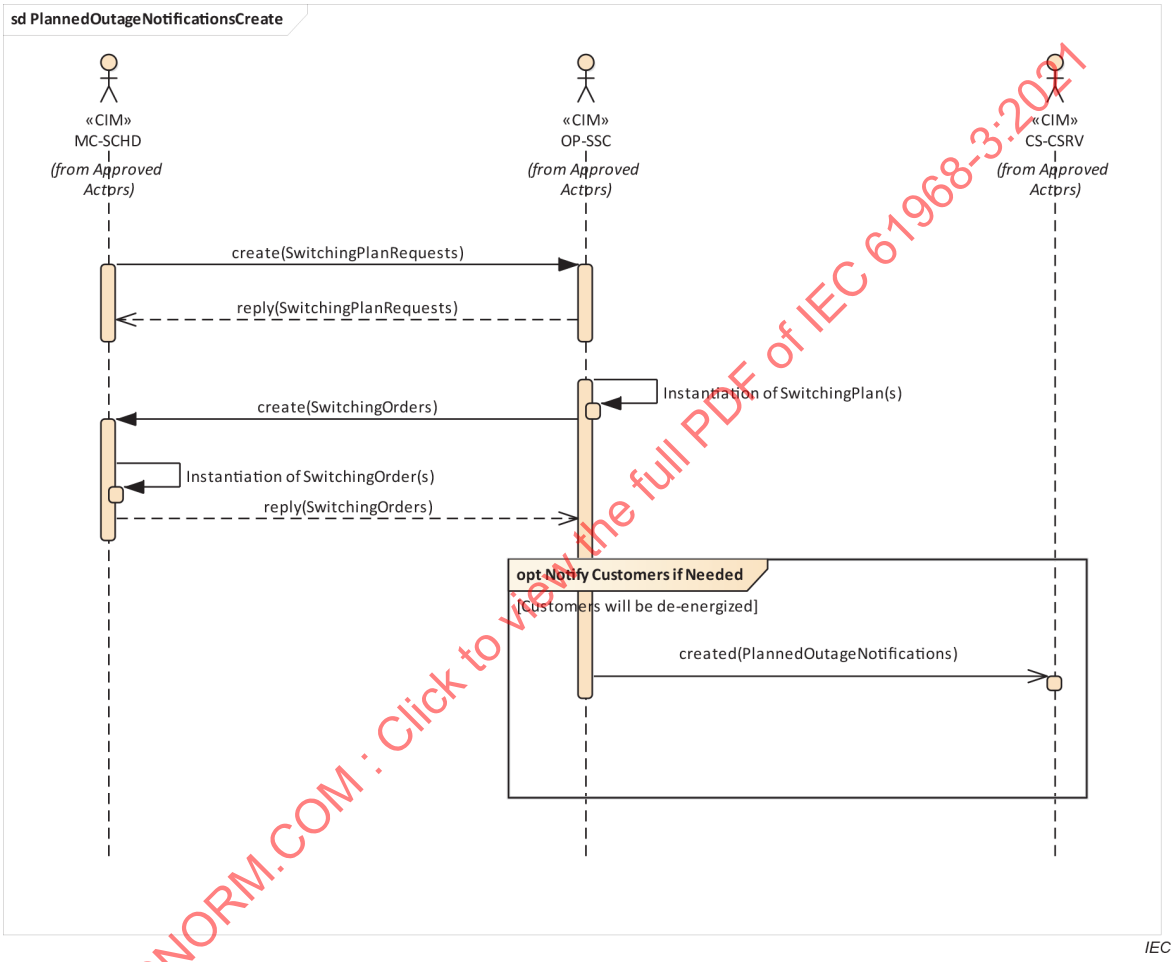
Pendant son développement, le **SwitchingPlan** traverse différents processus d'examen et d'approbation dans la fonction Programmation des actions de commutation. À l'issue du développement d'un **SwitchingPlan** approuvé, la Programmation des actions de commutation formule une demande de création d'une **SwitchingOrder** à la Programmation et répartition du travail (MC-SCHD) à l'aide du message **SwitchingOrders**. Le **SwitchingPlan** n'est pas encore communiqué à l'extérieur de la fonction Programmation des actions de commutation. Un exemple de cette communication est donné au 5.10.

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Le **SwitchingOrder** est planifié dans la Programmation et répartition du travail. Dès qu'il a été planifié, la Programmation et répartition du travail répond par un message **SwitchingOrders** afin d'indiquer que le **SwitchingOrder** a été planifié.

Enfin, si la commutation se traduit par des interruptions du client, le Service client est informé de l'interruption planifiée par l'intermédiaire d'un message **PlannedOutageNotification**.

Noter que la programmation et la coordination actuelles des SwitchingPlanRequests (Planification prédictive des conditions opérationnelles, telle que définie dans l'IEC 61968-1) ne relèvent pas du domaine d'application du présent document.



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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
Instantiation of SwitchingPlan(s)	Instanciation de SwitchingPlan(s)
Instantiation of SwitchingOrder(s)	Instanciation de SwitchingOrder(s)
(Customer will be de-energized)	(L'alimentation du client va être coupée)

Figure 25 – Diagramme de séquences SwitchingPlanRequests

5.6.2 Charge utile de messages

Les attributs du profil **SwitchingPlanRequests** sont décrits dans le Tableau 10 et présentés sous forme graphique à la Figure 26 et à la Figure 27.

Tableau 10 – Profil SwitchingPlanRequests

SwitchingPlanRequests				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
SwitchingPlanRequests	SwitchingPlanRequest	[1..*]		
Attributs de profil				
mRID	String	[0..1]	GUID	
description	String	[0..1]		Champ textuel au format libre qui décrit **SwitchingPlanRequest**
Names	Name	[0..*]	Voir l'Article B.56	Peut être utilisé pour donner des informations supplémentaires telles que le nombre de demandes internes.
comment	String	[0..1]		Commentaires du demandeur
createdDateTime	DateTime	[0..1]		DateTime à laquelle la SwitchingPlanRequest a été initialement créée.
equipmentToBeIsolated	String	[0..1]		Liste des équipements à isoler, texte au format libre
groundingPoints	String	[0..1]		Liste des points de mise à la terre potentiels, texte au format libre
isolationArea	String	[0..1]		Emplacement de la zone à isoler, texte au format libre
isolationPoints	String	[0..1]		Liste des points d'isolation potentiels, texte au format libre
lastModifiedDateTime	DateTime	[0..1]		DateTime de la dernière modification de la SwitchingPlanRequest.
purpose	String	[0..1]		Objectif de la demande de commutation
revisionNumber	String	[0..1]		Numéro de révision de la demande de commutation. Utilisé pour suivre les modifications.
subject	String	[0..1]		Texte au format libre
switchingRequestDetails	String	[0..1]		Texte au format libre
title	String	[0..1]		Texte au format libre
type	String	[0..1]		Type de demande de commutation
Author	Author	[0..1]	Voir l'Article B.13	Auteur de la SwitchingPlanRequest
docStatus	Status	[0..1]	Voir l'Article B.79	docStatus.value est utilisé pour spécifier le statut global du document SwitchingPlanRequest (projet, en cours d'examen, approuvé, annulé, etc.).
forwardSwitchingDateTimeInterval	DateTimeInterval	[0..1]		Avancer la date de début et de fin de la commutation – date et heure lorsque la commutation commence et se termine pour mettre l'équipement hors service
outageDateTimeInterval	DateTimeInterval	[0..1]		Date de début et de fin de l'interruption – date et heure lorsqu'il est prévu de mettre les clients hors tension, puis de les remettre sous tension.
RequestingOrganization	Organisation	[0..1]	Voir l'Article B.62	Nom et informations de contact de l'organisation qui formule la demande de commutation
reverseSwitchingDateTimeInterval	DateTimeInterval	[0..1]		Inverser la date de début et de fin de la commutation – date et heure lorsque la commutation commence et se termine pour remettre l'équipement en service

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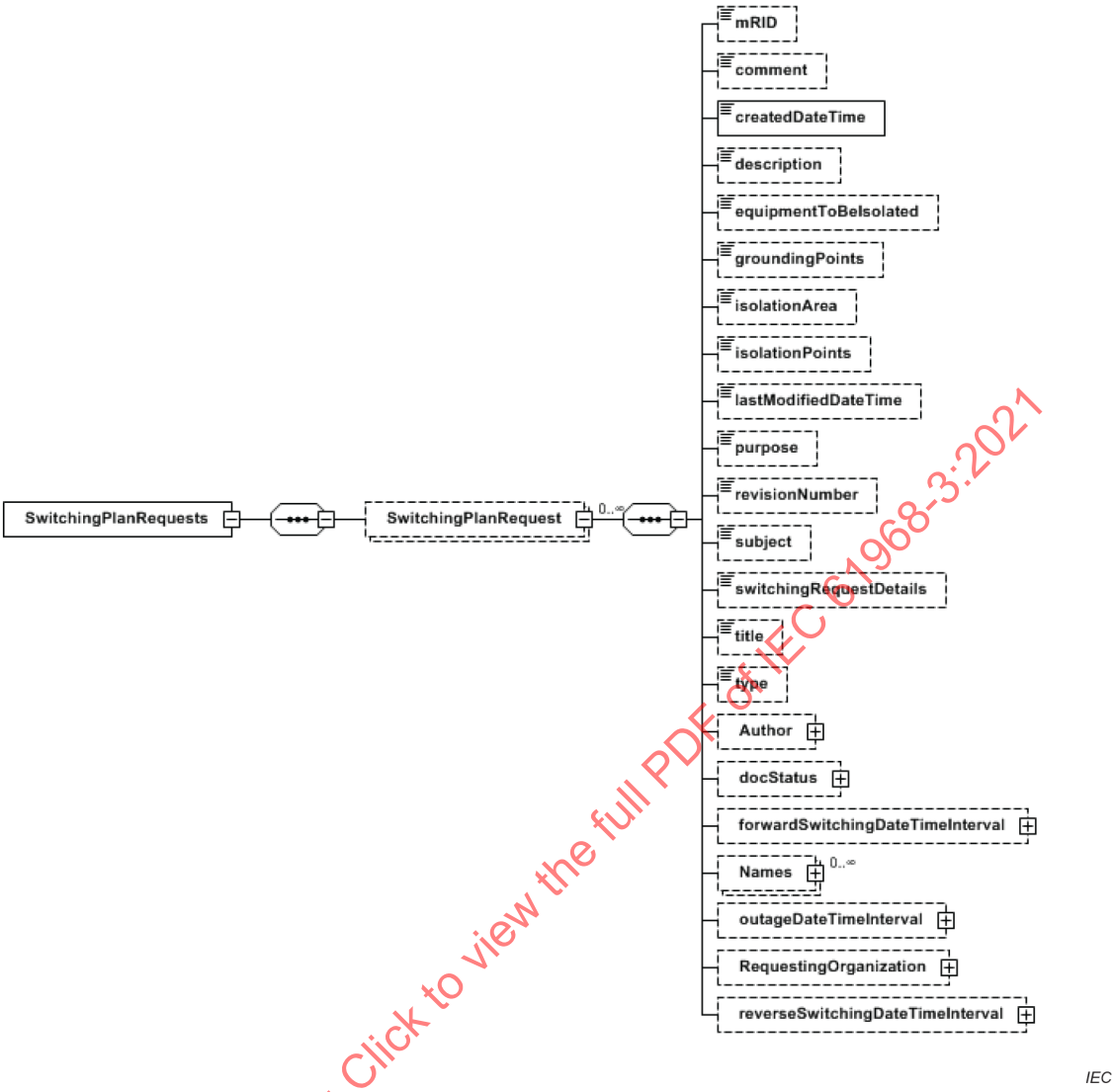


Figure 26 – Charge utile SwitchingPlanRequests (Partie 1)

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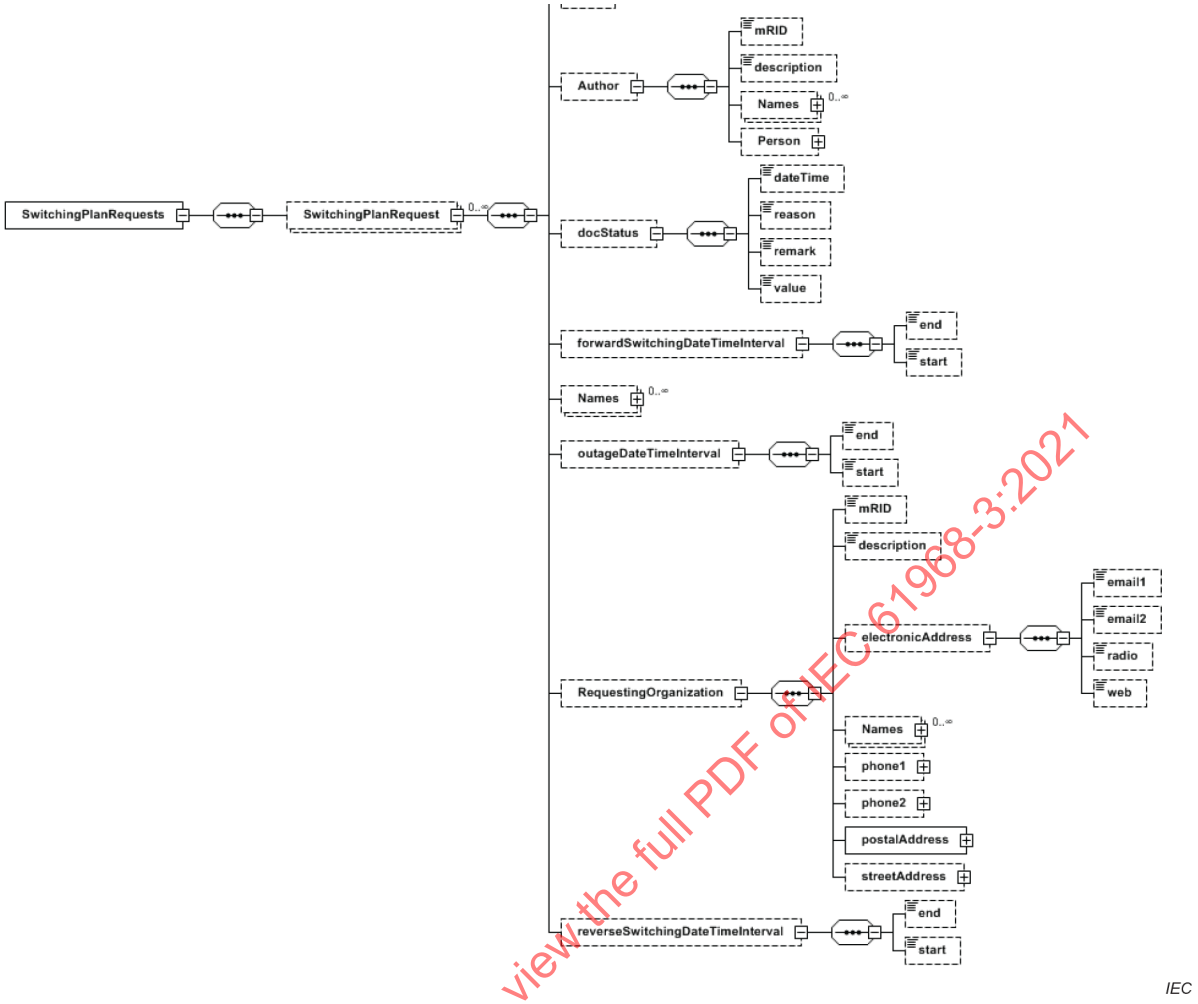


Figure 27 – Charge utile SwitchingPlanRequests (Partie 2)

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5.6.3 Exemple XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:SwitchingPlanRequests xmlns:m="http://iec.ch/TC57/2018/SwitchingPlanRequests#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/SwitchingPlanRequests# SwitchingPlanRequests.xsd
">
  <m:SwitchingPlanRequest>
    <m:mRID>205c0a0b-0422-4184-8cfe-b9fdfc433509</m:mRID>
    <m:comment>Line extension on 13 kV line at Bonkers Creek</m:comment>
    <m:createdDateTime>2019-04-01T12:12:12</m:createdDateTime>
    <m:description>Isolate line section between Cotter's Grove Lane and Snarly Brook
Street</m:description>
    <m:equipmentToBeIsolated> Switch SW-13423, Recloser R-4267</m:equipmentToBeIsolated>
    <m:groundingPoints>Ground switches GS-73456, GS-76721, manual grounds at SW-13423, R-
4267</m:groundingPoints>
    <m:isolationArea>Area bounded by SW-12113 to the North and SW-13211 to the
South</m:isolationArea>
    <m:isolationPoints> SW-12113, SW-13211</m:isolationPoints>
    <m:lastModifiedDateTime>2019-04-13T12:12:12</m:lastModifiedDateTime>
    <m:purpose>New construction</m:purpose>
    <m:revisionNumber>A</m:revisionNumber>
    <m:subject>Switching Plan Request</m:subject>
    <m:switchingRequestDetails> Capital expenditure project #14122-
A</m:switchingRequestDetails>
    <m:title>Substation: Lizard Lick; Feeder: 321</m:title>
    <m:type>Construction</m:type>
    <m:Author>
      <m:Person>
        <m:firstName>Mick</m:firstName>
        <m:lastName>Jagger</m:lastName>
        <m:electronicAddress>
          <m:email1>mickj@abc-utility.com</m:email1>
```

```
        </m:electronicAddress>
        <m:mobilePhone>
          <m:areaCode>919</m:areaCode>
          <m:cityCode>555</m:cityCode>
          <m:localNumber>1212</m:localNumber>
        </m:mobilePhone>
      </m:Person>
    </m:Author>
    <m:docStatus>
      <m:dateTime>2019-04-01T12:12:12</m:dateTime>
      <m:remark>Created</m:remark>
      <m:value>New</m:value>
    </m:docStatus>
    <m:forwardSwitchingDateTimeInterval>
      <m:end>2019-05-01T09:00:00</m:end>
      <m:start>2019-05-01T08:00:00</m:start>
    </m:forwardSwitchingDateTimeInterval>
    <m:Names>
      <m:name>Switching Request 2019-04-142</m:name>
    </m:Names>
    <m:outageDateTimeInterval>
      <m:end>2019-05-01T10:30:00</m:end>
      <m:start>2012-12-13T09:45:00</m:start>
    </m:outageDateTimeInterval>
    <m:RequestingOrganization>
      <m:electronicAddress>
        <m:email1>maint@abc-utility.com</m:email1>
      </m:electronicAddress>
      <m:Names>
        <m:name>Maintenance and Construction</m:name>
      </m:Names>
      <m:phone1>
        <m:areaCode>919</m:areaCode>
        <m:cityCode>555</m:cityCode>
        <m:localNumber>1234</m:localNumber>
      </m:phone1>
    </m:RequestingOrganization>
    <m:reverseSwitchingDateTimeInterval>
      <m:end>2019-05-01T12:00:00</m:end>
      <m:start>2019-05-01T11:30:00</m:start>
    </m:reverseSwitchingDateTimeInterval>
  </m:SwitchingPlanRequest>
</m:SwitchingPlanRequests>
```

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5.7 Définition et exécution de SwitchingPlan

Les étapes opérationnelles actuelles d'un **SwitchingPlan** sont définies à l'aide du profil **SwitchingPlans**. Les étapes opérationnelles peuvent contenir différentes **SwitchingActions** qui déterminent quelle opération doit être réalisée et sur quel composant du réseau. Au moment de l'exécution du **SwitchingPlan**, différents profils sont utilisés pour coordonner l'exécution entre la salle de commande, les équipes sur le terrain et SCADA. Un **SwitchingPlan** peut être uniquement composé d'étapes opérationnelles qui sont réalisées par une équipe sur le terrain et/ou uniquement par des étapes opérationnelles réalisées automatiquement avec SCADA.

Le Tableau 11 présente la coordination entre les actions et les messages. À l'exception de **MeasurementAction** activé par SCADA, toutes les interactions suivent le modèle d'événement induit défini dans l'IEC 61968-100. La **MeasurementAction** activée par SCADA suit le modèle de demande/réponse défini dans l'IEC 61968-100. La première colonne indique l'action qui est définie dans le profil **SwitchingPlans** en tant que **SwitchingPlanStep**. La deuxième colonne indique l'action et le profil qui sont utilisés pour envoyer une demande à une équipe sur le terrain ou à SCADA pour exécuter une **SwitchingPlanStep**. La troisième colonne indique l'action et le profil qui sont utilisés pour confirmer l'exécution de l'étape.

Tableau 11 – Messages utilisés pour coordonner différents types de SwitchingSteps

Action définie dans SwitchingPlan	Instruction d'exécution	Confirmation d'exécution
ClearanceAction	**SwitchingAction** – **ClearanceAction** envoyée à l'équipe sur le terrain	**SwitchingEvent** – **ClearanceAction** reçu de l'équipe sur le terrain
ControlAction (manuelle, pas de télémétrie)	**SwitchingAction** – **ControlAction** envoyée à l'équipe sur le terrain	**SwitchingEvent** – **ControlAction** reçu de l'équipe sur le terrain
ControlAction (automatique par SCADA, en cas de télémétrie)	**PSRControls** envoyés à SCADA	**PSRMeasurements** reçus de SCADA
CutAction	**SwitchingAction** – **CutAction** envoyée à l'équipe sur le terrain	**SwitchingEvent** – **CutAction** reçu de l'équipe sur le terrain
EnergySourceAction	**SwitchingAction** – **EnergySourceAction** envoyée à l'équipe sur le terrain	**SwitchingEvent** – **EnergySourceAction** reçu de l'équipe sur le terrain
GenericAction	**SwitchingAction** – **GenericAction** envoyée à l'équipe sur le terrain	**SwitchingEvent** – **GenericAction** reçu de l'équipe sur le terrain
GroundAction	**SwitchingAction** – **GroundAction** envoyée à l'équipe sur le terrain	**SwitchingEvent** – **GroundAction** reçu de l'équipe sur le terrain
JumperAction	**SwitchingAction** – **JumperAction** envoyée à l'équipe sur le terrain	**SwitchingEvent** – **JumperAction** reçu de l'équipe sur le terrain
MeasurementAction (manuelle, pas de télémétrie)	**SwitchingAction** – **MeasurementAction** envoyée à l'équipe sur le terrain	**SwitchingEvent** – **MeasurementAction** reçu de l'équipe sur le terrain
MeasurementAction (automatique par SCADA, en cas de télémétrie)	**GetPSRMeasurements** envoyées à SCADA	**PSRMeasurements** reçus de SCADA
SwitchAction	**SwitchingAction** – **SwitchAction** envoyée à l'équipe sur le terrain	**SwitchingEvent** – **SwitchAction** reçu de l'équipe sur le terrain
TagAction	**SwitchingAction** – **TagAction** envoyée à l'équipe sur le terrain	**SwitchingEvent** – **TagAction** reçu de l'équipe sur le terrain
VerificationAction	**SwitchingAction** – **VerificationAction** envoyée à l'équipe sur le terrain	**SwitchingEvent** – **VerificationAction** reçu de l'équipe sur le terrain

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5.8 Charge utile **SwitchingPlans**

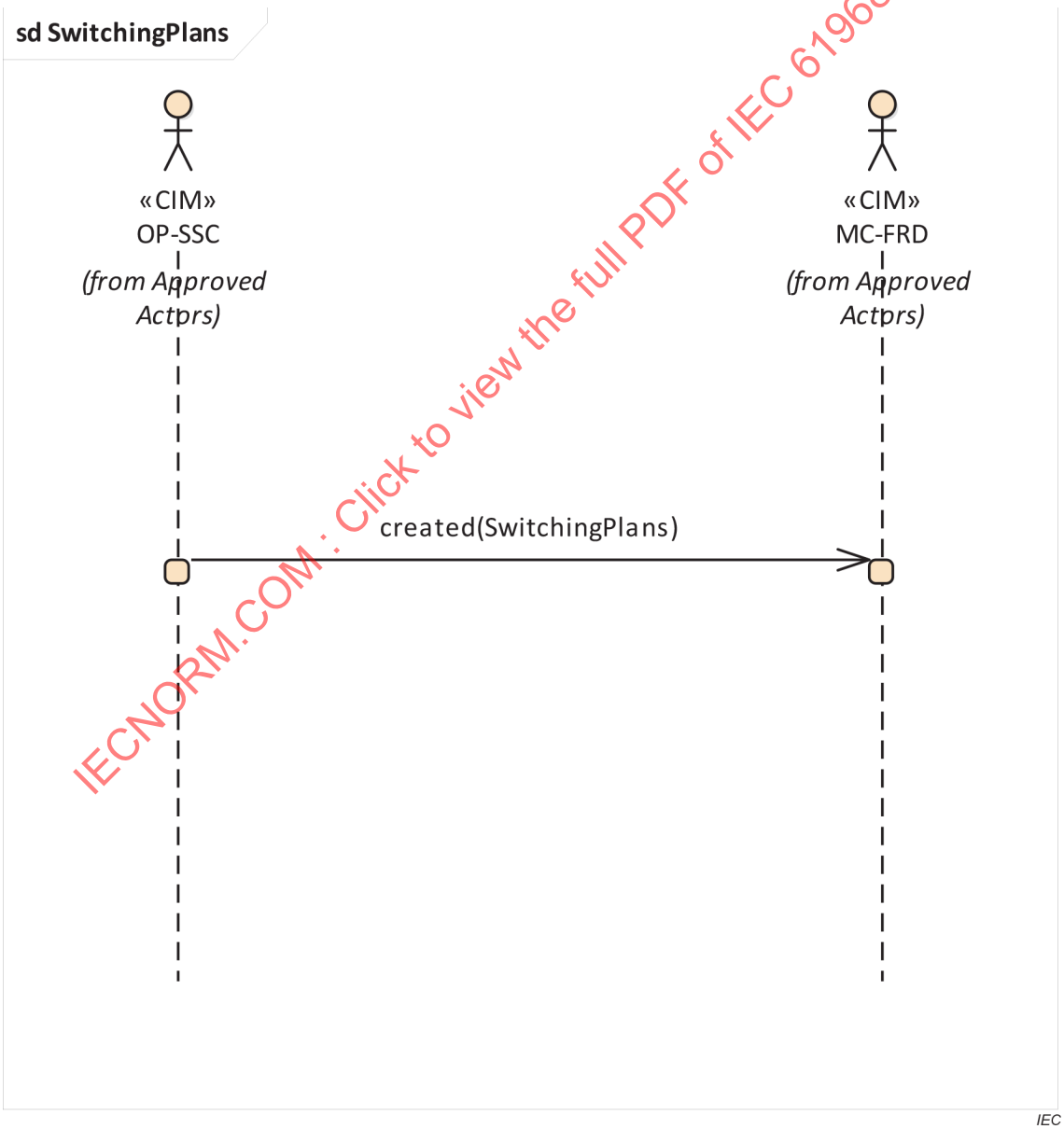
5.8.1 Généralités

Les charges utiles de messages **SwitchingPlans** sont conçues pour communiquer un ensemble de **SwitchingActions** qui forment une suite d'opérations permettant de gérer une tâche opérationnelle complète. Les charges utiles **SwitchingPlans** définissent la séquence des étapes qui vont être exécutées, alors que d'autres messages sont utilisés pour coordonner l'exécution du **SwitchingPlan**. La Figure 25 est un diagramme de séquences qui présente l'instanciation d'un SwitchingPlan dans le contexte de la maintenance planifiée, alors que la Figure 28 présente la communication des **SwitchingPlans** aux équipes sur le terrain. **Les SwitchingPlans** peuvent également être créés afin de réaliser une commutation d'urgence.

Les cas d'utilisation supplémentaires incluent:

- la fonction Gestion de défauts propose un ou plusieurs plans de commutation comme solutions alternatives aux isolements de défaut ou de zone de travail et/ou à la restauration de services;
- les applications d'optimisation du réseau (commande Volt/Var, reconfiguration optimale de ligne d'alimentation, etc.) proposent un ou plusieurs plans de commutation comme solutions alternatives pour optimiser l'ensemble du réseau de distribution ou des parties sélectionnées de ce réseau;
- une demande de génération d'un plan de commutation peut être le fruit de l'interaction d'utilisateurs ou peut être formulée par une application dans le cadre d'un flux de travail complet (localisation et isolement du défaut, et restauration).

Un plan de commutation peut inclure des actions non réalisées sur le réseau (mise en place ou retrait de balises, mise en place ou retrait d'éléments temporaires ou instructions générales données à l'équipe sur le terrain ou à l'opérateur, par exemple).



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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)

Figure 28 – Diagramme de séquences SwitchingPlans

5.8.2 Charge utile **Message**

Les attributs du profil **SwitchingPlans** sont décrits dans le Tableau 12.

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Tableau 12 – Profil SwitchingPlans

SwitchingPlans					
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**	**Profils utilisés dans, en plus de ce profil.**
SwitchingPlans	SwitchingPlan	[1..*]			
Attributs de profil					
mRID	String	[0..1]	GUID	mRID de ce SwitchingPlan	PlannedOutageNotifications, PlannedOutages, TroubleOrders
description	String	[0..1]		Champ textuel au format libre qui décrit le **SwitchingPlan**	PlannedOutageNotifications, PlannedOutages, TroubleOrders
Names	Name	[0..*]	Voir l'Article B.56	Liste de noms lisibles par l'homme pour le SwitchingPlan	PlannedOutageNotifications, PlannedOutages, TroubleOrders
approvedDateTime	DateTime	[0..1]		DateTime d'approbation du SwitchingPlan.	
cancelledDateTime	DateTime	[0..1]		DateTime d'annulation du SwitchingPlan.	
comment	String	[0..1]		Commentaires associés au SwitchingPlan	
createdDateTime	DateTime	[0..1]		DateTime à laquelle le SwitchingPlan a été initialement créé.	
lastModifiedDateTime	DateTime	[0..1]		DateTime de la dernière modification du SwitchingPlan.	
purpose	String	[0..1]		Objectif du plan de commutation	
rank	Integer	[0..1]		Priorité de ce SwitchingPlan par rapport aux autres SwitchingPlans	

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SwitchingPlans					
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**	**Profils utilisés dans, en plus de ce profil.**
revisionNumber	String	[0..1]		Numéro de révision du **SwitchingPlan**. En règle générale, il est utilisé pour suivre les modifications après que le SwitchingPlan a été approuvé, mais il peut également l'être pour suivre les modifications pendant le cycle de développement et d'examen.	
title	String	[0..1]		Titre du SwitchingPlan	
type	String	[0..1]		Type de SwitchingPlan	
Approver	Approver	[0..1]	Voir 'Article B.8	Personne qui a approuvé le **SwitchingPlan**	
Author	Author	[0..1]	Voir l'Article B.13	Personne qui a écrit le SwitchingPlan	
docStatus	Status	[0..1]	Voir l'Article B.79	docStatus.value est utilisé pour spécifier le statut global du document SwitchingPlan (projet, en cours d'examen, approuvé, annulé, etc.).	
plannedPeriod	DateTimeInterval	[0..1]		Dates de début et de fin prévues du SwitchingPlan	
SafetyDocuments	SafetyDocument	[0..*]	Voir l'Article B.75	Liste des SafetyDocuments associées au SwitchingPlan.	
SwitchingPlanRequest	SwitchingPlanRequest	[0..1]	Voir 5.7	Référence à la SwitchingPlanRequest à l'origine de la création de ce SwitchingPlan, identifiée par son mRID, sa description et Names. La SwitchingPlanRequest contient des informations plus détaillées relatives au SwitchingPlan, y compris son origine et son objectif.	
SwitchingStepGroups	SwitchingStepGroup	[0..1]	Voir 5.8.3.	Instructions détaillées relatives à la commutation qui doit être réalisée.	

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Le message **SwitchingPlans** étant volumineux, la description de la charge utile dans le présent document est répartie sur plusieurs paragraphes afin de faciliter la compréhension.

Cette charge utile de message, présentée à son niveau le plus élevé dans les diagrammes de la Figure 29,de la Figure 30 et de la Figure 31, peut être utilisée pour échanger 0 à plusieurs **SwitchingPlans**.

La Figure 29 présente le niveau le plus élevé d'un **SwitchingPlan.**

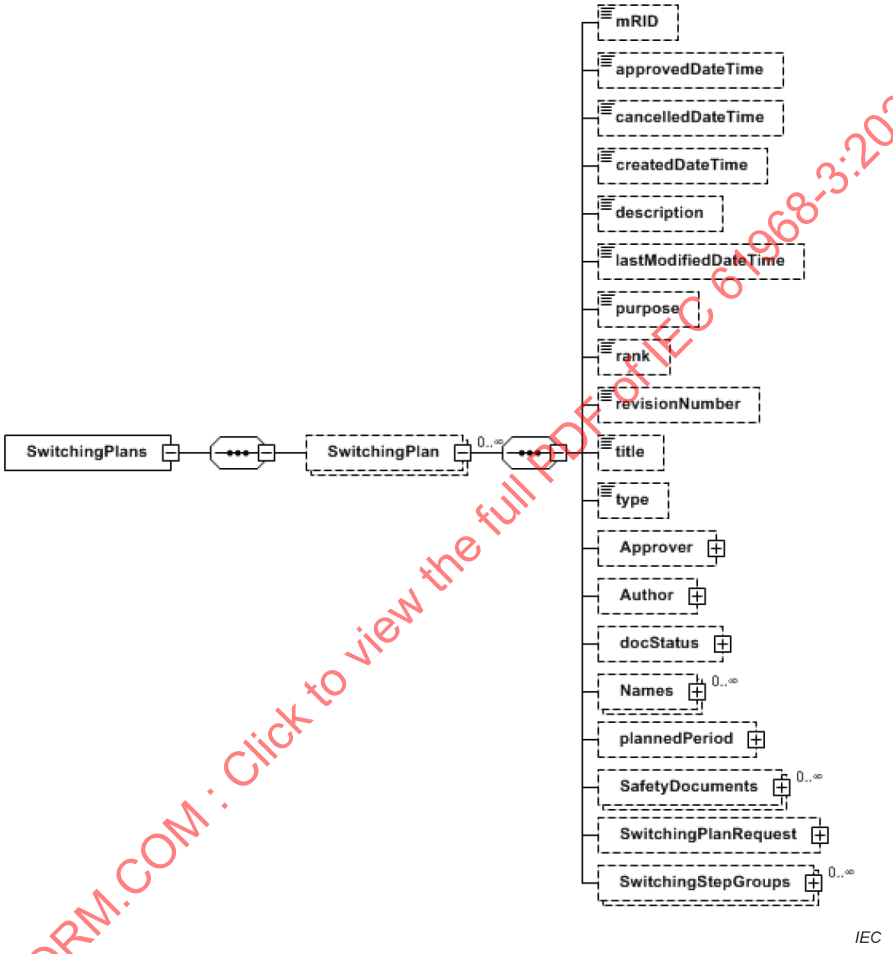


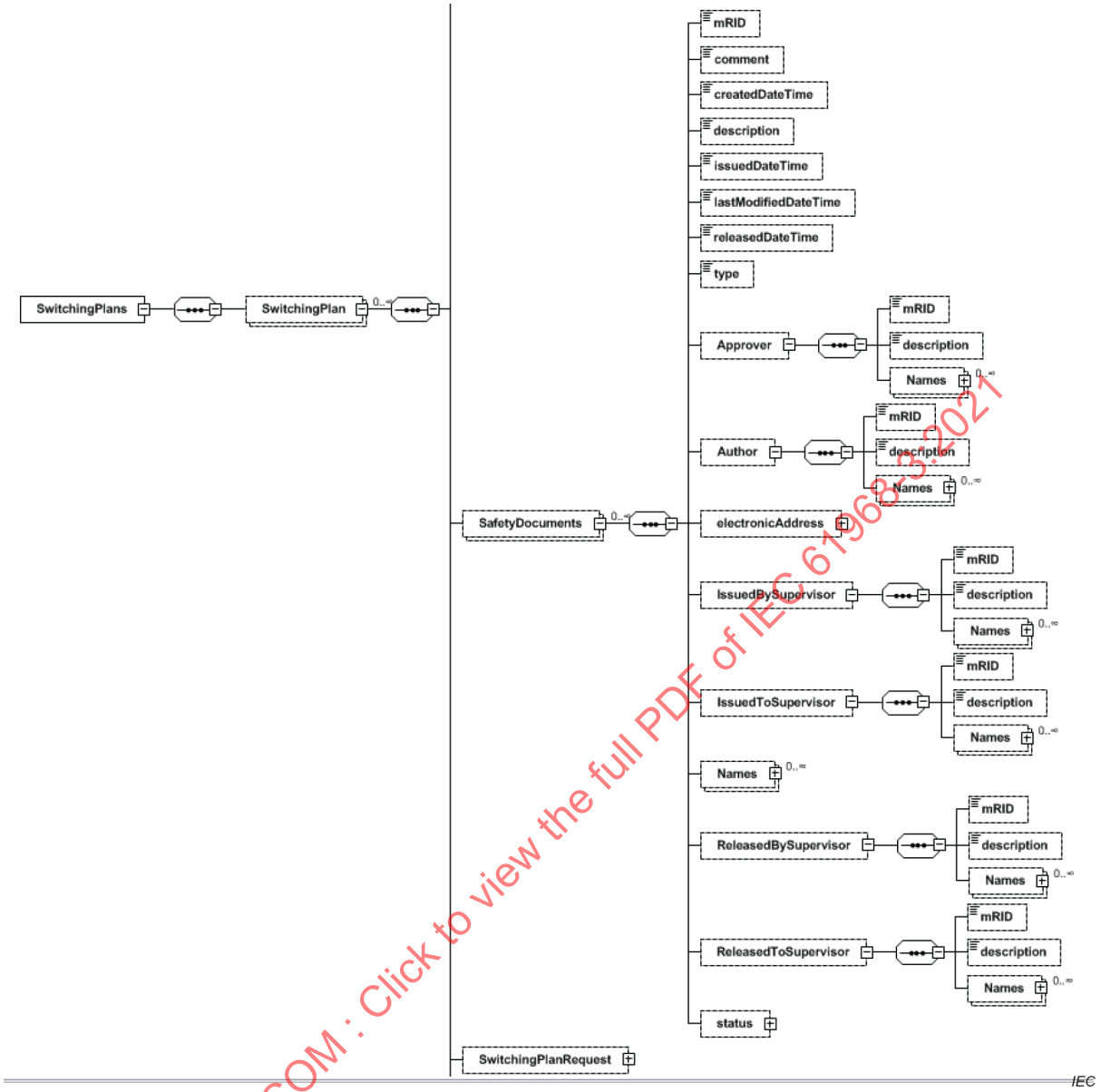
Figure 29 – Charge utile de message SwitchingPlans – niveau le plus élevé

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La Figure 30 présente un ensemble facultatif de **SafetyDocument**s associés à la gestion des aspects relatifs à la sécurité du **SwitchingPlan**. Les **SafetyDocument**s sont utilisés pour suivre les prises en charge entre les différentes parties afin d'assurer un fonctionnement en toute sécurité du réseau électrique. Au niveau du **SwitchingPlan**, les **SafetyDocuments** sont utilisés pour contrôler l'accès à une partie du réseau. Les **SafteyDocument**s peuvent également apparaître comme des étapes spécifiques dans un **SwitchingPlan**, dans lequel ils sont appelés **ClearanceAction**s.

Il est possible d'avoir un **SwitchingPlan** ne contenant aucune étape de commutation, mais ayant un ou plusieurs **SafetyDocuments**. Il s'agit, par exemple, de documents de sécurité permettant d'accéder à un poste ou à l'équipement du client lorsqu'aucune commutation n'est impliquée.

Les attributs du fragment de charge utile **SafetyDocument** sont décrits à l'Article B.75.



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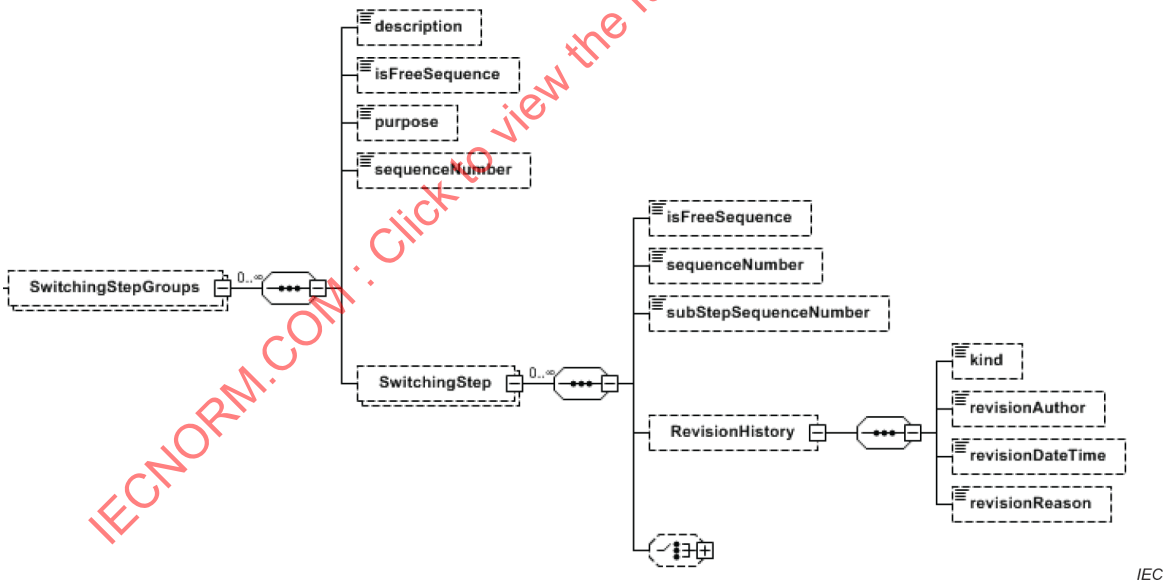
Figure 30 – Message SwitchingPlans – Fragment de charge utile SafetyDocuments

5.8.3 Charge utile SwitchingPlans – FragmentSwitchingStepGroups

Les attributs de **SwitchingStepGroups** utilisés dans ce profil sont présentés dans le Tableau 13. Comme indiqué à la Figure 31, chaque **SwitchingPlan** peut inclure 0 à plusieurs **SwitchingStepGroups**. Les **SwitchingStepGroups** sont utilisés pour définir la séquence (l'ordre) des groupes d'actions. Voir également 5.8.5 pour des informations complémentaires relatives à l'ordre d'exécution.

Tableau 13 – SwitchingPlans – Fragment de charge utile SwitchingStepGroups

Operations: SwitchingStepGroup				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
purpose	String	[0..1]		Commentaires ou instructions au format libre
description	String	[0..1]		Commentaires ou instructions au format libre
sequenceNumber	Integer	[0..1]		Définit l'ordre d'apparition des groupes d'étapes dans le **SwitchingPlan** et, conjointement avec isFreeSequence, définit la séquence dans laquelle les groupes d'étapes doivent être exécutés dans le **SwitchingPlan.** Voir 5.8.5 pour de plus amples informations. La valeur 1 est attribuée au sequenceNumber du premier **SwitchingStepGroup** d'un SwitchingPlan donné. Les **sequenceNumbers** successifs sont incrémentés de 1.
isFreeSequence	Boolean	[0..1]		Voir 5.8.5 pour de plus amples informations sur isFreeSequence et l'ordre dans lequel SwitchingStepGroups et SwitchingSteps peuvent être exécutés.
SwitchingStep	SwitchingStep	[0..*]	Voir 5.8.4.	



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Figure 31 – Charge utile de message SwitchingPlans – SwitchingStepGroups

5.8.4 Charge utile SwitchingPlans – FragmentSwitchingStep

Les attributs de **SwitchingStep** utilisés dans ce profil sont présentés dans le Tableau 14.

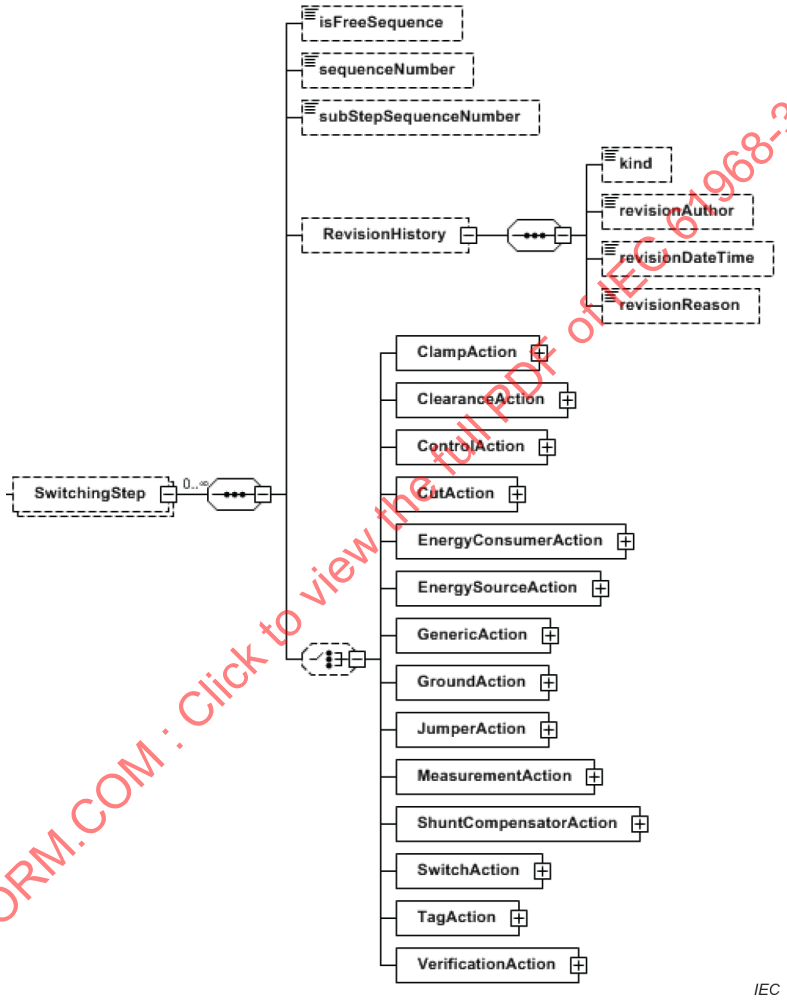
Tableau 14 – SwitchingPlans – Fragment de charge utile SwitchingStep

Operations: SwitchingStep				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
sequenceNumber	Integer	[0..1]		Détermine la séquence d'exécution dans la SwitchingStep. La valeur 1 est attribuée au **sequenceNumber** de la première **SwitchingStep** d'un **SwitchingPlan** donné. Les **sequenceNumbers** successifs sont incrémentés de 1, quel que soit le **SwitchingStepGroup** dans lequel apparaît la **SwitchingStep**.
isFreeSequence	Boolean	[0..1]		Voir 5.8.5 pour de plus amples informations sur **isFreeSequence** et l'ordre dans lequel les **SwitchingStepGroups** et les **SwitchingSteps** peuvent être exécutés.
RevisionHistory	RevisionHistory	[0..1]	Voir l'Article B.74	Historique de révision de l'étape. Utilisé pour indiquer si l'étape a été ajoutée ou supprimée (écartée) du plan après avoir été approuvée,
subStepSequenceNumber	Integer	[0..1]		Permet de définir un second niveau d'étapes pour chaque SwitchingStep. Les **subStepSequenceNumber**s commencent toujours à 1 dans une SwitchingStep donnée. Les sous-étapes sont définies de manière unique par leur **SwitchingStep sequenceNumber** et leur **subStepSequenceNumber** Les sous-étapes qui ont été insérées après l'approbation du plan de commutation ont un **RevisionHistory**.
		[1..1]		Choix d'une action comme indiqué ci-dessous
Actions				
ClampAction	ClampAction		Voir 5.8.6	
ClearanceAction	ClearanceAction		Voir 5.8.7.	
ControlAction	ControlAction		Voir 5.8.8.	
CutAction	CutAction		Voir 5.8.9.	
EnergyConsumerAction	EnergyConsumerAction		Voir 5.8.10.	
EnergySourceAction	EnergySourceAction		Voir 5.8.11.	
GenericAction	GenericAction		Voir 5.8.12.	
GroundAction	GroundAction		Voir 5.8.13.	
JumperAction	JumperAction		Voir 5.8.14.	
MeasurementAction	MeasurementAction		Voir 5.8.15.	
ShuntCompensatorAction	ShuntCompensatorAction		Voir 5.8.16.	
SwitchAction	SwitchAction		Voir 5.8.17.	
TagAction	TagAction		Voir 5.8.18.	
VerificationAction	VerificationAction		Voir 5.8.19.	

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Cela permet de construire un plan de commutation selon une combinaison d'étapes d'actions et d'étapes de commentaire ou d'en-tête. Cela permet également de définir une étape complexe sous la forme d'une combinaison d'étapes d'actions. Par exemple, une étape complexe peut être composée d'une seule étape numérotée jusqu'à "ouvrir et placer la balise Do Not Operate". Cela est représenté par une **SwitchingStep** avec une **SwitchAction** (**subStepSequenceNumber** = 1) et une **TagAction** (**subStepSequenceNumber** = 2). Les sous-étapes doivent être exécutées dans un ordre de **subStepSequenceNumber** strict.

Chaque **SwitchingStep** est composée d'un choix d'actions (voir la Figure 32).



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Figure 32 – Actions SwitchingStep

5.8.5 Spécification de l'ordre d'exécution de l'étape

L'ordre d'exécution des **SwitchingStepGroup**s et des **SwitchingStep**s peut être défini dans un **SwitchingStepGroup**. Le **SwitchingStepGroup** et les **SwitchingStep**s comportent un attribut Boolean, **isFreeSequence**.

Pour une étape, si la valeur "false" est attribuée à **isFreeSequence** ou qu'aucune valeur n'est spécifiée, toutes les étapes du groupe doivent être exécutées dans l'ordre défini par l'attribut **sequenceNumber**. Le **sequenceNumber** d'une étape a une signification différente lorsque l'attribut **isFreeSequence** d'au moins deux étapes séquentielles est défini sur "true". L'exécution doit toujours être réalisée dans l'ordre **sequenceNumber** tant qu'un ensemble d'au moins deux étapes dont **isFreeSequence** est défini sur "true" n'a pas été rencontré. Dans ce cas, ces étapes

peuvent être exécutées dans n'importe quelle séquence, tant qu'une étape dont **isFreeSequence** est défini sur "false" n'a pas été rencontrée. Toutes les étapes qui précèdent cette étape doivent être préalablement exécutées.

Un exemple est représenté dans le Tableau 15. Si **isFreeSequence** a été défini sur "false" pour toutes les étapes, ces dernières sont exécutées dans l'ordre de **sequenceNumber**, en commençant à 1. Toutefois, il est défini sur "true" pour les étapes 4, 5 et 6. La séquence modifiée consiste donc à commencer à l'étape 1, suivie de l'étape 2 et de l'étape 3. Les étapes 4, 5 et 6 peuvent être exécutées dans n'importe quel ordre, mais doivent toutes l'être avant l'étape 7.

Tableau 15 – Exemple d'ordre d'exécution de l'étape de commutation

Étape	Attributs	Commentaires
SwitchingStep 1	sequenceNumber: 1 isFreeSequence: false	Doit être exécutée en premier
SwitchingStep 2	sequenceNumber: 2 isFreeSequence: false	Doit être exécutée après l'étape 1.
SwitchingStep 3	sequenceNumber: 3 isFreeSequence: false	Doit être exécutée après l'étape 2
SwitchingStep 4	sequenceNumber: 4 isFreeSequence: true	Peut être exécutée à tout moment après que l'étape 3 a été exécutée.
SwitchingStep 5	sequenceNumber: 5 isFreeSequence: true	Peut être exécutée à tout moment après que l'étape 3 a été exécutée.
SwitchingStep 6	sequenceNumber: 6 isFreeSequence: true	Peut être exécutée à tout moment après que l'étape 3 a été exécutée.
SwitchingStep 7	sequenceNumber: 7 isFreeSequence: false	Peut uniquement être exécutée après que les étapes 4, 5 et 6 ont été exécutées.

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Une logique similaire s'applique à un **SwitchingStepGroup**.

Si une **SwitchingStep** contient des sous-étapes, toutes les sous-étapes d'une étape doivent être exécutées dans l'ordre défini par **subStepSequenceNumber**.

La Figure 33 est un exemple et indique les étapes qui doivent être exécutées de manière séquentielle, ainsi que les groupes d'étapes de commutation qui peuvent être exécutées en parallèle. Dans l'exemple, **SwitchingStepGroup** 1 doit être exécuté avant le Groupe 2, le Groupe 3 et le Groupe 4. Dès que le Groupe 1 a été exécuté, le Groupe 2 et le Groupe 3 peuvent être exécutés en parallèle ou dans n'importe quel ordre. Le Groupe 4 ne peut pas être exécuté tant que le Groupe 2 et le Groupe 3 ne l'ont pas été.

De même, les étapes du Groupe 1, du Groupe 2 du Groupe 4 doivent être exécutées en séquence dans leur groupe, alors que l'étape 5 et l'étape 6 du Groupe 3 peuvent être exécutées dans n'importe quelle séquence. L'étape 7 du Groupe 3 doit être exécutée après l'étape 5 et l'étape 6.

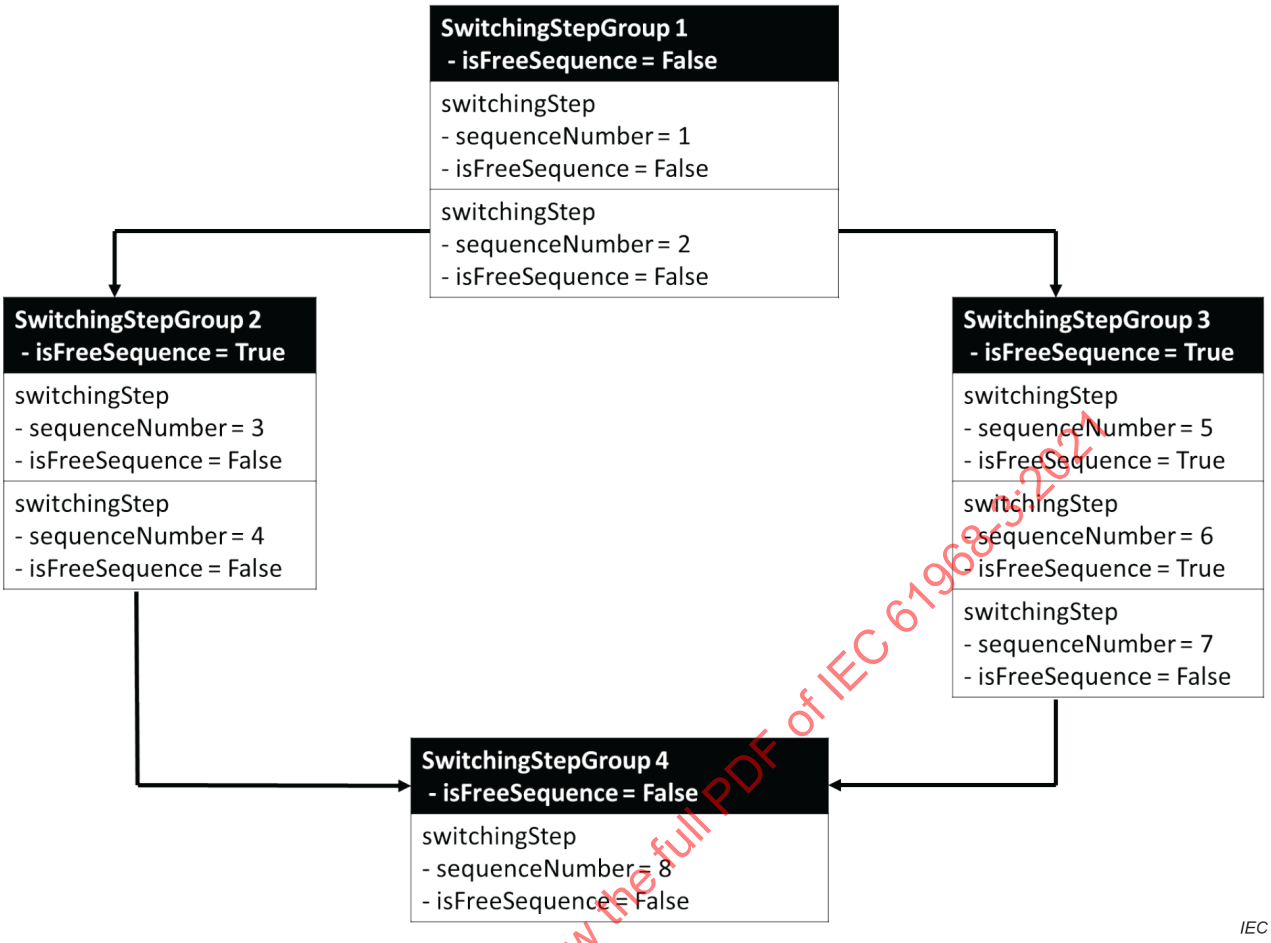


Figure 33 – Ordre d'exécution de SwitchingStepGroup et de SwitchingStep

5.8.6 Charge utile SwitchingPlans – ClampAction

La partie **ClampAction** d'une **SwitchingPlan** est présentée à la Figure 34.

Une **ClampAction** est un type d'étape dans un **SwitchingPlan** qui implique de placer un serre-fils (**Clamp**) temporaire sur un conducteur (**ACLineSegment**).

Un serre-fils (**Clamp**) est une connexion galvanique au niveau d'un segment de ligne où d'autres équipements sont connectés. Un serre-fils (**Clamp**) ne sépare pas le segment de ligne. Un serre-fils (**Clamp**) est un **ConductingEquipment** et comporte une borne (**Terminal**) associée à un **ConnectivityNode**. Une borne d'un autre **ConductingEquipment** peut être associée au même **ConnectivityNode**.

Les serre-fils (**Clamp**s) sont en général utilisés pour connecter des raccordements (**jumpers**) à un **ACLineSegment** lorsque le raccordement (**jumper**) doit être connecté le long d'un **ACLineSegment**. Si le raccordement (**jumper**) doit être connecté à l'une des extrémités d'un **ACLineSegment**, un serre-fils (**clamp**) n'est pas exigé.

Les attributs de **ClampAction** utilisés dans ce profil sont présentés dans le Tableau 16.

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Tableau 16 – Fragment de charge utile ClampAction pour les SwitchingPlans

Operations: ClampAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	**mRID de ClampAction**
description	String	[0..1]		**Description au format libre**
Names	Name	[0..*]	Voir l'Article B.56	Noms de la ClampAction
kind	TempEquipActionKind	[0..1]	Voir l'Article C.22	Détermine si le serre-fils est posé ou déposé. Énumération avec valeurs possibles "place", "remove".
Clamp	Clamp	[0..1]	Voir l'Article B.14	Définit le serre-fils actuel qui doit être posé ou déposé.
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.

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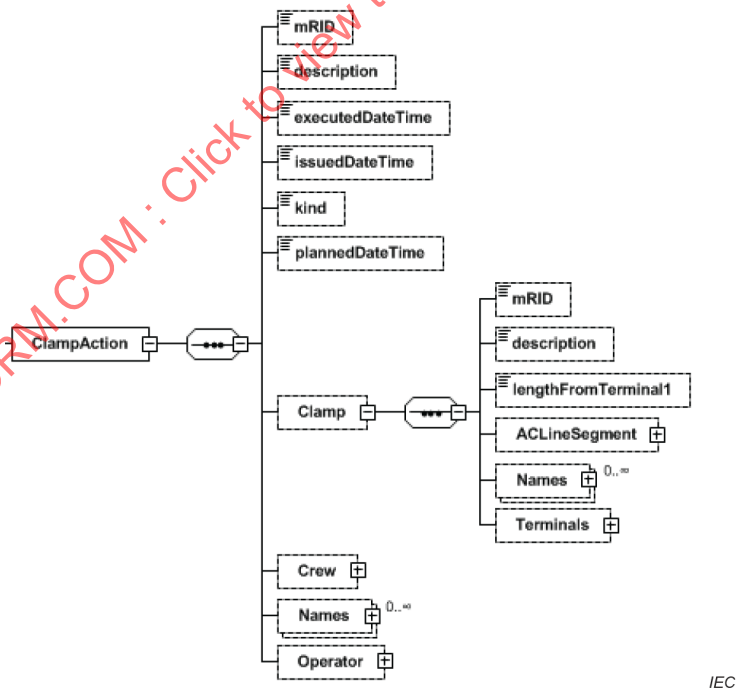


Figure 34 – SwitchingPlans – ClampAction

5.8.7 Charge utile SwitchingPlans – ClearanceAction

La partie **ClearanceAction** d'un **SwitchingPlan** est présentée à la Figure 35.

Une **ClearanceAction** est un type d'étape dans un **SwitchingPlan** qui implique le transfert de contrôle d'une partie définie du réseau électrique après que la partie du réseau a été déclarée comme étant sûre pour le personnel sur le terrain.

La **ClearanceAction** peut être utilisée dans un **SwitchingPlan** pour définir le transfert de contrôle entre une salle de commande et le personnel sur le terrain lorsque le travail peut commencer. Il s'agit en principe de définir une **ClearanceAction** avec une **ClearanceAction.kind** of **issue**.

Le contrôle revient à la salle de commande à l'issue des travaux sur le terrain. Il s'agit en principe de définir une **ClearanceAction** dans le **SwitchingPlan** avec une **ClearanceAction.kind** of **release**.

Une **ClearanceAction.kind update** (mise à jour) dans un **SwitchingPlan** peut être utilisée pour modifier la liste des **TaggedPSR** lorsque le **SwitchingPlan** exige d'étendre ou de contracter le domaine d'application des habilitations ou d'autres attributs liés aux responsabilités.

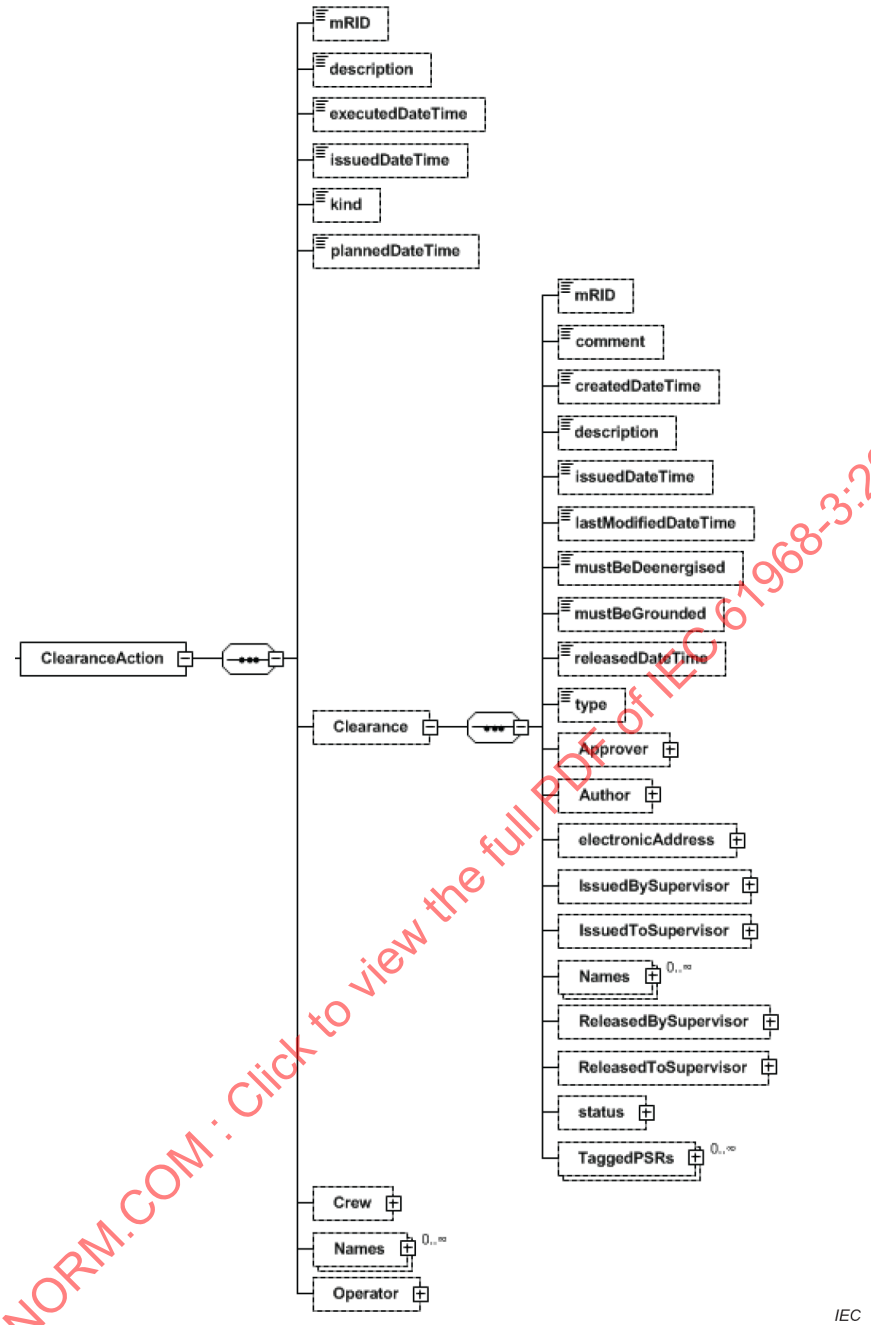
Les champs d'une **ClearanceAction** sont présentés à la Figure 35.

Les attributs de **ClearanceAction** utilisés dans ce profil sont présentés dans le Tableau 17.

Tableau 17 – Fragment de charge utile ClearanceAction pour les SwitchingPlans

Operations: ClearanceAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de ClearanceAction
description	String	[0..1]		Description au format libre de la ClearanceAction
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour la ClearanceAction
kind	ClearanceActionKind	[0..1]	Voir l'Article C.4	Emettre, mettre à jour ou publier Clearance.
Clearance	Clearance	[0..1]	Voir l'Article B.16	Définit l'habilitation (Clearance) actuelle à émettre, mettre à jour ou publier.
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.

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Figure 35 – SwitchingPlans – ClearanceAction

5.8.8 Charge utile SwitchingPlans – ControlAction

La partie **ControlAction** de la charge utile **SwitchingPlans** est présentée à la Figure 36. Les champs qui sont uniques à une **ControlAction** sont un choix de différents types d'actions de commande:

- **AccumulatorReset** – voir 5.5.3;
- **AnalogControl** – voir 5.5.3.2;
- **Command** – voir 5.5.4.2;
- **RaiseLowerCommand** – voir 5.5.5.2;
- **SetPoint** – voir 5.5.6.2.

Une **ControlAction** est une étape d'un **SwitchingPlan** permettant de modifier l'état de l'équipement sur le terrain. Il s'agit en principe d'un message **SwitchingActions** (manuel) ou d'un message PSRControls (automatisé). Voir 5.7 pour de plus amples informations.

Les attributs de **ControlAction** utilisés dans ce profil sont présentés dans le Tableau 18.

Tableau 18 – Fragment de charge utile ControlAction pour les SwitchingPlans

Operations: ControlAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de cette ControlAction
description	String	[0..1]		Description au format libre de cette ControlAction
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour cette ControlAction
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.
Choix des commandes		[1..1]		
Choix de l'un des éléments suivants				
AccumulatorReset	AccumulatorReset		Voir 5.6.4	
AnalogControl	AnalogControl		Voir 5.6.5	
Command	Command		Voir 5.6.6	
RaiseLowerCommand	RaiseLowerCommand		Voir 5.6.7	
SetPoint	SetPoint		Voir 5.6.8	

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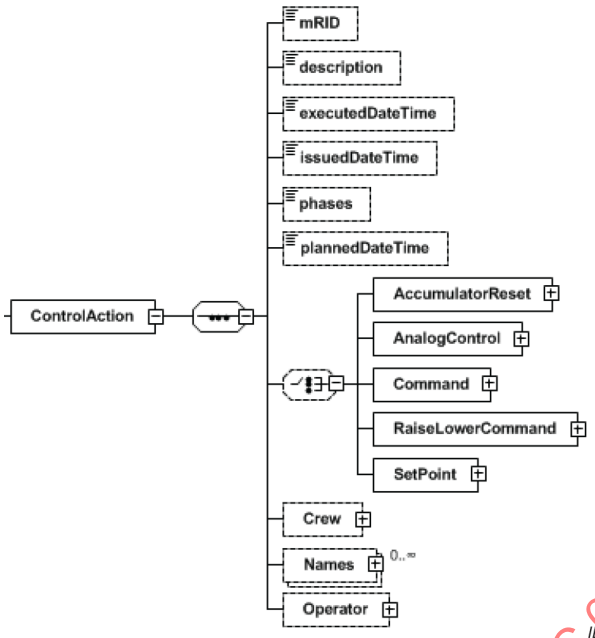


Figure 36 – SwitchingPlans – ControlAction

La **ControlAction** doit faire partie intégrante du **SwitchingPlan** de manière à pouvoir capturer les actions de commande manuelle dans le cadre du **SwitchingPlan**. Une action de "commande manuelle" est une demande adressée à l'équipe sur le terrain pour qu'elle exécute des actions de commande en utilisant les commandes locales d'un dispositif de terrain (modification d'un point de consigne ou modification de la position de prise du régulateur de tension, par exemple). Lors de l'exécution du SwitchingPlan, les demandes adressées à l'équipe sur le terrain sont formulées à l'aide d'une **SwitchingAction**.**ControlAction** et les résultats renvoyés depuis le terrain avec un **SwitchingEvent**.**ControlAction**.

S'il existe une capacité de commande à distance, le **SwitchingPlan** définit toujours une étape de type **ControlAction**. Toutefois, lors de l'exécution du **SwitchingPlan**, les demandes de contrôles sont envoyées à SCADA. Les **ControlActions** à distance sont exécutées à l'aide de **PSRControls** et de **PSRMeasurements**, comme indiqué dans le diagramme de séquences de la Figure 19 et décrit en 5.7.

5.8.9 Charge utile SwitchingPlans – CutAction

Une **CutAction** est utilisée pour spécifier une étape de commutation destinée à ajouter ou retirer une **Cut** d'un conducteur (**ACLineSegment**).

La partie **CutAction** de la charge utile **SwitchingPlans** est présentée à la Figure 37.

Les attributs de **CutAction** utilisés dans ce profil sont présentés dans le Tableau 19. Le contenu de la charge utile **Cut** est décrit en B.18.

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Tableau 19 – Fragment de charge utile CutAction pour les SwitchingPlans

Operations: CutAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de cette CutAction.
description	String	[0..1]		Description au format libre de cette CutAction
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour cette CutAction
kind	TempEquipActionKind	[0..1]	Voir l'Article C.20	Indique s'il convient de placer ou de retirer la séparation.
Cut	Cut	[0..1]	Voir l'Article B.18	Définit la séparation actuelle qui doit être placée ou retirée.
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.

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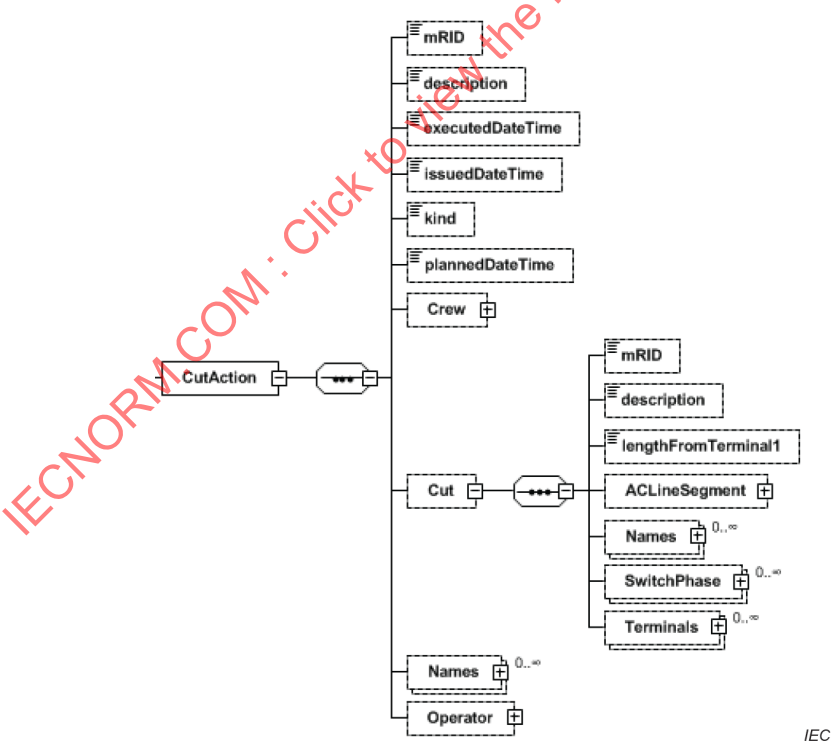


Figure 37 – SwitchingPlans – CutAction

Une description complète d'un **Cut** et un exemple sont donnés dans l'IEC 61970-301.

5.8.10 Charge utile SwitchingPlans – EnergyConsumerAction

L'**EnergyConsumerAction** de la charge utile **SwitchingPlans** est présentée à la Figure 38.

Une **EnergyConsumerAction** est utilisée pour spécifier une étape de commutation pour temporairement déconnecter ou connecter un **EnergyConsumer** permanent de ses bornes. **TempEquipAction.kind** définit s'il faut déconnecter ou connecter l'**EnergyConsumer** et peut avoir les valeurs de **disconnect** ou de **connect**.

Les attributs de **EnergyConsumerAction** utilisés dans ce profil sont présentés dans le Tableau 20.

Tableau 20 – Fragment de charge utile EnergyConsumerAction pour les SwitchingPlans

Operations: EnergyConsumerAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID d'EnergyConsumerAction
description	String	[0..1]		Description au format libre d'EnergyConsumerAction
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	TempEquipActionKind	[0..1]	Voir l'Article C.20	Définit s'il faut déconnecter ou connecter le client d'énergie.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases sur lesquelles exécuter l'action.
EnergyConsumer	EnergyConsumer	[0..1]	Voir l'Article B.34	EnergyConsumer à déconnecter ou connecter.
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.

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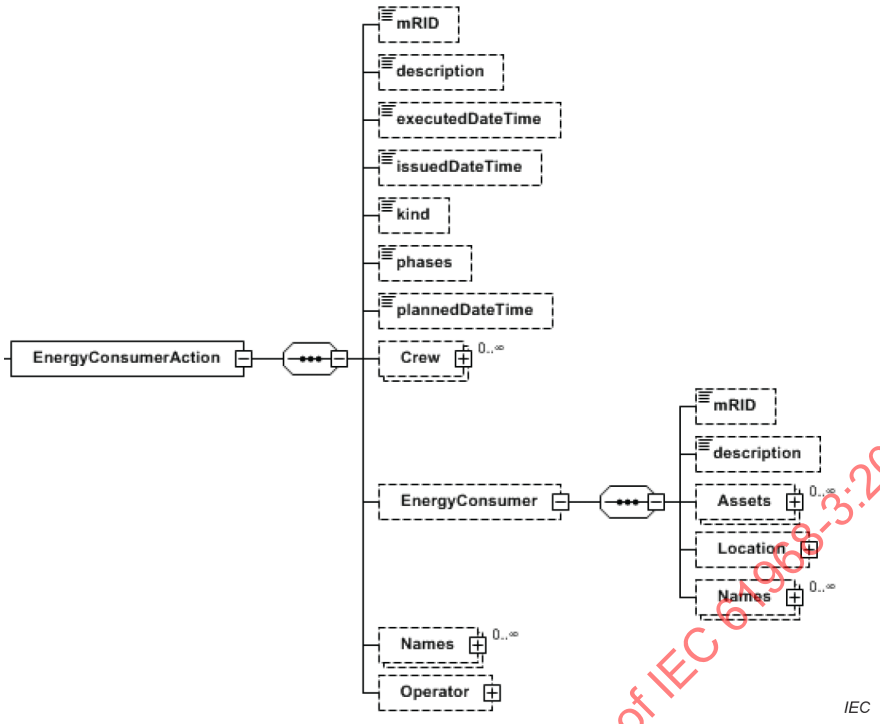


Figure 38 – SwitchingPlans – EnergyConsumerAction

5.8.11 Charge utile SwitchingPlans – EnergySourceAction

L'**EnergySourceAction** de la charge utile **SwitchingPlans** est présentée à la Figure 39.

Une **EnergySourceAction** est utilisée pour spécifier une étape de commutation destinée à ajouter ou retirer une **EnergySource temporaire**. **TempEquipAction.kind** définit s'il faut ajouter ou retirer l'**EnergySource** et peut avoir les valeurs **place** ou **remove**. De plus, une **EnergySourceAction** est utilisée pour spécifier une étape de commutation pour temporairement déconnecter ou connecter une **EnergySource permanente de ses bornes**. **EnergySourceAction.kind** définit s'il faut déconnecter ou connecter l'**EnergySource** et peut avoir les valeurs **disconnect** ou **connect**.

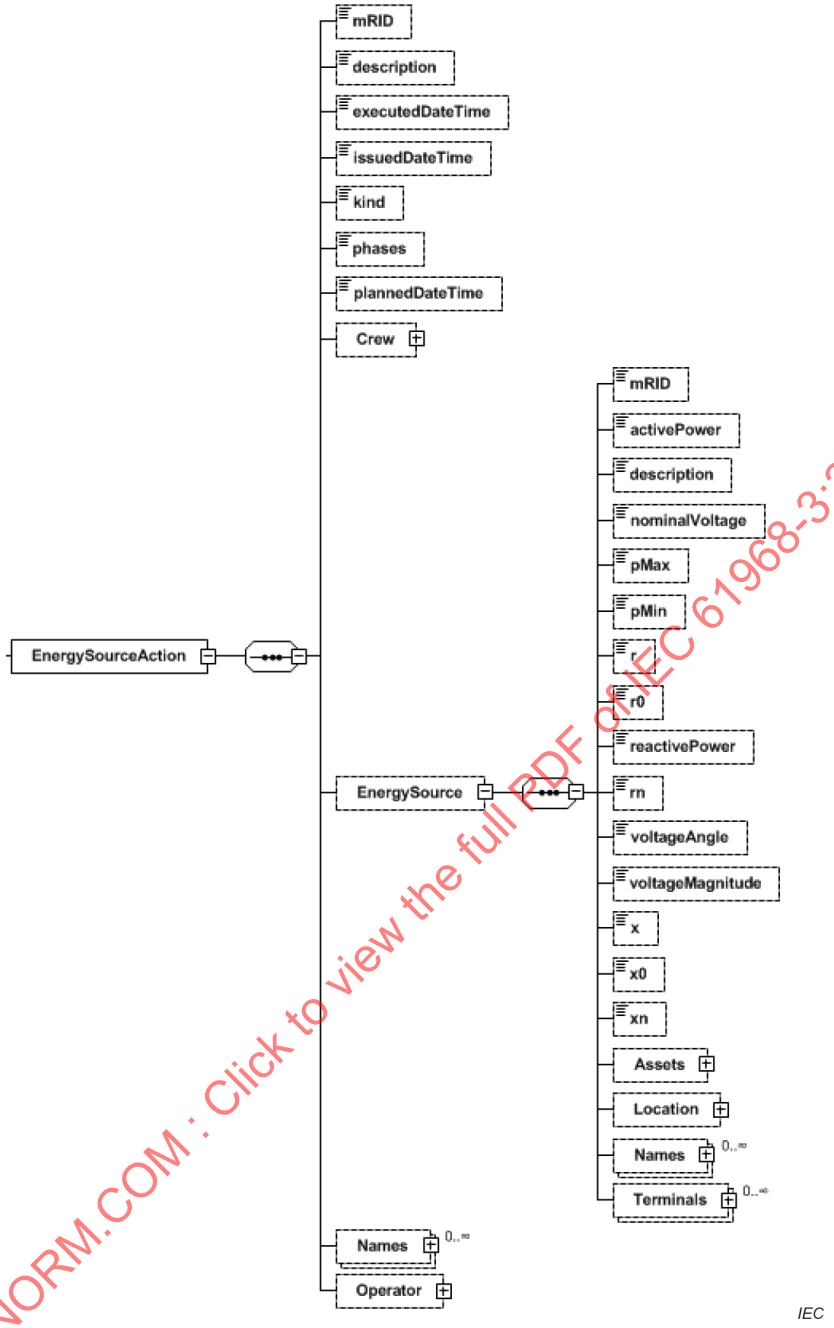
Les attributs de **EnergySourceAction** utilisés dans ce profil sont présentés dans le Tableau 21.

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Tableau 21 – Fragment de charge utile EnergySourceAction pour les SwitchingPlans

Operations: EnergySourceAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID d'EnergySourceAction
description	String	[0..1]		Description au format libre d'EnergySourceAction
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	TempEquipActionKind	[0..1]	Voir l'Article C.20	Définit s'il faut placer, retirer, déconnecter ou connecter la source d'énergie.
EnergySource	EnergySource	[0..1]	Voir l'Article B.35	EnergySource à placer, retirer, déconnecter ou connecter
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.

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Figure 39 – SwitchingPlans – EnergySourceAction

5.8.12 Charge utile SwitchingPlans – GenericAction

La partie **GenericAction** de la charge utile **SwitchingPlans** est présentée à la Figure 40.

Au sein du plan de commutation, les actions génériques définissent l'ensemble des actions réalisées à chaque étape de commutation qui n'ont pas d'incidence sur l'état du réseau ou entreprennent une action non modélisée sur le réseau.

Un exemple d'action qui n'a pas d'incidence sur l'état du réseau est le changement manuel de mode d'un dispositif (placer en manuel lorsque le mode n'est pas commandable à distance, par exemple) à enregistrer en tant qu'étape de commutation. Dans ce cas, la **description** est utilisée pour définir l'action ("Placer en manuel", par exemple) et la **PowerSystemResource** définit le composant de réseau à placer en manuel.

Un exemple d'action non modélisée entreprise sur le réseau consisterait à exploiter l'équipement détenu par le client utilisé par l'entreprise de distribution, laquelle ne le détient pas. Dans ce cas, la **description** est utilisée pour définir ce qui doit être fait, et toutes les parties de la **PowerSystemResource** sont vides, sauf **Location**, qui est utilisé pour définir l'emplacement (**Location**) géographique de l'action à réaliser.

Les attributs de **GenericAction** utilisés dans ce profil sont présentés dans le Tableau 22.

Tableau 22 – Fragment de charge utile GenericAction pour les SwitchingPlans

Operations: GenericAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de cette GenericAction.
description	String	[0..1]		Description au format libre de cette GenericAction
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour cette GenericAction
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases à exécuter par cette action.
PowerSystemResource	PowerSystemResource	[0..1]	Voir l'Article B.68	Définit la PowerSystemResource sur laquelle exécuter la GenericAction.
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.

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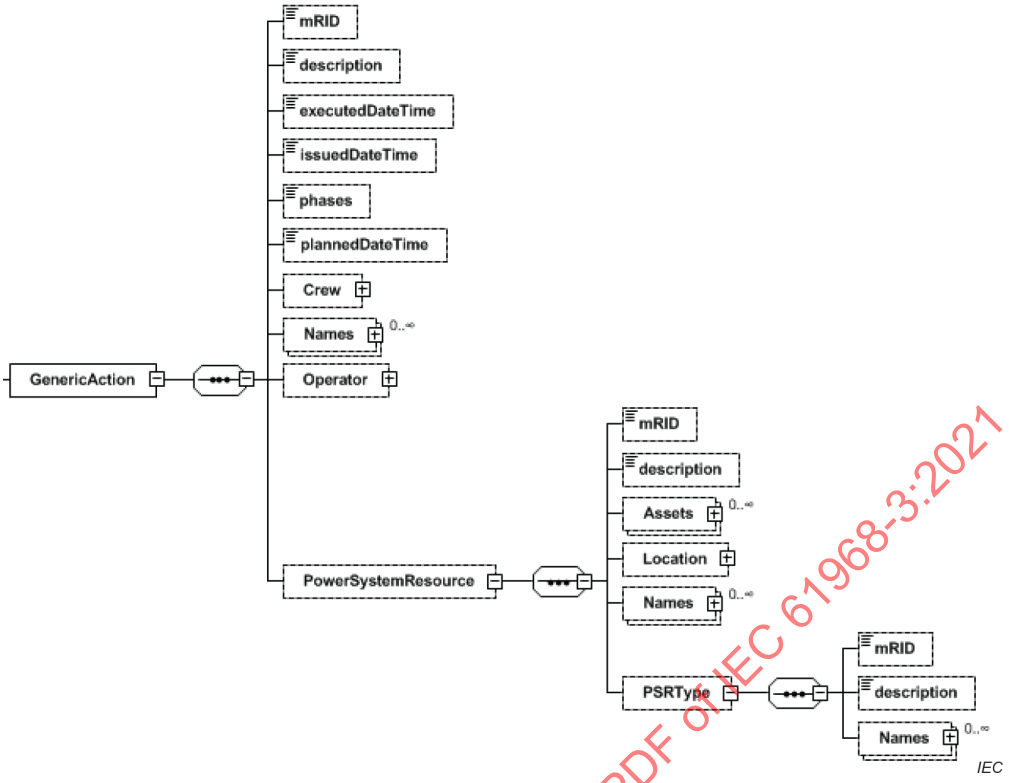


Figure 40 – SwitchingPlans – GenericAction

5.8.13 Charge utile SwitchingPlans – GroundAction

Une **GroundAction** est utilisée pour spécifier une étape de commutation destinée à placer ou retirer une Ground d'un conducteur ou d'un équipement, tel que défini par **GroundAction.kind**.

Une **Ground** est un point auquel le réseau est mis à la terre. Elle est utilisée pour relier l'équipement conducteur à la terre. Le modèle de système de puissance peut avoir un certain nombre de **Ground**s.

Le **Ground** peut être placé sur l'une des bornes d'un **ACLineSegment** ou du **ConductingEquipment**. Si le **Ground** doit être placé le long d'un **ACLineSegment**, le **Ground** doit être placé sur la borne d'un **Clamp**. Le **Clamp** doit déjà avoir été placé. Il est important de veiller à ce que la terre soit reliée à la borne prévue à cet effet d'un composant en comportant plusieurs. Par exemple, si une terre est reliée à un commutateur ouvert mis sous tension d'un seul côté, il convient qu'elle soit reliée à la borne qu'il est prévu de mettre hors tension.

Si la terre doit être placée sur une partie des phases disponibles, la phase est spécifiée par **Ground.Terminal.phases**. Cela est représenté à la Figure 42.

La partie **GroundAction** de la charge utile **SwitchingPlans** est présentée à la Figure 41.

Les attributs de **GroundAction** utilisés dans ce profil sont présentés dans le Tableau 23.

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Tableau 23 – Fragment de charge utile GroundAction pour les SwitchingPlans

Operations: GroundAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de la GroundAction
description	String	[0..1]		Description au format libre de la GroundAction
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour cette GroundAction.
kind	TempEquipActionKind	[0..1]	Voir l'Article C.22	Définit l'action à exécuter, placer ou retirer la terre
Ground	Ground	[0..1]	Voir l'Article B.44	Terre à placer ou à retirer.
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.
Choix de l'un des éléments suivants				
ACLineSegment	ACLineSegment		Voir l'Article B.4	Conducteur sur lequel la terre doit être placée.
Clamp	Clamp		Voir l'Article B.14	Clamp sur lequel la terre doit être placée, si la terre doit être placée le long d'un conducteur
ConductingEquipment	ConductingEquipment		Voir l'Article B.14	ConductingEquipment sur lequel la terre doit être placée.

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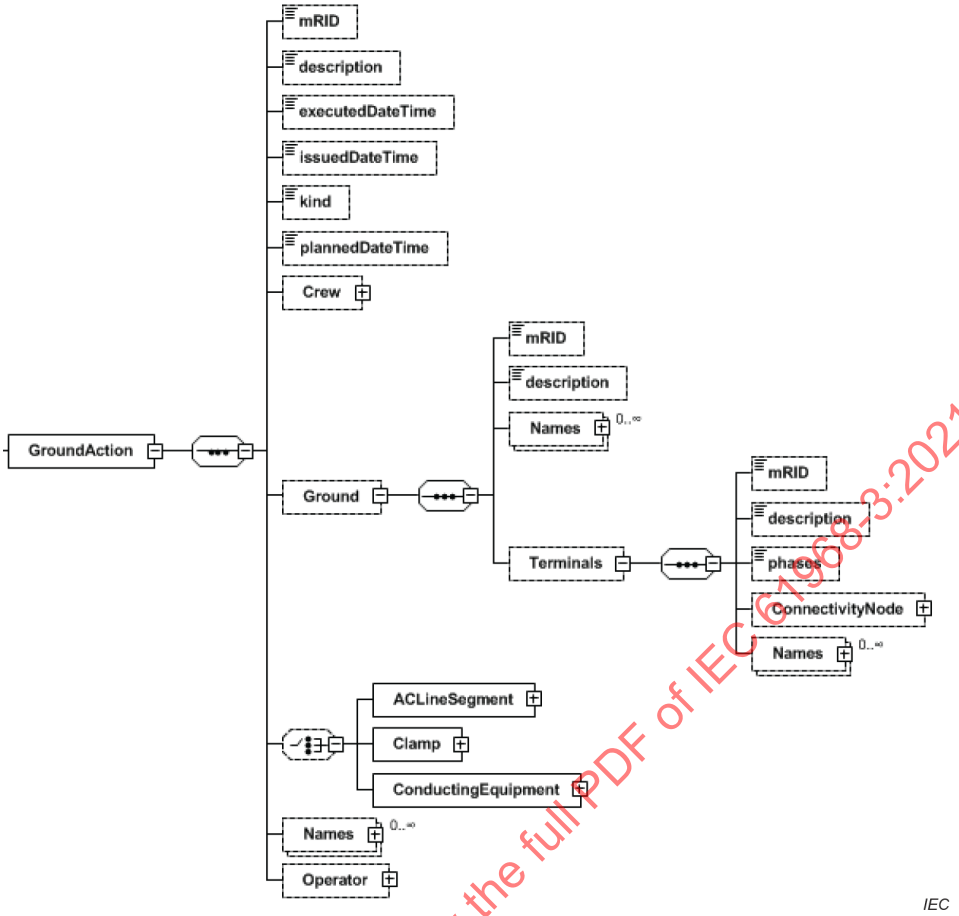


Figure 41 – SwitchingPlans – GroundAction

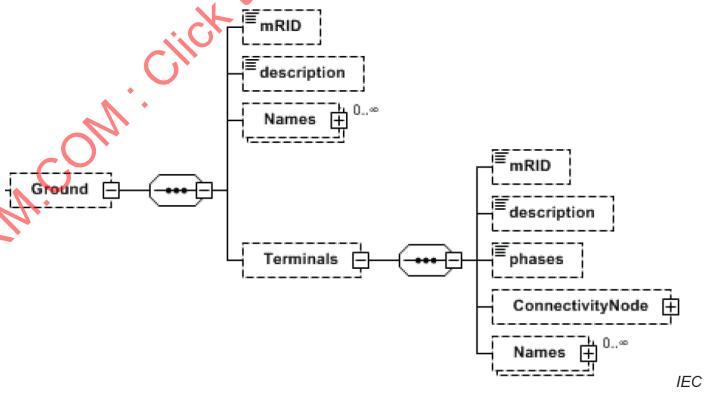


Figure 42 – SwitchingPlans – GroundAction – Ground

La terre peut être placée selon l'un des trois choix possibles. La borne associée à la terre est reliée à la borne définie dans chacun des choix possibles. Pour le ConductingEquipment comportant plusieurs bornes, la terre est reliée à la borne définie dans la charge utile. La Figure 43 présente le fragment de charge utile correspondant au choix **ACLineSegment**.

Les champs d'**ACLineSegment** sont définis à l'Article B.4

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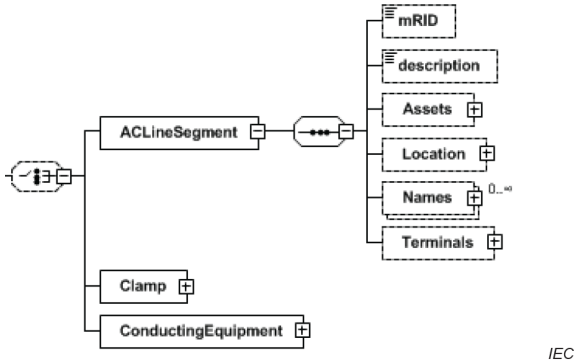


Figure 43 – Choix d'ACLineSegment pour la connexion de ground

La Figure 44 présente le fragment de charge utile correspondant au choix **Clamp**.

Les champs de **Clamp** sont définis à l'Article B.14

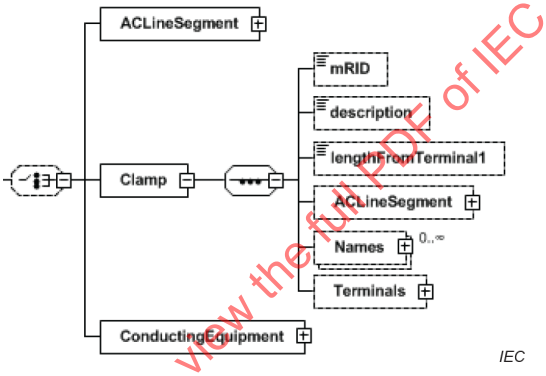


Figure 44 – Choix Clamp pour la connexion de ground

La Figure 45 présente le fragment de charge utile correspondant au choix **ConductingEquipment**.

Les champs de **ConductingEquipment** sont définis à l'Article B.17

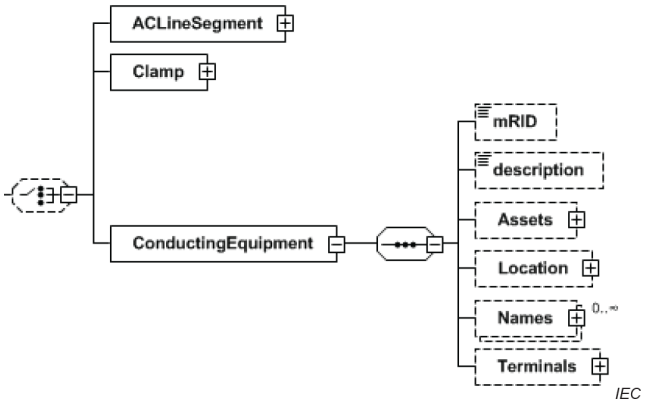


Figure 45 – Choix ConductingEquipment pour la connexion de ground

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5.8.14 Charge utile **SwitchingPlans – JumperAction**

Une **JumperAction** est utilisée pour spécifier une étape de commutation destinée à ajouter ou retirer un **Jumper**. Un **Jumper** est un conducteur temporaire qui est utilisé pour mettre le réseau sous tension et présente une impédance négligeable. Dans CIM, un **Jumper** hérite de **Switch** et, de ce fait, comporte deux **Terminals** et peut être ouvert ou fermé.

Selon le type de réseaux (symétrique / asymétrique), une **JumperAction** peut affecter les réseaux triphasés, biphasés ou monophasés. En cas de création d'un raccordement monophasé, ce raccordement peut connecter deux phases différentes de ressources de terrain respectives (raccordement de phases croisé).

Les **Jumpers** doivent être placés entre deux **terminals**. Chaque **terminal** peut être l'un des suivants:

- l'un des **terminals** d'un **ACLineSegment**;
- le **terminal** d'un **clamp**;
- l'un des **terminals** d'un **ConductingEquipment**.

S'ils sont utilisés, les **clamp**(s) doivent déjà avoir été placés avant de pouvoir placer le **jumper**. Si le **jumper** est retiré, les **clamp**s doivent être conservés et doivent être explicitement retirés par une **ClampAction**.

Pour vérifier que le bon côté du raccordement est placé sur la borne correcte, le **ConnectivityNode** de chaque paire de **terminals** à connecter doit être le même dans chaque charge utile. En d'autres termes, le **ConnectivityNode** du **terminal** portant le numéro de séquence 1 dans le **jumper** doit être le même que le **ConnectivityNode** de la borne de l'**ACLineSegment**, du **Clamp** ou du **ConductingEquipment** auquel le côté 1 du **jumper** se connecte. Le même principe s'applique au côté 2 du **jumper**.

La partie **JumperAction** de la charge utile **SwitchingPlans** est présentée sous forme graphique à la Figure 46.

Les attributs de **JumperAction** utilisés dans ce profil sont présentés dans le Tableau 24.

Tableau 24 – Fragment de charge utile JumperAction pour les SwitchingPlans

Operations: JumperAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de cette ControlAction
description	String	[0..1]		Description au format libre de cette ControlAction
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour cette ControlAction
kind	TempEquipActionKind	[0..1]	Voir l'Article C.20	Indique s'il convient de placer ou de retirer le raccordement.
ACLineSegment	ACLineSegment	[0..*]	Voir l'Article B.4	La charge utile peut contenir zéro, un ou deux ACLineSegments, en fonction de l'endroit où doit être fixé le raccordement. Chaque ACLineSegment définit où une extrémité du raccordement doit être placée.

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Operations: JumperAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
Clamp	Clamp	[0..*]	Voir l'Article B.14	La charge utile peut contenir zéro, un ou deux Clamps, en fonction de l'endroit où doit être fixé le raccordement. Chaque Clamp définit où une extrémité du raccordement est placée
JumpedEquipments	ConductingEquipment	[0..*]	Voir l'Article B.14	La charge utile peut contenir zéro, un ou deux JumpedEquipments, en fonction de l'endroit où doit être fixé le raccordement. Chaque JumpedEquipments définit le ConductingEquipment auquel une extrémité du raccordement est fixée.
Jumper	Jumper	[0..1]	Voir l'Article B.35	Le raccordement qui doit être placé ou retiré.
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.

La partie **Jumper** de la charge utile est définie à l'Article B.35.

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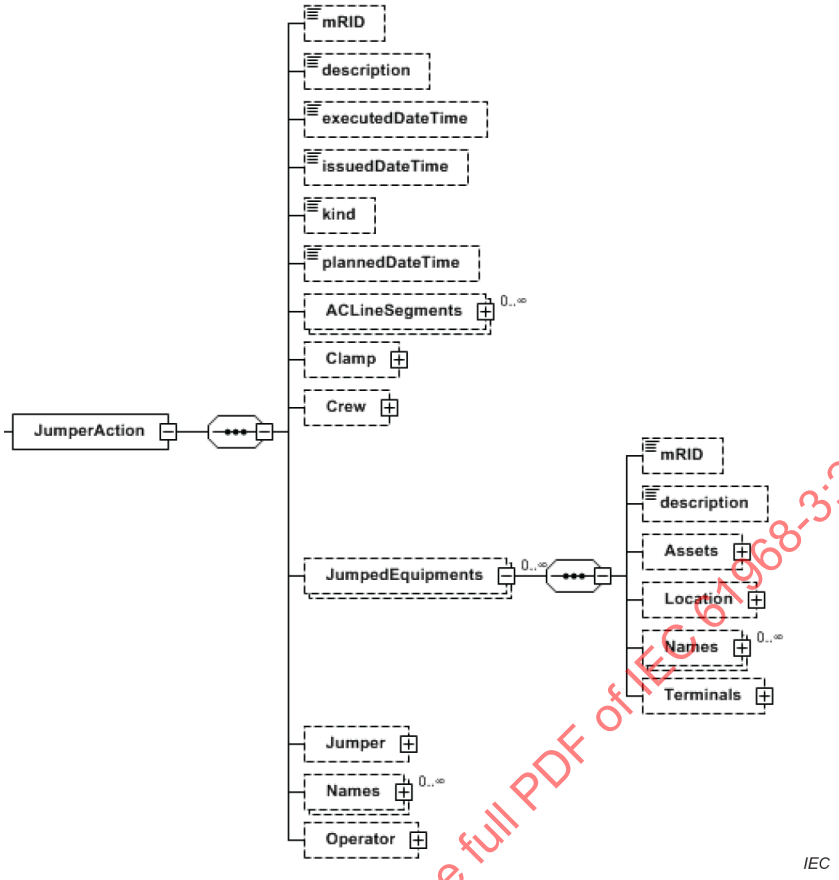


Figure 46 – SwitchingPlans – JumperAction

Le fragment de charge utile de **Jumper** est présenté à la Figure 47.

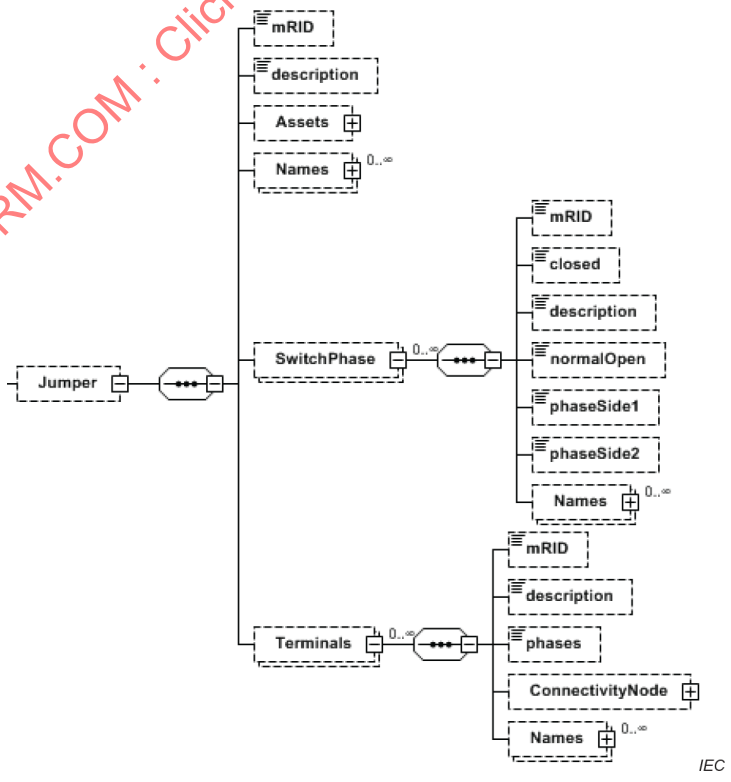


Figure 47 – SwitchingPlans – Fragment de charge utile Jumper

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5.8.15 Charge utile **SwitchingPlans – MeasurementAction**

La Figure 48 présente le champ **MeasurementAction** de la charge utile de message **SwitchingPlans**.

Les attributs de **MeasurementAction** utilisés dans ce profil sont présentés dans le Tableau 25.

Une **MeasurementAction** à l'intérieur d'un **SwitchingPlan** définit un mesurage associé à une ressource du système de puissance qui doit être enregistrée manuellement dans le cadre de la **SwitchingStep**. Par exemple, un mesurage Amps peut être réalisé avant de fermer un commutateur, puis un second mesurage est réalisé après la fermeture du commutateur, afin de confirmer qu'il est réellement fermé. Ces mesurages constituent un enregistrement permanent de la commutation qui a été réalisée. Voir 5.4 pour une description des profils **GetPSRMeasurements** et **PSRMeasurements** qui peuvent être utilisés pour obtenir des mesurages de manière électronique.

Tableau 25 – Fragment de charge utile MeasurementAction pour les SwitchingPlans

Operations: MeasurementAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de cette MeasurementAction.
description	String	[0..1]		Description au format libre de cette MeasurementAction
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour cette MeasurementAction
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.
Choix de l'un des éléments suivants				
Accumulator	Accumulator		Voir l'Article B.2	
Analog	Analog		Voir l'Article B.6	
Discrete	Discrete		Voir l'Article B.28	
StringMeasurement	StringMeasurement		Voir l'Article B.81	

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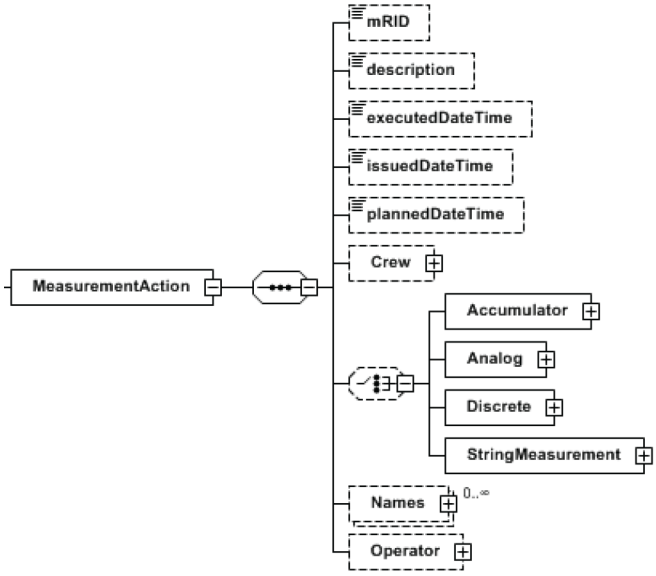
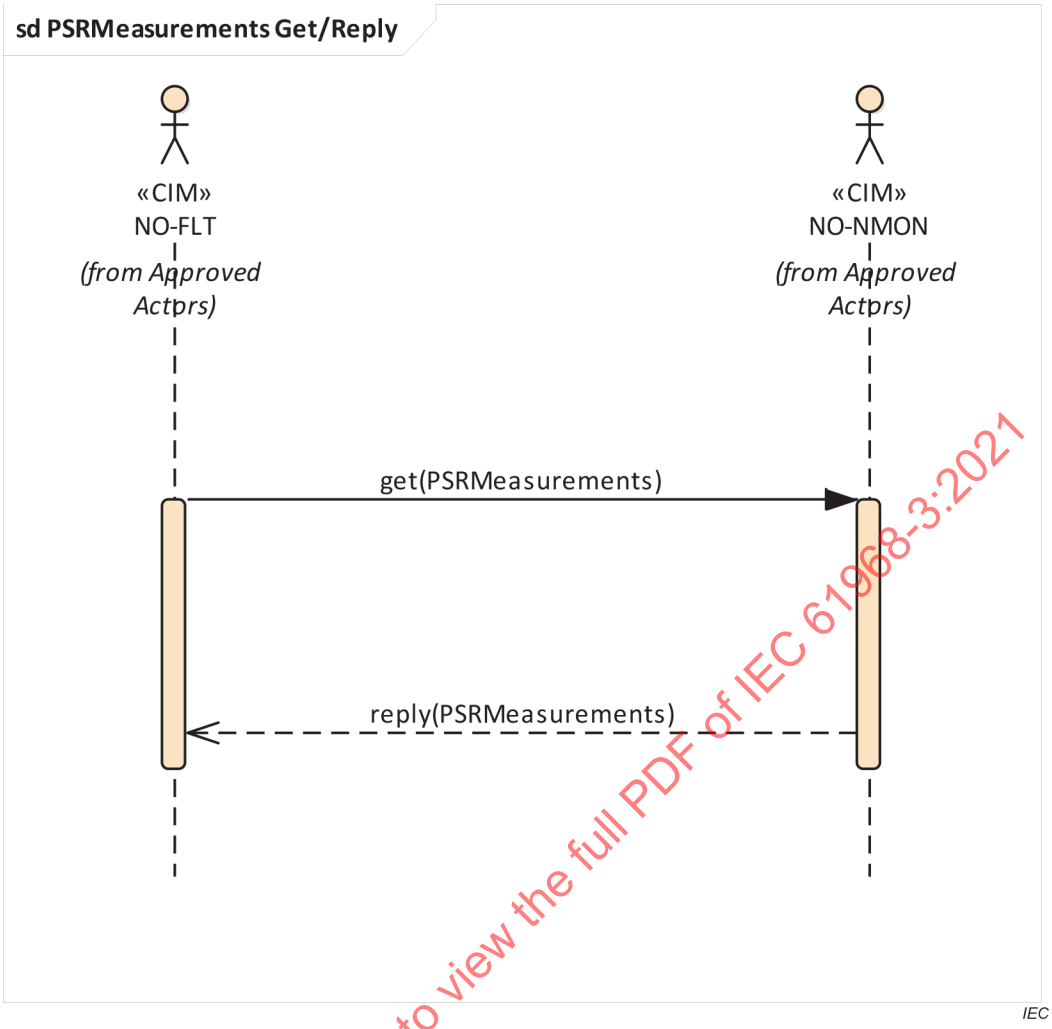


Figure 48 – SwitchingPlans – MeasurementAction

La **MeasurementAction** est incluse dans la charge utile **SwitchingPlan** de manière à pouvoir capturer les mesurages manuels dans le cadre du **SwitchingPlan**. Lors de l'exécution du **SwitchingPlan**, les demandes adressées à l'équipe sur le terrain sont formulées à l'aide d'une **SwitchingAction**.**MeasurementAction** et les résultats renvoyés depuis le terrain avec un **SwitchingEvent**.**MeasurementAction**. Voir le diagramme de séquences de la Figure 59 présentant les **SwitchingEvents** et les **SwitchingActions**.

Si la télémétrie est disponible, le **SwitchingPlan** peut également définir un type de **MeasurementActio**. Dans ce cas, lors de l'exécution du **SwitchingPlan**, les demandes de mesurage sont envoyées à SCADA à l'aide des **PSRMeasurements** (voir la Figure 49). Le diagramme contient une demande d'extraction des **PSRMeasurements**, les mesurages réels étant renvoyés sous la forme d'une réponse **PSRMeasurements**. Voir l'IEC 61968-100 pour une description de l'usage des profils d'extraction.

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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)

Figure 49 – Exécution d'une SwitchingStep avec une MeasurementAction et grandeur à télémesurer

5.8.16 Charge utile SwitchingPlans – ShuntCompensatorAction

La **ShuntCompensatorAction** de la charge utile **SwitchingPlans** est présentée à la Figure 50.

Une **ShuntCompensatorAction** est utilisée pour spécifier une étape de commutation pour temporairement déconnecter ou connecter un **ShuntCompensator permanent de ses bornes**. **kind** définit s'il faut déconnecter ou connecter le **ShuntCompensator** et peut avoir les valeurs **disconnect** ou **connect**.

Les attributs de **ShuntCompensatorAction** utilisés dans ce profil sont présentés dans le Tableau 26.

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Tableau 26 – Fragment de charge utile ShuntCompensatorAction pour les SwitchingPlans

Operations: ShuntCompensatorAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de ShuntCompensatorAction
description	String	[0..1]		Description au format libre de ShuntCompensatorAction
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	TempEquipActionKind	[0..1]	Voir l'Article C.20	Définit s'il faut déconnecter ou connecter le compensateur shunt.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases sur lesquelles exécuter l'action.
ShuntCompensator	ShuntCompensator	[0..1]	Voir l'Article B.78	ShuntCompensator à déconnecter ou connecter.
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.

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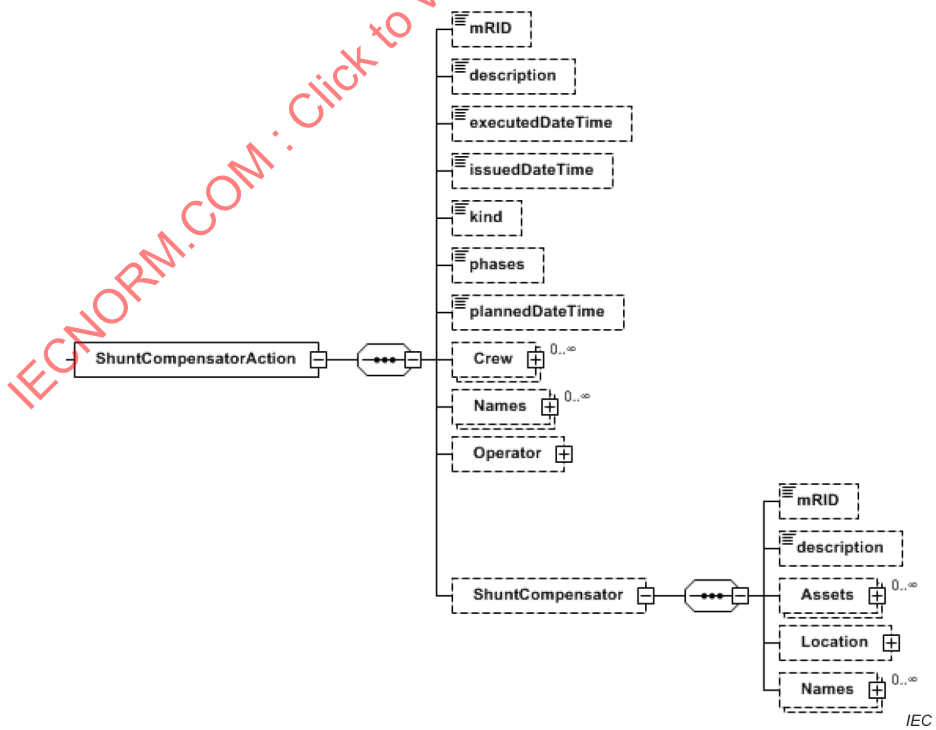


Figure 50 – SwitchingPlans – ShuntCompensatorAction

5.8.17 Charge utile **SwitchingPlans – SwitchAction**

La partie **SwitchAction** de la charge utile **SwitchingPlans** est présentée à la Figure 51. **SwitchAction** est utilisée pour spécifier une étape de commutation destinée à ouvrir ou à fermer une ou plusieurs phases d'un **OperatedSwitch**. Si plusieurs phases d'un commutateur multiphase doivent être ouvertes et que d'autres doivent être fermées, deux **SwitchAction**s distinctes, chacune spécifiant la **SwitchPhase** particulière, sont exigées. En effet, **SwitchAction.kind** s'applique au commutateur dans son ensemble.

Les attributs de **SwitchAction** utilisés dans ce profil sont présentés dans le Tableau 27.

Tableau 27 – Fragment de charge utile SwitchAction pour les SwitchingPlans

Operations: SwitchAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de l'action
description	String	[0..1]		Description au format libre de l'action
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour la SwitchAction.
kind	SwitchActionKind	[0..1]	Voir l'Article C.20	Action de commutation à réaliser - ouvrir, fermer, disableReclosing, enableReclosing
OperatedSwitch	Switch	[0..1]	Voir l'Article B.86	Commutateur à opérer.
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.

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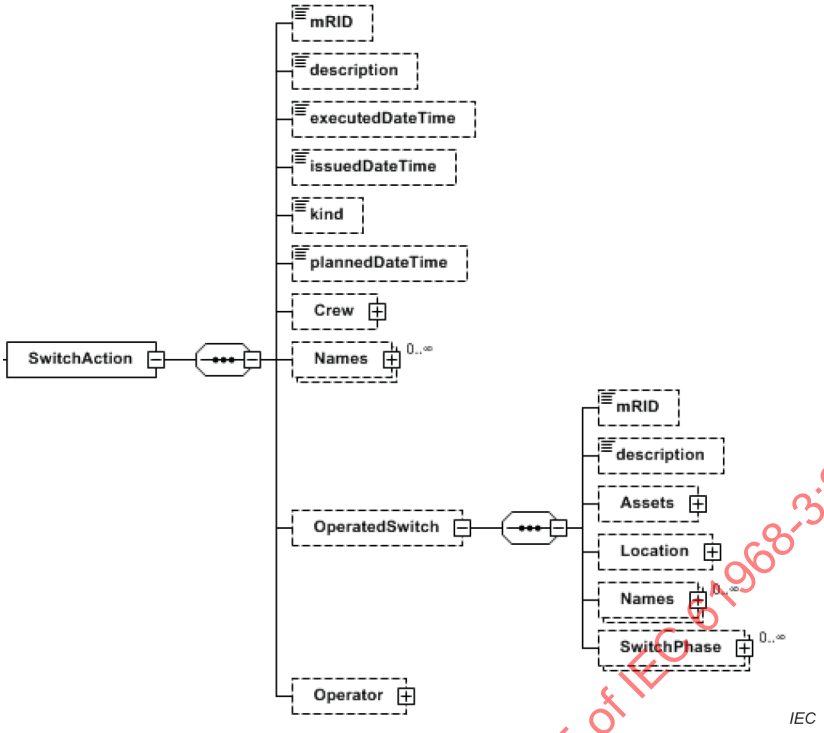


Figure 51 – SwitchingPlans – SwitchAction

5.8.18 Charge utile SwitchingPlans – TagAction

La charge utile **SwitchingPlans TagAction** est présentée à la Figure 52. La **TagAction** est utilisée pour spécifier une étape de commutation destinée à **placer**, **retirer** ou **vérifier** une **OperationalTag**, tel que défini par **TagAction.kind**. La fonction exécutée par la balise (Do Not Operate, Do Not Close, etc.) est définie par **TagAction.OperationalTag.type**. Si toutes les phases disponibles ne doivent pas être balisées, l'attribut **phases** spécifie celles qui doivent l'être.

Les valeurs admises de **TagAction.OperationalTag.type** ne sont pas définies dans le présent document.

Les attributs de **TagAction** utilisés dans ce profil sont présentés dans le Tableau 28.

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Tableau 28 – Fragment de charge utile TagAction pour les SwitchingPlans

Operations: TagAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de cette TagAction.
description	String	[0..1]		Description au format libre de cette TagAction.
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour cette TagAction.
kind	TagActionKind	[0..1]	Voir l'Article C.21	Opération à réaliser sur Tag – placer, retirer, vérifier.
OperationalTag	OperationalTag	[0..1]	Voir l'Article B.59	La balise actuelle qui doit être placée, retirée ou vérifiée.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases sur lesquelles la balise doit être placée. (par exemple, A, AB, AC, ABC, etc.).
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.

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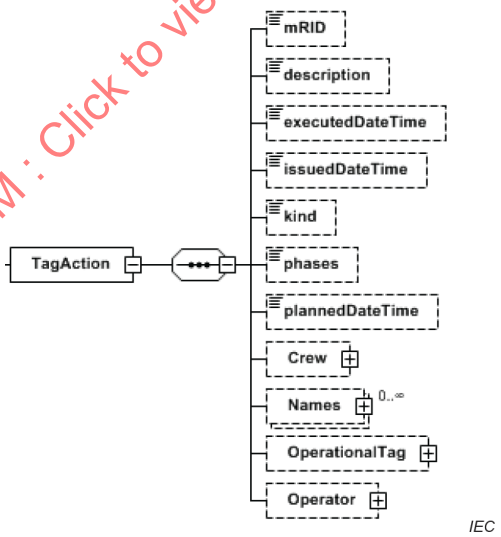


Figure 52 – SwitchingPlans – Charge utile TagAction

La charge utile pour la partie **OperationalTag** de la **TagAction** est présentée à la Figure 53. Son contenu est défini à l'Article B.59.

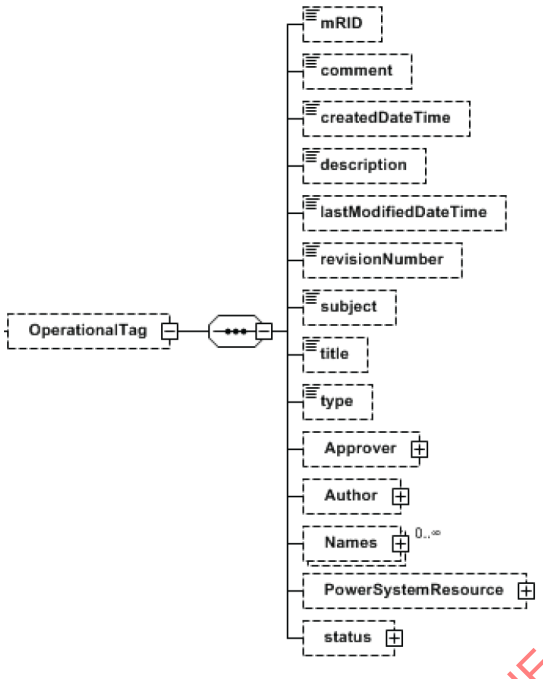


Figure 53 – SwitchingPlans – Fragment de charge utile OperationalTag

5.8.19 Charge utile SwitchingPlans – VerificationAction

La charge utile **SwitchingPlans VerificationAction** est présentée à la Figure 54. La **VerificationAction** est utilisée pour spécifier une étape de commutation destinée à vérifier que la **PowerSystemResource** est à l'état prévu (vérification qu'un commutateur est ouvert, par exemple).

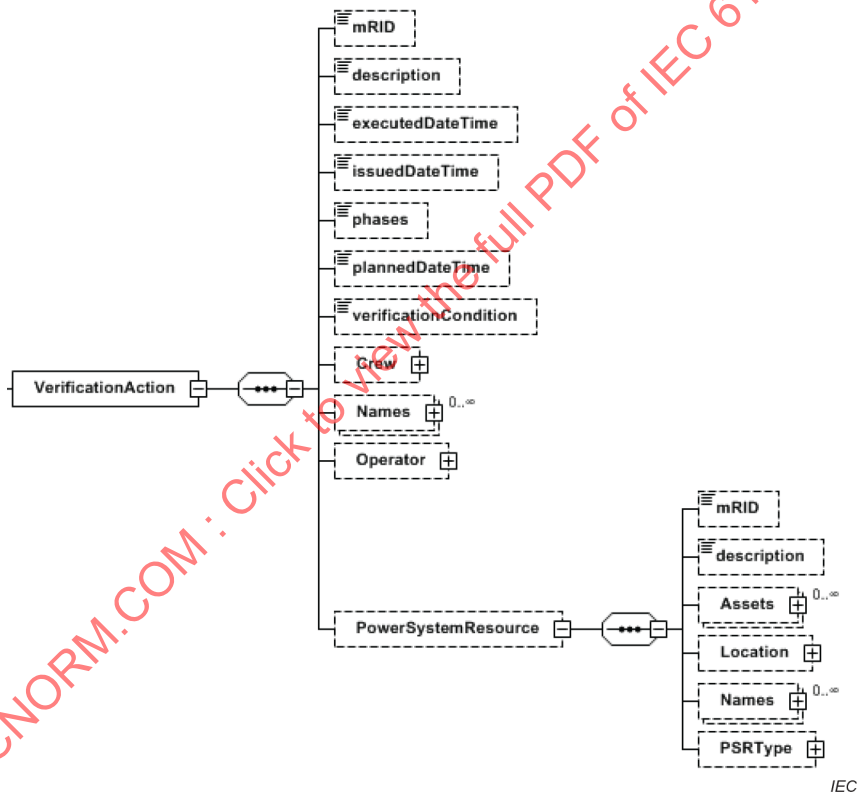
Les attributs de **VerificationAction** utilisés dans ce profil sont présentés dans le Tableau 29.

Tableau 29 – Fragment de charge utile VerificationAction pour les SwitchingPlans

Operations: VerificationAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de cette VerificationAction.
description	String	[0..1]		Description au format libre de cette VerificationAction
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour cette VerificationAction
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases à exécuter par cette action (par exemple, A, AB, AC, ABC, etc.).
verificationCondition	String	[0..1]		Chaîne textuelle au format libre décrivant la condition à vérifier (par exemple, vérifier l'ouverture, désactiver la refermeture, placer en mode manuel, etc.).
PowerSystemResource	PowerSystemResource	[0..1]	Voir l'Article B.68	PowerSystemResource sur laquelle exécuter l'action de vérification.

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Operations: VerificationAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été envoyée à l'équipe
plannedDateTime	DateTime	[0..1]		Date et heure de l'exécution prévue de l'étape
Crew	Crew	[0..1]	Voir l'Article B.22	Équipe affectée à l'étape. Une équipe peut être préalablement affectée à l'exécution de l'étape.
Operator	Operator	[0..1]	Voir l'Article B.59	Reste vide tant que l'action n'a pas été envoyée à l'équipe.



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Figure 54 – SwitchingPlans – Charge utile VerificationAction

5.8.20 Exemple de SwitchingPlan

Le Tableau 30 donne un exemple d'étapes de plan de commutation et leur mapping aux objets CIM. Les colonnes Numéro d'étape et Opération contiennent les éléments qui apparaîtraient dans un plan de commutation réel classique. Les colonnes Explication et Mapping sont proposées pour décrire l'objectif de chaque étape et la manière dont elle mappe au CIM. Cet exemple ne contient qu'un seul **SwitchingStepGroup.**

Tableau 30 – Exemple de plan de commutation

Numéro d'étape	Opération	Explication	Mapping
	Isoler et placer les balises	Étape liée à l'en-tête qui n'est pas numérotée et n'est pas exécutable	**SwitchingStepGroup** avec un **sequenceNumber** de 1 et une **description** "Isoler et placer les balises" Pas de **SwitchingStep**
1	Contacter une usine de production d'aluminium pour signaler que l'interruption planifiée est sur le point de commencer	Étape de commentaire exécutable pour demander à la salle de commande de faire quelque chose qui n'est pas en lien avec le réseau	**SwitchingStep** avec un **sequenceNumber** de 1 et une **GenericAction** dont la **description** est "Contacter une usine de production d'aluminium pour signaler que l'interruption planifiée est sur le point de commencer"
2	Ouvrir le commutateur 12345	Étape exécutable qui modifie le réseau	**SwitchingStep** avec un **sequenceNumber** de 2 et une **SwitchAction**.
3	Placer la balise "Do Not Operate" sur le commutateur 12345	Étape de balisage exécutable	**SwitchingStep** avec un **sequenceNumber** de 3 et une **TagAction**.
4	Vérifier l'ouverture du commutateur 6789 et placer la balise "Do Not Operate"	Étape de composite exécutable constituée d'une étape de vérification et d'une étape de balisage	**SwitchingStep** avec un **sequenceNumber** de 4, un **subStepSequenceNumber** de 1 et une **VerificationAction**. **SwitchingStep** avec un **sequenceNumber** de 4, un **subStepSequenceNumber** de 2 et une **TagAction**.
5	Délivrer l'habilitation numéro 99 au membre Joe Blow à l'aide de la balise "Do Not Operate" sur le commutateur 12345 et de la balise "Do Not Operate" sur le commutateur 6789	Étape de l'action d'habilitation exécutable	**SwitchingStep** avec un **sequenceNumber** de 5 et une **ClearanceAction**.
	Retour à la normale	Étape liée à l'en-tête qui n'est pas numérotée et n'est pas exécutable	**SwitchingStepGroup** avec un **sequenceNumber** de 2 et description de "Retour à la normale" Pas de **SwitchingStep**
6	Libérer l'habilitation numéro 99 du membre Joe Blow à l'aide de la balise "Do Not Operate" sur le commutateur 12345 et de la balise "Do Not Operate" sur le commutateur 6789	Étape de l'action d'habilitation exécutable	**SwitchingStep** avec un **sequenceNumber** de 6 et une **ClearanceAction**.
7	Retirer la balise "Do Not Operate" du commutateur 6789	Étape de balisage exécutable	**SwitchingStep** avec un **sequenceNumber** de 7 et une **TagAction**.
8	Retirer la balise "Do Not Operate" du commutateur 12345	Étape de balisage exécutable	**SwitchingStep** avec un **sequenceNumber** de 8 et une **TagAction**.
9	Fermer le commutateur 12345	Étape exécutable qui modifie le réseau	**SwitchingStep** avec un **sequenceNumber** de 9 et une **SwitchAction**.

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Numéro d'étape	Opération	Explication	Mapping
10	Contacter l'usine de production d'aluminium pour signaler que l'interruption planifiée est terminée	Étape de commentaire exécutable pour demander à la salle de commande de faire quelque chose qui n'est pas en lien avec le réseau	**SwitchingStep** avec un **sequenceNumber** de 10 et une **GenericAction** dont la **description** est "Contacter une usine de production d'aluminium pour signaler que l'interruption planifiée est terminée"

Le modèle XML des étapes du plan de commutation ci-dessus est présenté à la Figure 55. Note: il s'agit d'un fragment, pas d'un SwitchingPlan complet.

```
<SwitchingPlans>
    <SwitchingPlan>
        <SwitchingStepGroups>
            <sequenceNumber>1</sequenceNumber>
            <Description>Isolate and Place Tags</Description>
            <SwitchingStep>
                <sequenceNumber>1</sequenceNumber>
                    <GenericAction>
                    <description>Contact Aluminum plant to tell them that their planned outage
is about to start</description>
                    </GenericAction>
            </SwitchingStep>
            <SwitchingStep>
                <sequenceNumber>2</sequenceNumber>
                <SwitchAction>
                    <OperatedSwitch>
                        <Name>switch 12345</Name>
                        <SwitchPhase>
                            <Names>ABC</names>
                            <closed>0</closed>
                        </SwitchPhase>
                    </OperatedSwitch>
                </SwitchAction>
            </SwitchingStep>
            <SwitchingStep>
                <sequenceNumber>3</sequenceNumber>
                <TagAction>
                    <kind>place</kind>
                    <OperationalTag>
                        <PowerSystemResource>
                            <Names>switch 12345</Names>
                        </PowerSystemResource>
                    </OperationalTag>
                </TagAction>
            </SwitchingStep>
            <SwitchingStep>
                <sequenceNumber>4</sequenceNumber>
                <subStepSequenceNumber>1</subStepSequenceNumber>
                <VerificationAction>
                    <VerificationCondition>check open</VerificationCondition>
                    <PowerSystemResource>
                        <Names>switch 6789</Names>
                    </PowerSystemResource>
                </VerificationAction>
                <sequenceNumber>4</sequenceNumber>
                <subStepSequenceNumber>2</subStepSequenceNumber>
                <TagAction>
                    <kind>place</kind>
                    <OperationalTag>
                        <PowerSystemResource>
                            <Names>switch 6789</Names>
                        </PowerSystemResource>
                    </OperationalTag>
                </TagAction>
            </SwitchingStep>
            <SwitchingStep>
                <sequenceNumber>5</sequenceNumber>
                <ClearanceAction>
                    <Kind>issue</Kind>
                    <Clearance>
                        <TaggedPSRs>
```

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```
                        <Names>switch 6789</Names>
                        <Names>switch 12345</Names>
                    </TaggedPSRs>
                </Clearance>
            </ClearanceAction>
        </SwitchingStep>
    </SwitchingStepGroups>
    <SwitchingStepGroups>
        <sequenceNumber>2</sequenceNumber>
        <Description>Return to Normal</Description>
        <SwitchingStep>
            <sequenceNumber>6</sequenceNumber>
            <ClearanceAction>
                <Kind>release</Kind>
                <Clearance>
                    <TaggedPSRs>
                        <Names>switch 6789</Names>
                        <Names>switch 12345</Names>
                    </TaggedPSRs>
                </Clearance>
            </ClearanceAction>
        </SwitchingStep>
        <SwitchingStep>
            <sequenceNumber>7</sequenceNumber>
            <TagAction>
                <kind>remove</kind>
                <OperationalTag>
                    <PowerSystemResource>
                        <Names>switch 6789</Names>
                    </PowerSystemResource>
                </OperationalTag>
            </TagAction>
        </SwitchingStep>
        <SwitchingStep>
            <sequenceNumber>8</sequenceNumber>
            <TagAction>
                <kind>remove</kind>
                <OperationalTag>
                    <PowerSystemResource>
                        <Names>switch 12345</Names>
                    </PowerSystemResource>
                </OperationalTag>
            </TagAction>
        </SwitchingStep>
        <SwitchingStep>
            <sequenceNumber>9</sequenceNumber>
            <SwitchAction>
                <OperatedSwitch>
                    <Name>switch 12345</Name>
                    <SwitchPhase>
                        <Names>ABC</names>
                        <closed>1</closed>
                    </SwitchPhase>
                </OperatedSwitch>
            </SwitchAction>
        </SwitchingStep>
        <SwitchingStep>
            <sequenceNumber>10</sequenceNumber>
                <GenericAction>
                <description>Contact Aluminum plant to tell them that their planned outage
is over</description>
                </GenericAction>
        </SwitchingStep>
    </SwitchingStepGroups>
  </SwitchingPlan>
</SwitchingPlans>
```

Figure 55 – Modèle XML pour SwitchingPlans

5.8.21 Exemple XML d'un SwitchingPlan complet

L'exemple ci-dessous présente un SwitchingPlan complet avec un en-tête et une seule SwitchingAction. Il vise à présenter la structure XML plutôt qu'à donner un exemple de SwitchingPlan réel.

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```
<?xml version="1.0" encoding="UTF-8"?>
<m:SwitchingPlans xmlns:m="http://iec.ch/TC57/2019/SwitchingPlans#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/SwitchingPlans# SwitchingPlans.xsd ">
  <m:SwitchingPlan>
    <m:mRID>6571f4c4-acee-4024-8d1f-6c4a0398e5fa</m:mRID>
    <m:approvedDateTime>2019-04-10T14:14:14</m:approvedDateTime>
    <m:createdDateTime>2019-04-01T09:15:00</m:createdDateTime>
    <m:description>Example switching plan</m:description>
    <m:lastModifiedDateTime>2019-04-23T10:46:22</m:lastModifiedDateTime>
    <m:purpose>New Construction</m:purpose>
    <m:revisionNumber>C</m:revisionNumber>
    <m:Approver>
      <m:Names>
        <m:name>Keith Richards</m:name>
      </m:Names>
    </m:Approver>
    <m:Author>
      <m:Names>
        <m:name>Mick Jagger</m:name>
      </m:Names>
    </m:Author>
    <m:Names>
      <m:name>Switching Plan PO-2019-04-142</m:name>
    </m:Names>
    <m:plannedPeriod>
      <m:end>2019-05-01T12:00:00</m:end>
      <m:start>2019-01-01T08:00:00</m:start>
    </m:plannedPeriod>
    <m:SafetyDocuments>
      <m:mRID> 0f8aca59-1d58-4054-ac22-8d00487e91ee </m:mRID>
      <m:comment>Clearance #1 for Switching Plan PO-2019-04-142</m:comment>
      <m:createdDateTime>2019-04-05T11:11:11</m:createdDateTime>
      <m:description>Isolate using SW-13231 and SW-13542</m:description>
      <m:issuedDateTime>2019-05-01T10:12:00</m:issuedDateTime>
      <m:lastModifiedDateTime>2019-04-23T15:09:00</m:lastModifiedDateTime>
      <m:releasedDateTime></m:releasedDateTime>
      <m:type>Clearance</m:type>
      <m:Approver>
        <m:Names>
          <m:name>Keith Richards</m:name>
        </m:Names>
      </m:Approver>
      <m:Author>
        <m:Names>
          <m:name>Mick Jagger</m:name>
        </m:Names>
      </m:Author>
      <m:IssuedBySupervisor>
        <m:Names>
          <m:name>Samuel Adams</m:name>
        </m:Names>
      </m:IssuedBySupervisor>
      <m:IssuedToSupervisor>
        <m:Names>
          <m:name>Billy Scruggs</m:name>
          <m:NameType>
            <m:name>Contractor</m:name>
            <m:NameTypeAuthority>
              <m:name>XYZ Electrical Services LLC</m:name>
            </m:NameTypeAuthority>
          </m:NameType>
        </m:Names>
      </m:IssuedToSupervisor>
      <m:Names>
        <m:name>Clearance PO-2019-04-142-1</m:name>
      </m:Names>
      <m:ReleasedBySupervisor>
        <m:Names>
          <m:name>Billy Scruggs</m:name>
          <m:NameType>
            <m:name>Contractor</m:name>
            <m:NameTypeAuthority>
              <m:name>XYZ Electrical Services LLC</m:name>
            </m:NameTypeAuthority>
          </m:NameType>
        </m:Names>
      </m:ReleasedBySupervisor>
```

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```
      <m:ReleasedToSupervisor>
        <m:Names>
          <m:name>Samuel Adams</m:name>
        </m:Names>
      </m:ReleasedToSupervisor>
      <m:status>
        <m:dateTime>2019-05-01T10:31:42</m:dateTime>
        <m:reason>Status change</m:reason>
        <m:remark>Issued to Billy Scruggs</m:remark>
        <m:value>Issued</m:value>
      </m:status>
    </m:SafetyDocuments>
    <m:status>
      <m:dateTime>2019-05-01T07:12:19</m:dateTime>
      <m:reason>State Change</m:reason>
      <m:remark>Approved and ready to execute.  Checked in study mode this morning</m:remark>
      <m:value>Approved</m:value>
    </m:status>
    <m:SwitchingPlanRequest>
      <m:mRID>205c0a0b-0422-4184-8cfe-b9fdfc433509 </m:mRID>
      <m:description>Isolate line section between Cotter's Grove Lane and Snarly Brook
Street</m:description>
      <m:Names>
        <m:name>Switching Request 2019-04-142</m:name>
      </m:Names>
    </m:SwitchingPlanRequest>
    <m:SwitchingStepGroups>
      <m:description>First and only group</m:description>
      <m:isFreeSequence>false</m:isFreeSequence>
      <m:purpose>First group of the switching plan</m:purpose>
      <m:sequenceNumber>1</m:sequenceNumber>
      <m:SwitchingStep>
        <m:isFreeSequence>false</m:isFreeSequence>
        <m:sequenceNumber>1</m:sequenceNumber>
        <m:subStepSequenceNumber>1</m:subStepSequenceNumber>
        <m:ClampAction>
          <m:description>Place clamp on feeder 170-01</m:description>
          <m:kind>place</m:kind>
          <m:Clamp>
            <m:description>13.8 kV clamp</m:description>
            <m:lengthFromTerminal1>120</m:lengthFromTerminal1>
            <m:ACLineSegment>
              <m:mRID>69bdf28b-b4d2-4d05-91f4-ee7f9815b481</m:mRID>
              <m:description>13.8 kV 2ACSR</m:description>
              <m:Location>
                <m:direction>Two blocks south of Highway 27 at Crows Feet Street<m:direction>
                <m:mainAddress>
                  <m:townDetail>
                    <m:name>Bloomsbury</m:name>
                    <m:stateOrProvince>North Carolina</m:stateOrProvince>
                  </m:townDetail>
                </m:mainAddress>
                <m:PositionPoints>
                  <m:groupNumber>0</m:groupNumber>
                  <m:sequenceNumber>0</m:sequenceNumber>
                  <m:xPosition>35.7718409</m:xPosition>
                  <m:yPosition>-78.6801357</m:yPosition>
                </m:PositionPoints>
              </m:Location>
              <m:Names>
                <m:name>13.8 kV line</m:name>
              </m:Names>
            </m:ACLineSegment>
            <m:Names>
              <m:name>Clampy Mc Clamp Face</m:name>
            </m:Names>
            <m:Terminals>
              <m:mRID>6a8a6da5-bb10-49de-a682-710d9a6ee3e9</m:mRID>
              <m:description>New terminal associated with the clamp</m:description>
              <m:phases>ABC</m:phases>
            </m:Terminals>
          </m:Clamp>
        </m:ClampAction>
      </m:SwitchingStep>
    </m:SwitchingStepGroups>
  </m:SwitchingPlan>
</m:SwitchingPlans>
```

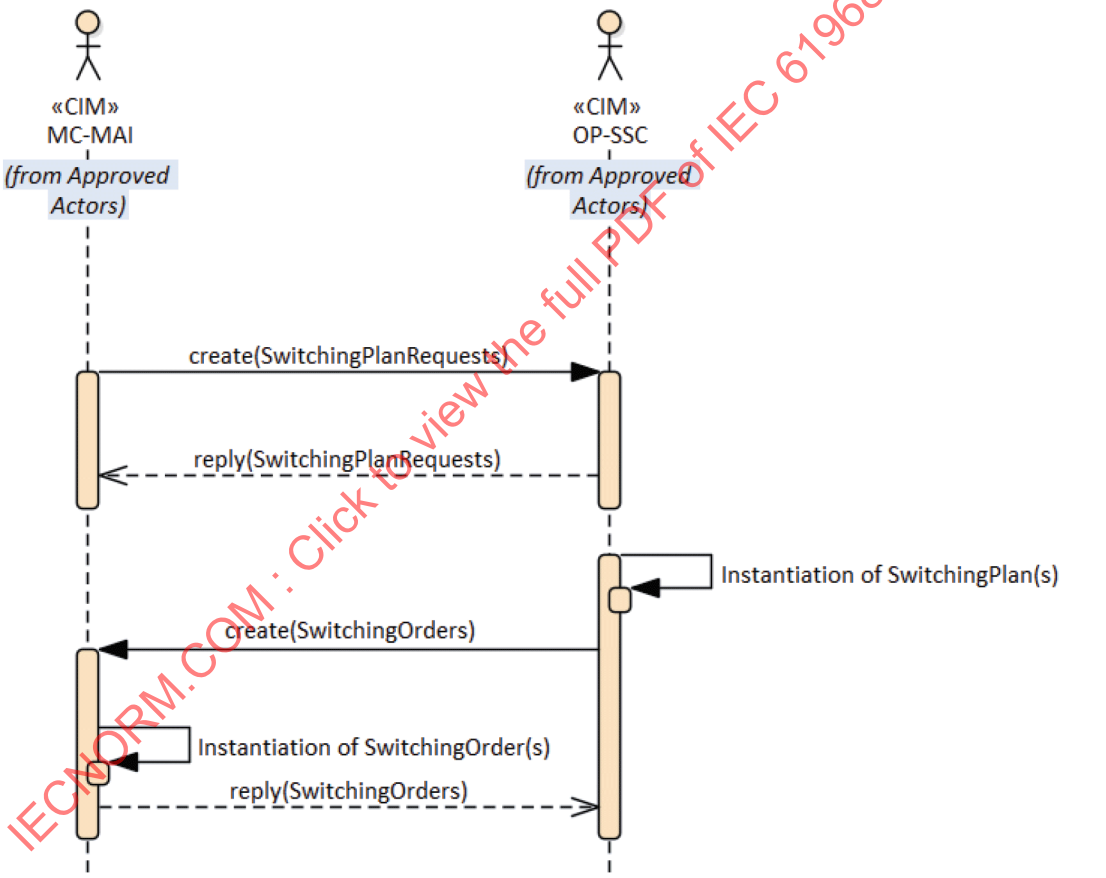
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5.9 Charge utile **SwitchingOrders**

5.9.1 Généralités

Les charges utiles de messages **SwitchingOrders** sont conçues pour communiquer des demandes de planification de l'exécution d'un **SwitchingPlan** pour une commutation d'urgence ou planifiée. Un exemple de la manière dont un **SwitchingOrder** peut être communiqué entre différentes parties pendant son cycle de vie est présenté à la Figure 56.

- Une demande de planification d'un **SwitchingPlan** est formulée par l'intermédiaire d'une demande de création d'un **SwitchingOrder**
- Le **SwitchingPlan** est planifié dans le cadre de la gestion des travaux, donnant lieu à la création d'un **SwitchingOrder**
- La planification est communiquée à la planification de séquence de commutation par l'intermédiaire d'une réponse **SwitchingOrder**



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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
Instantiation of SwitchinPlan(s)	Instanciation de SwitchinPlan(s)
Instantiation of SwitchinOrder(s)	Instanciation de SwitchinOrder(s)

Figure 56 – Diagramme de séquences SwitchingOrders

5.9.2 Charge utile de message

La charge utile **SwitchingOrders** est présentée à la Figure 57.

Les attributs du profil **SwitchingOrders** sont décrits dans le Tableau 31.

Tableau 31 – Profil SwitchingOrders

SwitchingOrders				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
SwitchingOrders	SwitchingOrder	[0..*]		
Attributs de profil				
mRID	String	[0..1]	GUID	mRID du SwitchingOrder.
description	String	[0..1]		Champ textuel au format libre qui décrit le **SwitchingOrder**
Names	Name	[0..*]	Voir l'Article B.56	Liste de noms lisibles par l'homme pour le SwitchingOrder
comment	String	[0..1]		Texte au format libre
createdDateTime	DateTime	[0..1]		DateTime à laquelle le SwitchingOrder a été initialement créé.
lastModifiedDateTime	DateTime	[0..1]		DateTime de la dernière modification du SwitchingOrder.
revisionNumber	String	[0..1]		Numéro de révision du **SwitchingOrder**. En règle générale, il est utilisé pour suivre les modifications après que le SwitchingOrder a été approuvé et planifié.
subject	String	[0..1]		Texte au format libre
Titre	String	[0..1]		Texte au format libre
Type	String	[0..1]		Texte au format libre
Approver	Approver	[0..1]	Voir l'Article B.8	Personne qui a approuvé le **SwitchingOrder**
electronicAddress	ElectronicAddress	[0..1]		Adresse électronique de la personne qu'il convient de contacter en ce qui concerne le SwitchingOrder.
Issuer	DateTimeInterval	[0..1]		Personne qui a délivré le SwitchingOrder (la personne qui a envoyé le SwitchingOrder à planifier, par exemple)
Location	Location	[0..*]	Voir l'Article B.52	Emplacement(s) du SwitchingOrder. L'emplacement inclut le CrewType exigé à chaque Location. Cela définit l'ensemble des compétences et la quantité de chaque type d'équipes exigés à chaque Location.
plannedExecutionInterval	DateTimeInterval	[0..1]		Date/heure de début et de fin demandée
status	Status	[0..1]	Voir l'Article B.79	Status.value est utilisé pour spécifier le statut global du SwitchingOrder (projet, en cours d'examen, approuvé, annulé, etc.).
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.8.2.	mRID, description et Names du SwitchingPlan associé.

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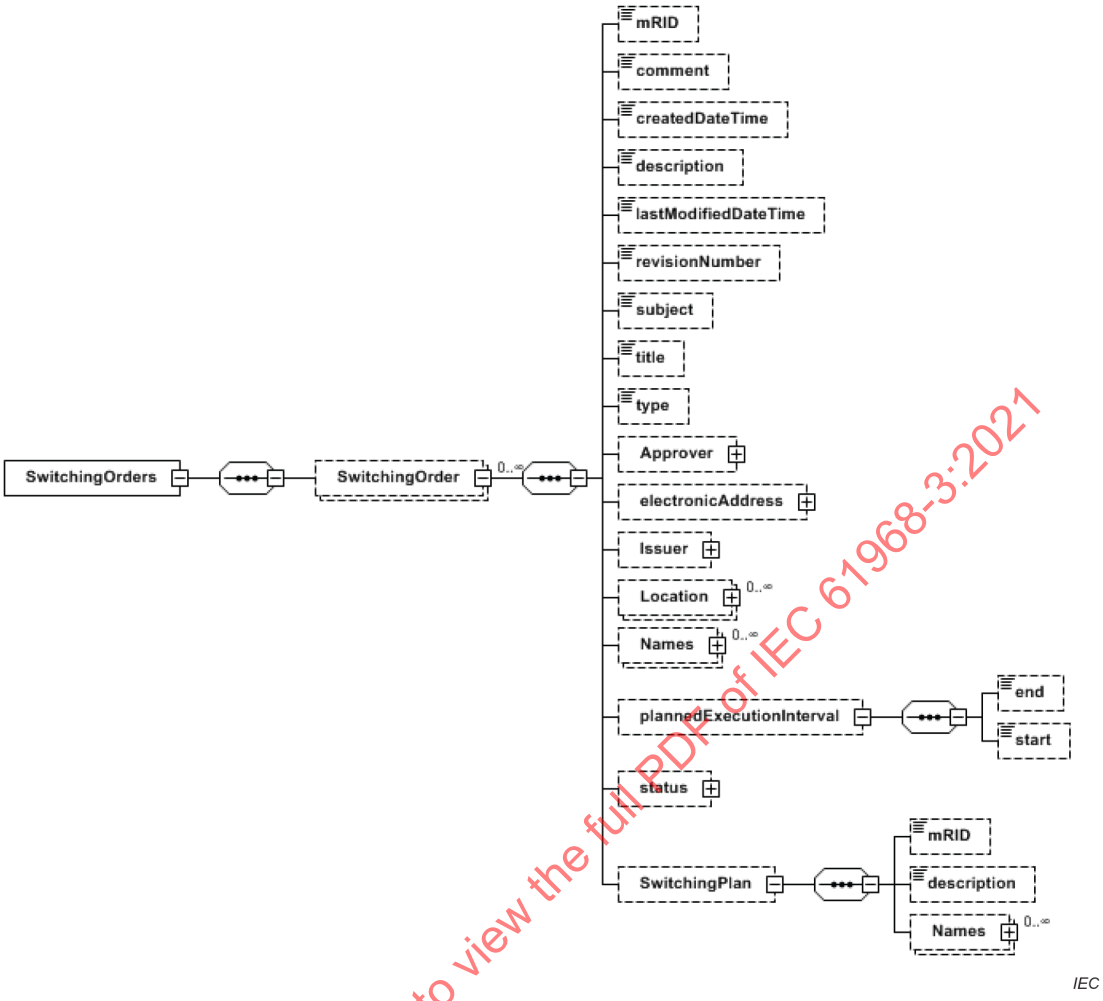


Figure 57 – Charge utile de message SwitchingOrders

La partie Location de cette charge utile est présentée à la Figure 58. Elle permet au système demandeur de spécifier un nombre de **CrewType**(s) exigés à chaque Location afin de planifier le travail. Dans la réponse, il convient de renvoyer les **CrewType**(s) et **Names** et/ou **CrewMembers** actuels.

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Figure 58 – SwitchingOrders – Fragment Location

5.9.3 Exemple XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:SwitchingOrders xmlns:m="http://iec.ch/TC57/2019/SwitchingOrders#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/SwitchingOrders# SwitchingOrders.xsd ">
  <m:SwitchingOrder>
    <m:mRID>m:mRID</m:mRID>
    <m:comment>Line extension on 13 kV line at Bonkers Creek</m:comment>
    <m:createdDateTime>2019-05-31T12:01:11</m:createdDateTime>
    <m:description> Isolate line section between Cotter's Grove Lane and Snarly Brook Street
</m:description>
    <m:lastModifiedDateTime>2019-05-31T12:01:11</m:lastModifiedDateTime>
    <m:revisionNumber>B</m:revisionNumber>
    <m:subject>Switching Order</m:subject>
    <m:title>Substation: Lizard Lick; Feeder: 321</m:title>
    <m:type>Construction</m:type>
    <m:Approver>
      <m:Names>
        <m:name>James T Kirk</m:name>
      </m:Names>
    </m:Approver>
    <m:electronicAddress>
      <m:email1>jtkirk@enterprise.gov</m:email1>
    </m:electronicAddress>
    <m:Issuer>
      <m:Names>
        <m:name>John Snow</m:name>
      </m:Names>
    </m:Issuer>
    <m:Location>
      <m:description>Area bounded by SW-12113 to the North and SW-13211 to the
South</m:description>
      <m:direction>Highway 27 2 blocks South</m:direction>
        <m:CrewType>
          <m:Names>
            <m:name>Switchman Level 2</m:name>
          </m:Names>
        </m:CrewType>
        <m:CrewType>
          <m:Names>
            <m:name>Switchman Level 2</m:name>
          </m:Names>
        </m:CrewType>
      </m:Crew>
    </m:Location>
    <m:Names>
      <m:name>Switching Order PO-2019-04-142</m:name>
```

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```
    </m:Names>
    <m:plannedExecutionInterval>
      <m:end>2001-05-01T12:00:00</m:end>
      <m:start>2019-05-01T08:00:00</m:start>
    </m:plannedExecutionInterval>
    <m:SwitchingPlan>
      <m:mRID>6571f4c4-acee-4024-8d1f-6c4a0398e5fa</m:mRID>
      <m:description>Example switching plan</m:description>
      <m:Names>
        <m:name>Switching Plan PO-2019-04-142</m:name>
      </m:Names>
    </m:SwitchingPlan>
  </m:SwitchingOrder>
</m:SwitchingOrders>
```

5.10 Charge utile **SwitchingActions**

5.10.1 Généralités

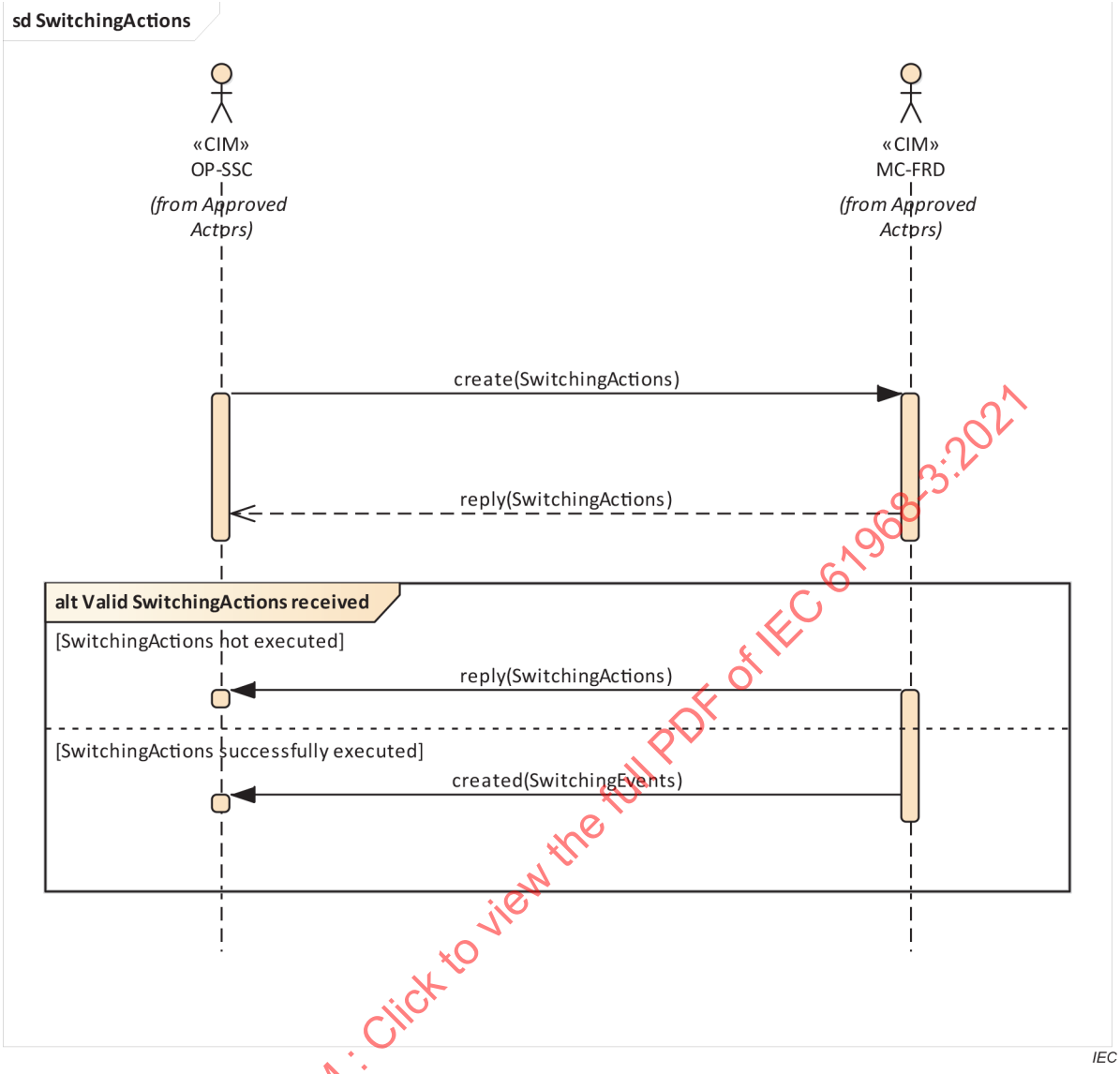
Les **SwitchingActions** sont utilisées pour coordonner l'exécution manuelle des étapes à l'intérieur des **SwitchingPlans** entre la salle de commande et les équipes sur le terrain. Les **SwitchingActions** peuvent également être utilisées pour communiquer des demandes d'exécution d'une commutation à l'extérieur d'un **SwitchingPlan**. L'exécution automatisée de l'étape est coordonnée avec les messages **PSRControls**.

La Figure 59 donne un exemple de la manière dont une étape de commutation peut être envoyée de la salle de commande à une équipe sur le terrain à l'aide d'un message **SwitchingActions**. Même si l'équipe sur le terrain peut déjà disposer d'un exemplaire complet du **SwitchingPlan**, ce message peut être utilisé pour lui demander d'exécuter l'étape spécifique indiquée dans le message. L'échange de message utilise le modèle de message d'événement induit défini dans l'IEC 61968-100.

La réponse indique que l'équipe sur le terrain a reçu l'instruction d'exécuter une étape de commutation et que la demande est valable. Si la demande réussit la validation initiale (ou si aucune validation n'a été réalisée), la section Reply de la réponse IEC 61968-100 doit indiquer la réussite. Si la validation initiale de la demande n'aboutit pas (la demande fait référence à un **SwitchingPlan** inconnu, par exemple), la section Reply de la réponse doit indiquer une défaillance. Si la demande a abouti, le message **SwitchingEvents** (voir 5.11) est une confirmation que l'étape de commutation a été exécutée.

Si la demande a été acceptée, une tentative d'exécution de la **SwitchingAction** doit être réalisée. Si la **SwitchingAction** n'a pas pu être réalisée avec succès (le dispositif demandé ne peut pas être accessible physiquement, par exemple), une seconde réponse doit communiquer la défaillance et sa raison à l'aide de la section Reply du message de réponse IEC 61968-100. Dans ce cas, aucun message **SwitchingEvents** ne doit être renvoyé.

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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
alt Valid SwitchinActions received	autre SwitchinActions valables reçues
SwitchinActions not executed	SwitchinActions non exécutées
SwitchinActions successfully executed	SwitchinActions exécutées avec succès

Figure 59 – Diagramme de séquences de l'exécution de l'étape de commutation

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5.10.2 Charge utile de messages

La charge utile de niveau supérieur pour les **SwitchingActions** est présentée sous forme graphique à la Figure 60. Les attributs du profil **SwitchingActions** sont décrits dans le Tableau 32.

Le message est composé d'un choix de zéro, d'une ou de plusieurs actions. Plusieurs actions de types différents peuvent être envoyées dans une seule charge utile. Cela s'avère nécessaire lorsqu'une **SwitchingStep** est composée de plusieurs sous-étapes faisant partie de la même étape dans le même **SwitchingPlan**. Chaque action ne doit contenir qu'une **SwitchingStep** ou sous-étape.

Noter que la structure des actions des **SwitchingActions** est différente de celles des **SwitchingPlans**.

Tableau 32 – Profil SwitchingActions

SwitchingActions				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
SwitchingActions	SwitchingAction	[0..*]		Choix d'actions comme indiqué ci-dessous
Actions				
ClampAction	ClampAction		Voir 5.10.6.	
ClearanceAction	ClearanceAction		Voir 5.10.7.	
ControlAction	ControlAction		Voir 5.10.8.	
CutAction	CutAction		Voir 5.10.9.	
EnergyConsumerAction	EnergyConsumerAction		Voir 5.10.10.	
EnergySourceAction	EnergySourceAction		Voir 5.10.11.	
GenericAction	GenericAction		Voir 5.10.12.	
GroundAction	GroundAction		Voir 5.10.13.	
JumperAction	JumperAction		Voir 5.10.14.	
MeasurementAction	MeasurementAction		Voir 5.10.15.	
ShuntCompensatorAction	ShuntCompensatorAction		Voir 5.10.16.	
SwitchAction	SwitchAction		Voir 5.10.17.	
TagAction	TagAction		Voir 5.10.18.	
VerificationAction	VerificationAction		Voir 5.10.19.	

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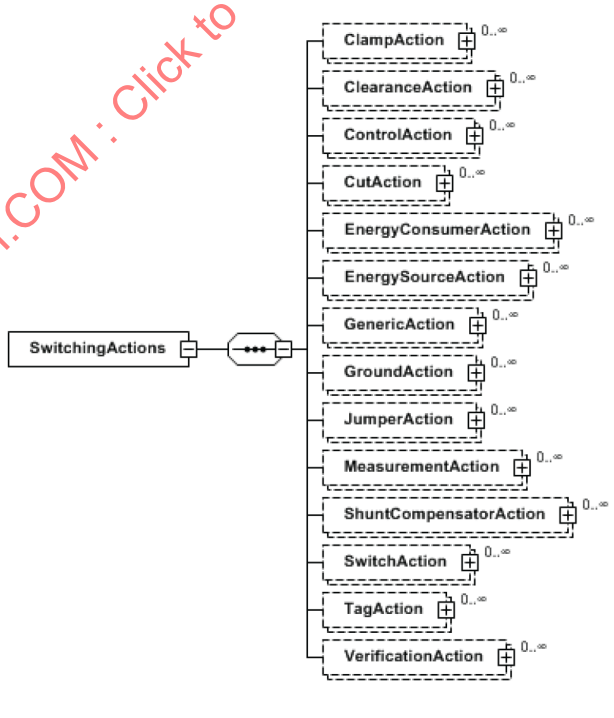


Figure 60 – Charge utile de niveau supérieur SwitchingActions

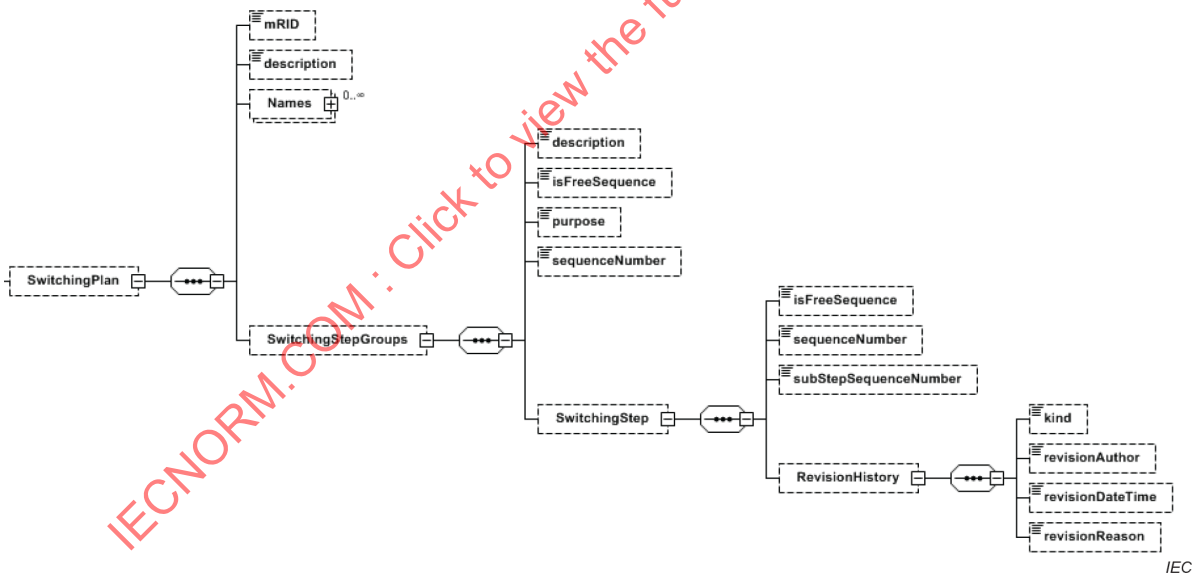
5.10.3 Charge utile **SwitchingActions** – Fragment **SwitchingStep**

Le fragment **SwitchingStep** est présenté dans le Tableau 33 et sous forme graphique à la Figure 61.

Ce fragment est commun à toutes les actions de la **SwitchingAction**.

Tableau 33 – Fragment de charge utile SwitchingStep pour les SwitchingActions

Operations: SwitchingStep				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
isFreeSequence	Boolean	[0..*]		En présence de plusieurs SwitchingSteps dans la SwitchingAction, est utilisée pour déterminer la séquence d'exécution. Voir 5.9.3.1 pour de plus amples informations.
sequenceNumber	Integer	[0..1]		Numéro de séquence qui identifie la SwitchingStep dans le SwitchingPlan.
subStepSequenceNumber	Integer	[0..1]		SequenceNumber de la SwitchingStepSubStep
RevisionHistory	RevisionHistory	[0..1]	Voir l'Article B.74	Indique si l'étape a été ajoutée ou ignorée.



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Figure 61 – SwitchingActions – Fragment SwitchingPlan

5.10.4 Charge utile **SwitchingActions** – Fragment **SwitchingStepGroups**

Le fragment **SwitchingStepGroups** est présenté dans le Tableau 34 et sous forme graphique à la Figure 61.

Ce fragment est commun à toutes les actions de la **SwitchingAction**.

Tableau 34 – Fragment de charge utile SwitchingStepGroup pour les SwitchingActions

Operations: SwitchingStepGroups				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
description	String	[0..1]		Texte au format libre qui décrit le SwitchingStepGroup
isFreeSequence	Boolean	[0..*]		En présence de plusieurs SwitchingStepGroups dans la SwitchingAction, est utilisée pour déterminer la séquence d'exécution. Voir 5.9.3.1 pour de plus amples informations.
purpose	String	[0..1]		Texte au format libre qui décrit l'objectif du SwitchingStepGroup
sequenceNumber	Integer	[0..1]		Numéro de séquence qui identifie le SwitchingStepGroup dans le SwitchingPlan.
SwitchingStep	SwitchingStep	[0..1]	Voir 5.10.3.	SwitchingStep associé à ce SwitchingStepGroup

5.10.5 Charge utile SwitchingActions – Fragment SwitchingPlan

Le fragment **SwitchingPlan** est présenté dans le Tableau 35 et sous forme graphique à la Figure 61.

Ce fragment est commun à toutes les actions de la **SwitchingAction**.

Tableau 35 – Fragment de charge utile SwitchingPlan pour les SwitchingActions

Operations: SwitchingPlan				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		Texte au format libre qui décrit le SwitchingPlan
Names	Name	[0..*]	Voir l'Article B.56	
purpose	String	[0..1]		Texte au format libre qui décrit l'objectif du SwitchingStepGroup
sequenceNumber	Integer	[0..1]		Numéro de séquence qui identifie le groupe d'étapes de commutation à l'intérieur de plan de commutation.
SwitchingStepGroups	SwitchingStepGroup	[0..1]	Voir 5.10.4.	SwitchingStepGroup associé à cette SwitchingAction

5.10.6 Charge utile SwitchingActions – ClampAction

Les attributs de **ClampAction** utilisés dans ce profil sont présentés dans le Tableau 36 et sous forme graphique à la Figure 62.

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Tableau 36 – Fragment de charge utile ClampAction pour les SwitchingActions

Operations: ClampAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de ClampAction
description	String	[0..1]		Description au format libre de l'action.
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à la ClampAction
kind		[0..1]		Détermine si le serre-fils est posé ou déposé. Énumération avec valeurs possibles "place", "remove".
Clamp	Clamp	[0..1]	Voir l'Article B.14	Détails du serre-fils actuel qui doit être posé ou déposé.
executedDateTime	DateTime	[0..1]		Reste vide tant que l'action n'a pas été exécutée sur le terrain
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue.
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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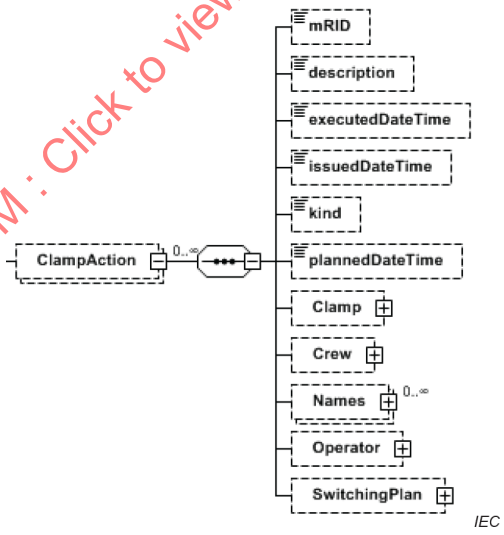


Figure 62 – SwitchingAction – Fragment ClampAction

5.10.7 Charge utile SwitchingActions – ClearanceAction

Les attributs de **ClearanceAction** utilisés dans ce profil sont présentés dans le Tableau 37 et sous forme graphique à la Figure 63.

Tableau 37 – Fragment de charge utile ClearanceAction pour les SwitchingActions

Operations: ClearanceAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de ClearanceAction
description	String	[0..1]		Description au format libre de la ClearanceAction
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	ClearanceActionKind	[0..1]	Voir l'Article C.4	La ClearanceAction peut être utilisée dans un SwitchingPlan pour définir le transfert de contrôle entre la salle de commande et le personnel sur le terrain lorsque le travail peut commencer. Il s'agit en principe de définir une ClearanceAction avec une ClearanceAction.kind of issue. Le contrôle revient à la salle de commande à l'issue des travaux sur le terrain. Il s'agit en principe de définir une ClearanceAction dans le SwitchingPlan avec une ClearanceAction.kind of release. Une ClearanceAction.kind of update dans un SwitchingPlan peut être utilisée pour modifier la liste des TaggedPSR ou d'autres attributs.
Clearance	Clearance	[0..1]	Voir l'Article B.16	Définit la Clearance actuelle qui fait partie de cette action.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe. Reste vide tant que l'action n'a pas été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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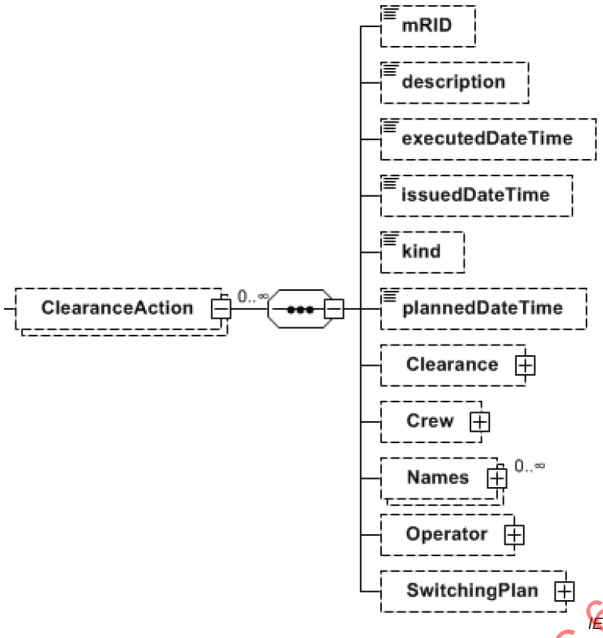


Figure 63 – SwitchingActions – Fragment ClearanceAction

5.10.8 Charge utile SwitchingActions – ControlAction

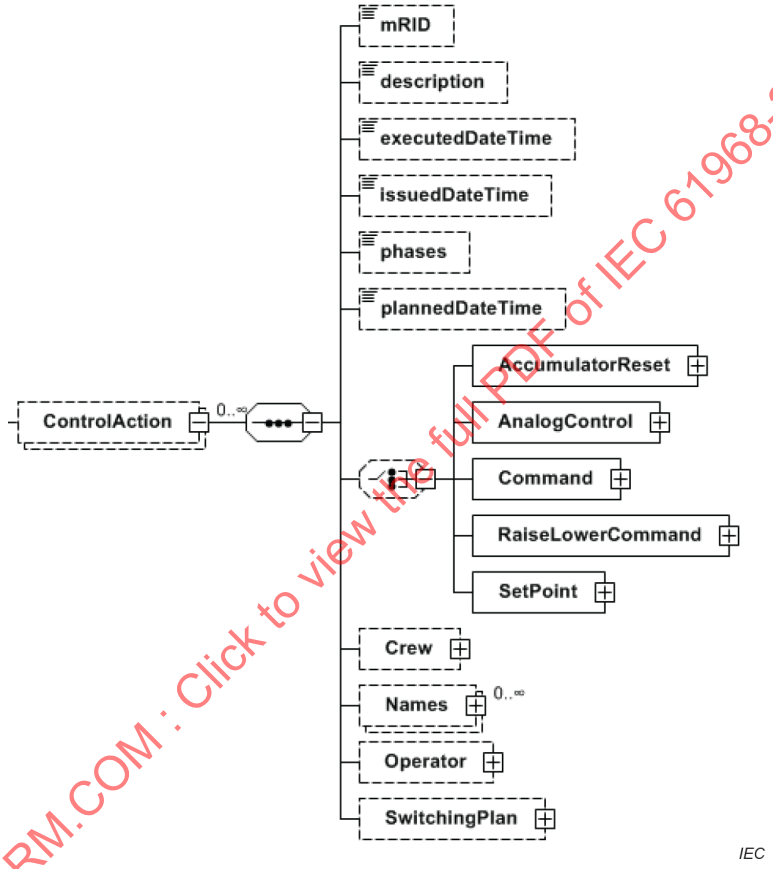
Les attributs de **ControlAction** utilisés dans ce profil sont présentés dans le Tableau 38 et sous forme graphique à la Figure 64.

Tableau 38 – Fragment de charge utile ControlAction

Operations: ControlAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de cette ControlAction
description	String	[0..1]		Description au format libre de l'action.
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases à commander.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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Operations: ControlAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
Choix de l'une des commandes suivantes				
AccumulatorReset	AccumulatorReset		Voir 5.6.4	
AnalogControl	AnalogControl		Voir 5.6.5	
Command	Command		Voir 5.6.6	
RaiseLowerCommand	RaiseLowerCommand		Voir 5.6.7	
SetPoint	SetPoint		Voir 5.6.8	



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Figure 64 – SwitchingActions – Fragment ControlAction

5.10.9 Charge utile SwitchingActions – CutAction

Les attributs de **CutAction** utilisés dans ce profil sont présentés dans le Tableau 39 et sous forme graphique à la Figure 65.

Tableau 39 – Fragment de charge utile CutAction pour les SwitchingActions

Operations: CutAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de cette CutAction
description	String	[0..1]		Description au format libre de l'action.
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	TempEquipActionKind	[0..1]	Voir l'Article C.20	Indique s'il convient de placer ou de retirer la séparation.
Cut	Cut	[0..1]	Voir l'Article B.18	Définit la séparation actuelle qui doit être placée ou retirée.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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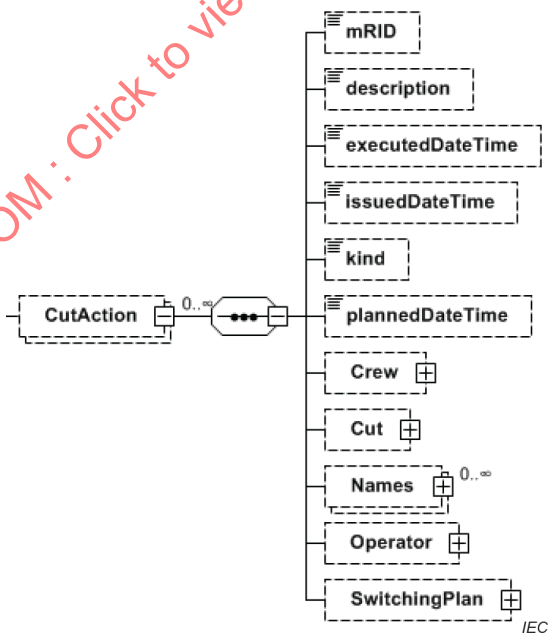


Figure 65 – SwitchingActions – Fragment CutAction

5.10.10 Charge utile SwitchingActions – EnergyConsumerAction

Les attributs de **EnergyConsumerAction** utilisés dans ce profil sont présentés dans le Tableau 40 et sous forme graphique à la Figure 66.

Tableau 40 – Fragment de charge utile EnergyConsumerAction pour les SwitchingActions

Operations: EnergyConsumerAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID d'EnergyConsumerAction
description	String	[0..1]		Description au format libre d'EnergyConsumerAction
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	TempEquipActionKind	[0..1]	Voir l'Article C.20	Définit s'il faut déconnecter ou connecter le client d'énergie de ses bornes.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases sur lesquelles exécuter l'action.
EnergyConsumer	EnergyConsumer	[0..1]	Voir l'Article B.34	EnergyConsumer à connecter ou déconnecter.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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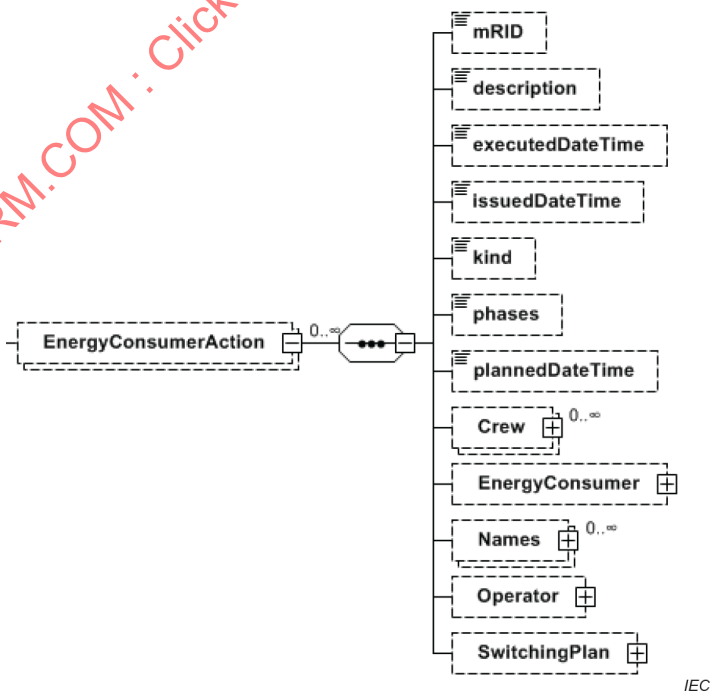


Figure 66 – SwitchingActions – Fragment EnergyConsumerAction

5.10.11 Charge utile **SwitchingActions – EnergySourceAction**

Les attributs d'**EnergySourceAction** utilisés dans ce profil sont présentés dans le Tableau 41 et sous forme graphique à la Figure 67.

Tableau 41 – Fragment de charge utile EnergySourceAction pour les SwitchingActions

Operations: EnergySourceAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID d'EnergySourceAction
description	String	[0..1]		Description au format libre d'EnergySourceAction
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	TempEquipActionKind	[0..1]	Voir l'Article C.20	Définit s'il faut placer ou retirer la source d'énergie.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases sur lesquelles exécuter l'action.
EnergySource	EnergySource	[0..1]	Voir l'Article B.35	EnergySource à placer ou à retirer.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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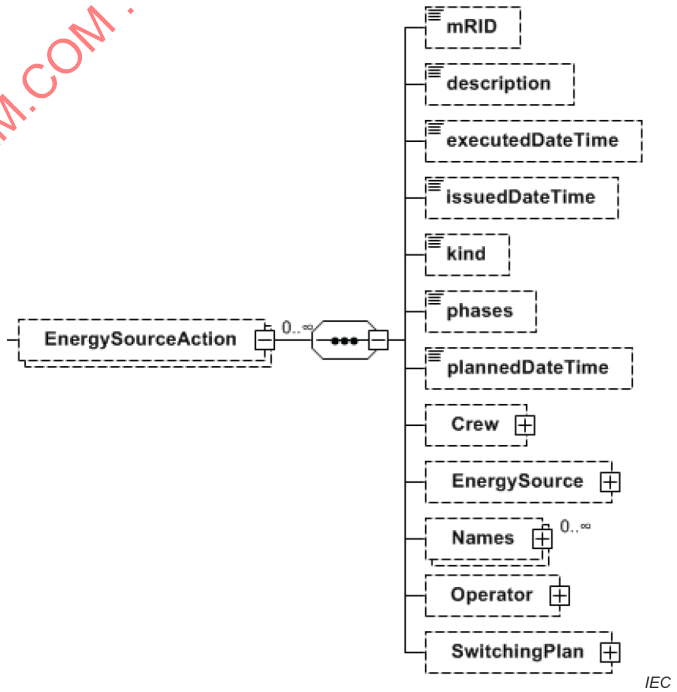


Figure 67 – SwitchingActions – Fragment EnergySourceAction

5.10.12 Charge utile **SwitchingActions – GenericAction**

Les attributs de **GenericAction** utilisés dans ce profil sont présentés dans le Tableau 42 et sous forme graphique à la Figure 68.

Tableau 42 – Fragment de charge utile GenericAction pour les SwitchingActions

Operations: GenericAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de cette GenericAction
description	String	[0..1]		Description au format libre de l'action.
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases sur lesquelles exécuter cette action.
PowerSystemResource	PowerSystemResource	[0..1]	Voir l'Article B.68	Définit la PowerSystemResource sur laquelle exécuter la GenericAction.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases à opérer.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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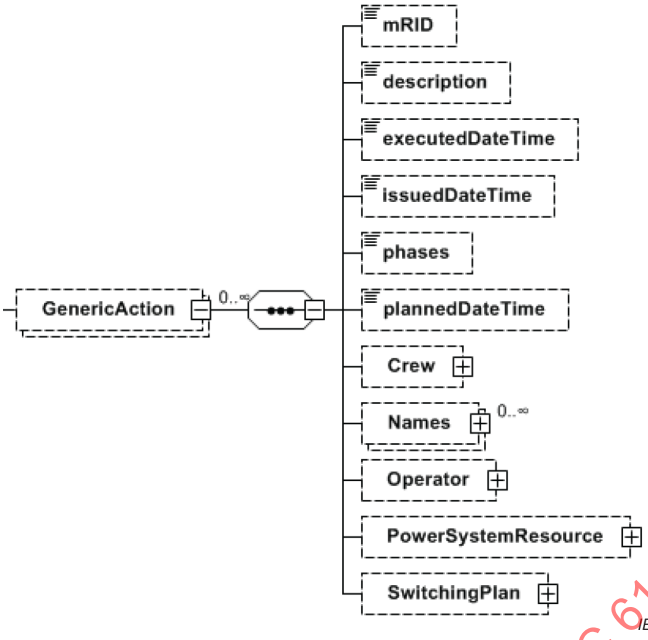


Figure 68 – SwitchingActions – Fragment GenericAction

5.10.13 Charge utile SwitchingActions – GroundAction

Les attributs de **GroundAction** utilisés dans ce profil sont présentés dans le Tableau 43 et sous forme graphique à la Figure 69.

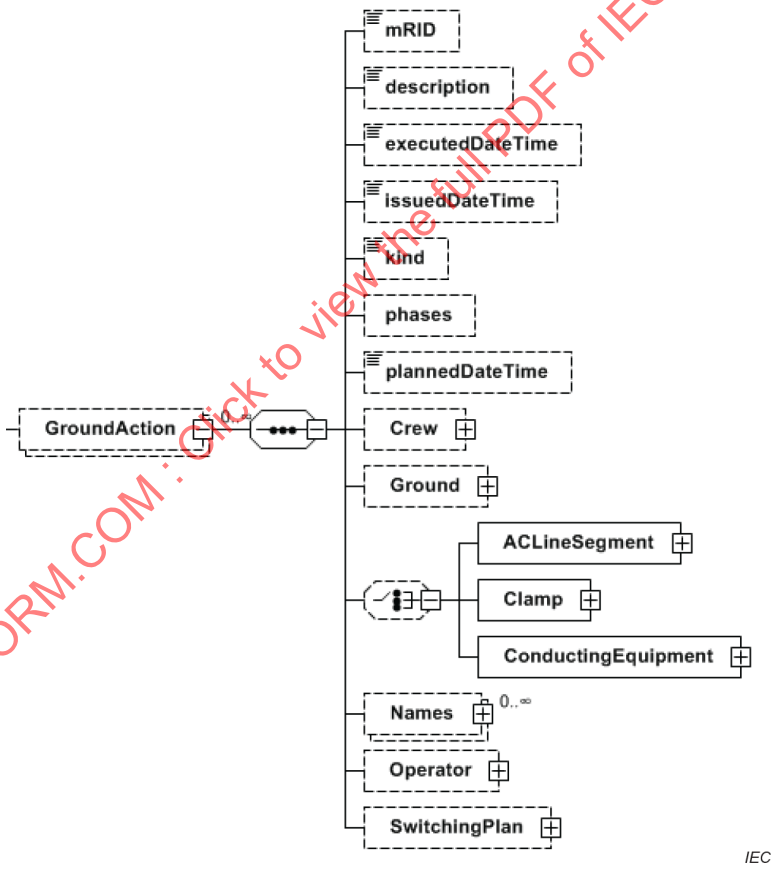
Voir 5.8.13 pour une description plus détaillée de la **GroundAction**, même si la charge utile est sensiblement différente.

Tableau 43 – Fragment de charge utile GroundAction pour les SwitchingActions

Operations: GroundAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de la GroundAction
description	String	[0..1]		Description au format libre de la GroundAction
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	TempEquipActionKind	[0..1]	Voir l'Article C.22	Définit l'action à exécuter, placer ou retirer la terre
Ground	Ground	[0..1]	Voir l'Article B.44	Terre à placer ou à retirer.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter

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Operations: GroundAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.
Choix de l'un des éléments suivants				
ACLineSegment	ACLineSegment		Voir l'Article B.4	Conducteur sur lequel la terre doit être placée.
Clamp	Clamp		Voir l'Article B.14	Clamp sur lequel la terre doit être placée, si la terre doit être placée le long d'un conducteur
ConductingEquipment	ConductingEquipment		Voir l'Article B.14	ConductingEquipment sur lequel la terre doit être placée.



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Figure 69 – SwitchingActions – Fragment GroundAction

5.10.14 Charge utile SwitchingActions – JumperAction

Les attributs de **JumperAction** utilisés dans les profils IEC 61968-3 sont présentés dans le Tableau 44 et sous forme graphique à la Figure 70.

Tableau 44 – Fragment de charge utile JumperAction pour les SwitchingActions

Operations: JumperAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		Description au format libre de l'action.
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	TempEquipActionKind	[0..1]	Voir l'Article C.20	Indique s'il convient de placer ou de retirer le raccordement.
ACLineSegment	ACLineSegment	[0..*]	Voir l'Article B.4	La charge utile peut contenir zéro, un ou deux ACLineSegments, en fonction de l'endroit où doit être fixé le raccordement. Chaque ACLineSegment définit où une extrémité du raccordement doit être placée.
Clamp	Clamp	[0..*]	Voir l'Article B.14	La charge utile peut contenir zéro, un ou deux Clamps, en fonction de l'endroit où doit être fixé le raccordement. Chaque Clamp définit où une extrémité du raccordement est placée.
JumpedEquipments	ConductingEquipment	[0..*]	Voir l'Article B.14	La charge utile peut contenir zéro, un ou deux JumpedEquipments, en fonction de l'endroit où doit être fixé le raccordement. Chaque JumpedEquipments définit le ConductingEquipment auquel une extrémité du raccordement est fixée.
Jumper	Jumper	[0..1]	Voir l'Article B.35	Le raccordement qui doit être placé ou retiré.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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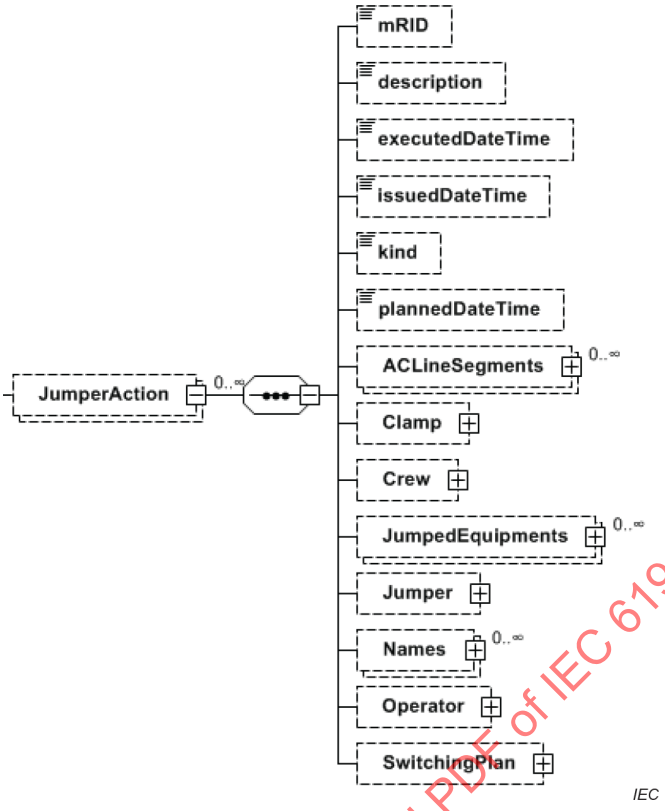


Figure 70 – SwitchingActions – Fragment JumperAction

5.10.15 Charge utile SwitchingActions – MeasurementAction

Les attributs de **MeasurementAction** utilisés dans ce profil sont présentés dans le Tableau 45 et sous forme graphique à la Figure 71.

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Tableau 45 – Fragment de charge utile MeasurementAction pour les SwitchingActions

Operations: MeasurementAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		Description au format libre de l'action.
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
phases	PhaseCode	[0..1]	Voir l'Article C.12	
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.
Choix de l'un des éléments suivants				
Accumulator	Accumulator		Voir 5.4.2.	
Analog	Analog		Voir 5.4.2.	
Discrete	Discrete		Voir 5.4.2.	
StringMeasurement	StringMeasurement		Voir 5.4.2.	

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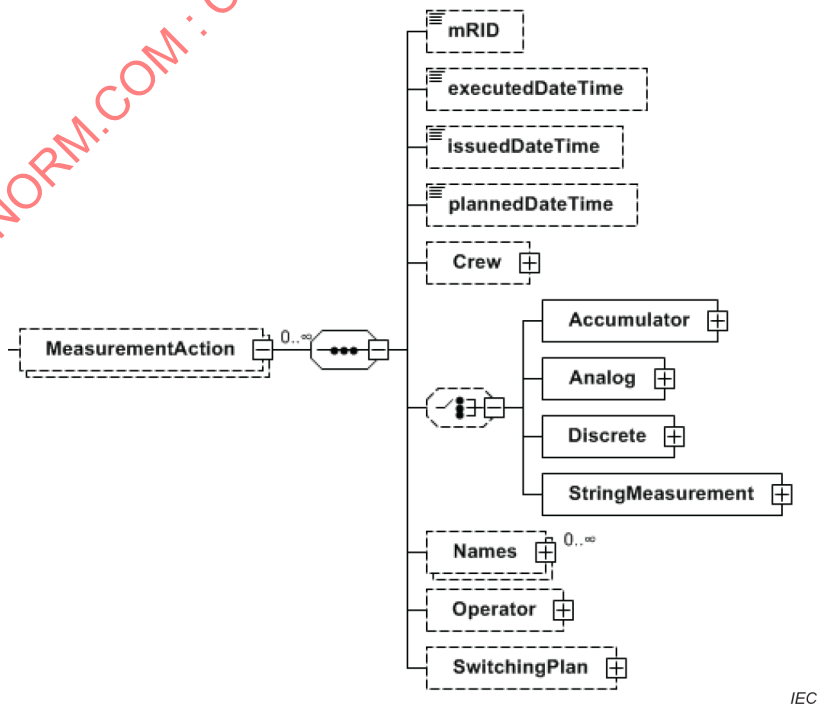


Figure 71 – SwitchingActions – Fragment MeasurementAction

5.10.16 Charge utile **SwitchingActions – ShuntCompensatorAction**

Les attributs de **ShuntCompensatorAction** utilisés dans ce profil sont présentés dans le Tableau 46 et sous forme graphique à la Figure 72.

Tableau 46 – Fragment de charge utile ShuntCompensatorAction pour les SwitchingActions

Operations: ShuntCompensatorAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de l'action
description	String	[0..1]		Description au format libre de l'action
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	TempEquipActionKind	[0..1]	Voir l'Article C.20	Action à exécuter – déconnecter ou connecter
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases à déconnecter ou connecter.
ShuntCompensator	ShuntCompensator	[0..1]	Voir l'Article B.78	ShuntCompensator sur lequel exécuter l'action.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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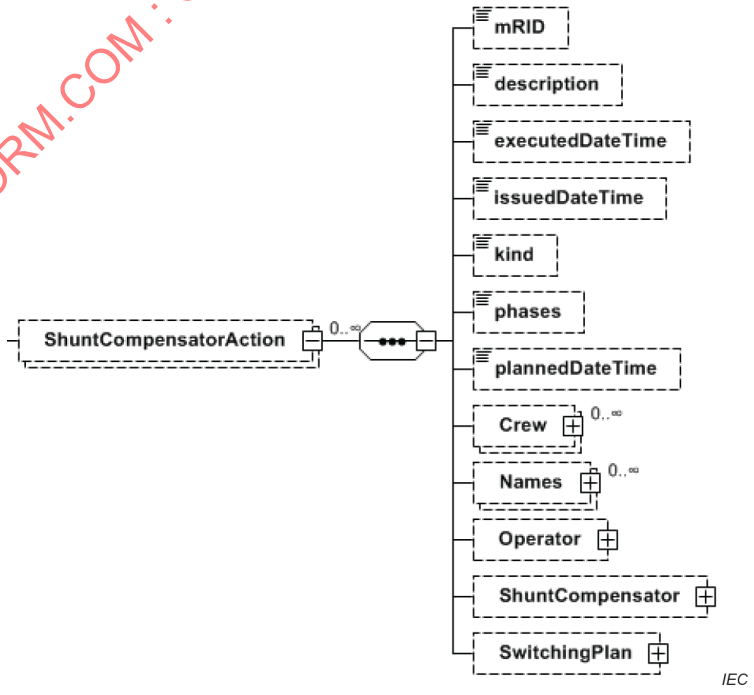


Figure 72 – SwitchingActions – Fragment ShuntCompensatorAction

5.10.17 Charge utile **SwitchingActions – SwitchAction**

Les attributs de **SwitchAction** utilisés dans ce profil sont présentés dans le Tableau 47 et sous forme graphique à la Figure 73.

Tableau 47 – Fragment de charge utile SwitchAction pour les SwitchingActions

Operations: SwitchAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de l'action
description	String	[0..1]		Description au format libre de l'action
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	SwitchActionKind	[0..1]	Voir l'Article C.20	Action de commutation à réaliser - ouvrir, fermer, disableReclosing, enableReclosing
OperatedSwitch	Switch	[0..1]	Voir l'Article B.85	Commutateur à opérer.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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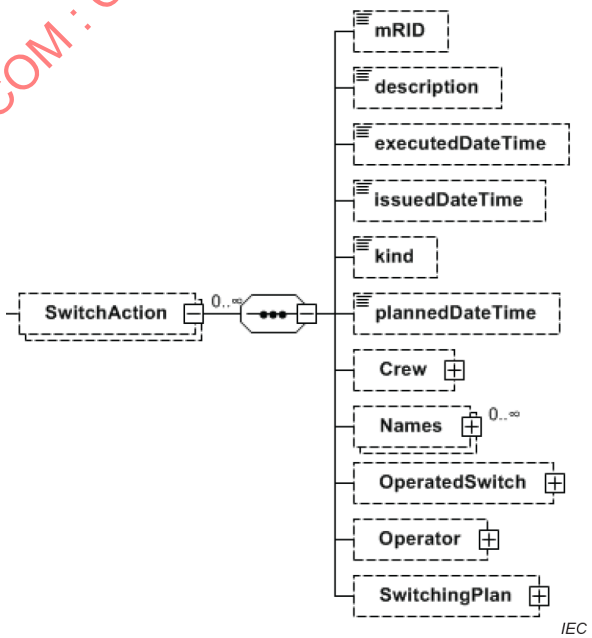


Figure 73 – SwitchingActions – Fragment SwitchAction

5.10.18 Charge utile **SwitchingActions – TagAction**

Les attributs de **TagAction** utilisés dans ce profil sont présentés dans le Tableau 48 et sous forme graphique à la Figure 74.

Tableau 48 – Fragment de charge utile TagAction pour les SwitchingActions

Operations: TagAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		Description au format libre de l'action.
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
kind	TagActionKind	[0..1]	Voir l'Article C.21	Opération à réaliser sur Tag – placer, retirer, vérifier
OperationalTag	OperationalTag	[0..1]	Voir l'Article B.59	La balise actuelle qui doit être placée, retirée ou vérifiée.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases sur lesquelles la balise doit être placée. (par exemple, A, B, AC, ABC)
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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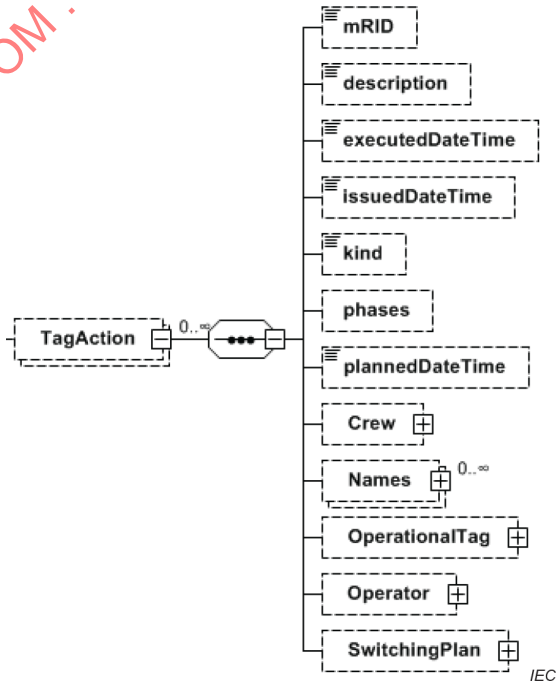


Figure 74 – SwitchingActions – Fragment TagAction

5.10.19 Charge utile **SwitchingActions – VerificationAction**

Les attributs de **VerificationAction** utilisés dans ce profil sont présentés dans le Tableau 49 et sous forme graphique à la Figure 75.

Tableau 49 – Fragment de charge utile VerificationAction pour les SwitchingActions

Operations: VerificationAction				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	
description	String	[0..1]		Description au format libre de l'action.
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à l'action.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases sur lesquelles exécuter l'action (par exemple, A, AB, AC, ABC, etc.).
verificationCondition	String	[0..1]		Chaîne textuelle au format libre décrivant la condition à vérifier (par exemple, vérifier l'ouverture, désactiver la refermeture, placer en mode manuel, etc.).
PowerSystemResource	PowerSystemResource	[0..1]	Voir l'Article B.68	PowerSystemResource sur laquelle exécuter l'action de vérification.
executedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été exécutée. Reste vide tant que l'action n'a pas été exécutée sur le terrain.
issuedDateTime	DateTime	[0..1]		DateTime à laquelle l'action a été envoyée à l'équipe.
phases	PhaseCode	[0..1]	Voir l'Article C.12	
plannedDateTime	DateTime	[0..1]		DateTime à laquelle l'exécution de l'action est prévue
Crew	Crew	[0..1]	Voir l'Article B.22	L'équipe à laquelle a été donnée l'action à exécuter
Operator	Operator	[0..1]	Voir l'Article B.60	Opérateur qui a donné l'action à exécuter à l'équipe
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.10.3.	SwitchingPlan auquel est associée cette action.

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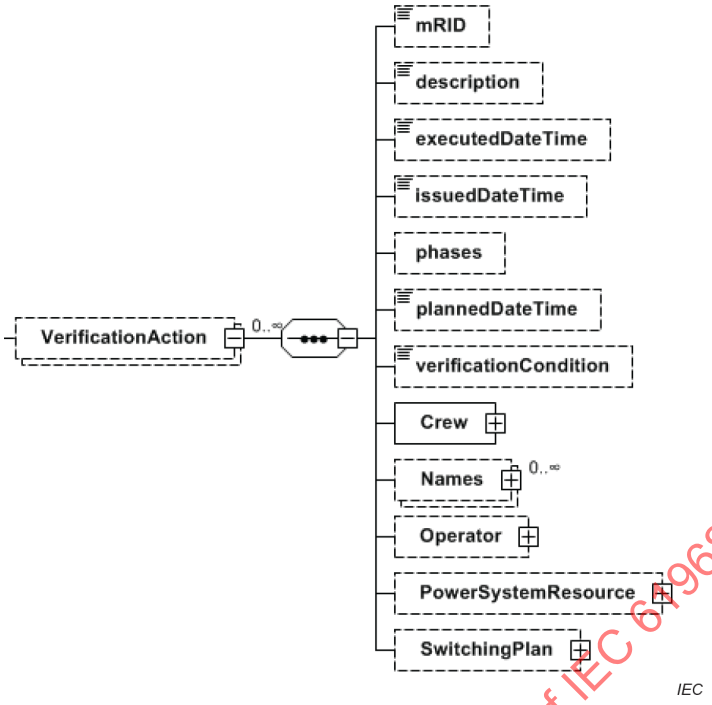


Figure 75 – SwitchingActions – Fragment VerificationAction

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5.10.20 Exemple XML

L'exemple présente l'un des choix d'actions possibles, une **SwitchAction** en l'occurrence.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:SwitchingActions xmlns:m="http://iec.ch/TC57/2019/SwitchingActions#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/SwitchingActions# SwitchingActions.xsd ">
  <m:SwitchAction>
    <m:mRID>4dcc0e34-de05-4836-83ff-2afa11a6c8c4</m:mRID>
    <m:description>Request to close Switch 1083</m:description>
    <m:issuedDateTime>2019-06-01T08:00:00</m:issuedDateTime>
    <m:kind>close</m:kind>
    <m:Crew>
      <m:Names>
        <m:name>James Smedley IV</m:name>
      </m:Names>
    </m:Crew>
    <m:OperatedSwitch>
      <m:mRID>0738a0bd-0f26-499d-9c44-e2e8ce87a065</m:mRID>
      <m:Assets>
        <m:Names>
          <m:name>Switch 1083</m:name>
        </m:Names>
      </m:Assets>
      <m:Location>
        <m:direction>W Side 25th Ave N of Linden Ave Southbury</m:direction>
      </m:Location>
      <m:Names>
        <m:name>Switch 1083</m:name>
      </m:Names>
      <m:SwitchPhase>
        <m:closed>false</m:closed>
        <m:normalOpen>false</m:normalOpen>
        <m:phaseSide1>ABC</m:phaseSide1>
        <m:phaseSide2>ABC</m:phaseSide2>
      </m:SwitchPhase>
    </m:OperatedSwitch>
    <m:Operator>
      <m:Names>
        <m:name>Horatio Hornblower</m:name>
      </m:Names>
    </m:Operator>
    <m:SwitchingPlan>
      <m:mRID>6571f4c4-acee-4024-8d1f-6c4a0398e5fa</m:mRID>
      <m:description>Example switching plan</m:description>
      <m:Names>
        <m:name>Switching Plan PO-2019-04-142</m:name>
      </m:Names>
      <m:SwitchingStepGroups>
        <m:description>m:First Group</m:description>
        <m:isFreeSequence>false</m:isFreeSequence>
        <m:purpose>m:Close the switch</m:purpose>
        <m:sequenceNumber>1</m:sequenceNumber>
        <m:SwitchingStep>
          <m:isFreeSequence>false</m:isFreeSequence>
          <m:sequenceNumber>1</m:sequenceNumber>
          <m:subStepSequenceNumber>1</m:subStepSequenceNumber>
        </m:SwitchingStep>
      </m:SwitchingStepGroups>
    </m:SwitchingPlan>
  </m:SwitchAction>
</m:SwitchingActions>
```

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5.11 Charge utile SwitchingEvents

5.11.1 Généralités

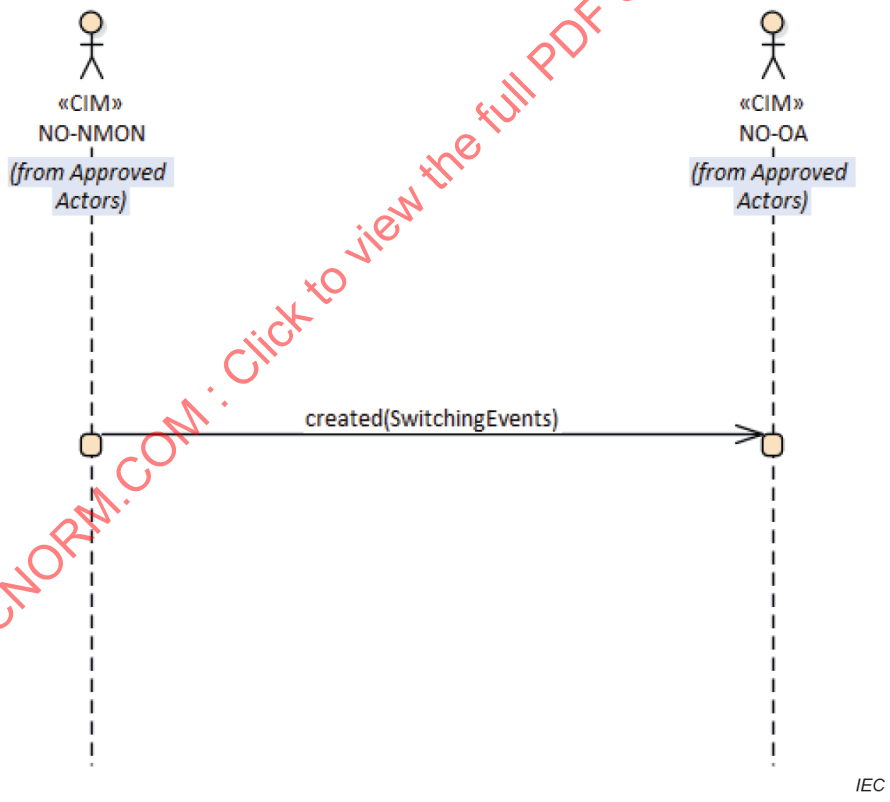
Les **SwitchingEvents** sont utilisés pour communiquer les modifications temporaires du réseau qui ont été apportées après l'exécution d'une étape de plan de commutation ou après la réalisation d'opérations de réseau hors du plan de commutation.

Les **SwitchingEvents** sont utilisés pour communiquer les modifications temporaires de réseau qui ont été apportées après l'exécution d'une **SwitchingPlanStep** (voir 5.8) dans un **SwitchingPlan** initié par l'intermédiaire d'une **SwitchingAction.**

Les résultats de l'exécution d'une **SwitchingPlanStep** qui est une **ControlAction** sont coordonnés avec les messages **PSRControls** et **PSRMeasurements** plutôt qu'avec les **SwitchingEvents**.

Les **SwitchingEvents** sont également utilisés pour communiquer les modifications temporaires de réseau entre des systèmes d'entreprise qui sont apportées hors d'un **SwitchingPlan**. Les modifications temporaires de réseau revêtent une importance particulière en cas de construction de réseau, lors d'interruptions provoquées par des conditions climatiques sévères ou de graves catastrophes ou comme sauvegarde d'urgence lors de la maintenance du réseau ou des centrales électriques. Dans ces scénarii, les systèmes électriques sont obligés de toujours maintenir l'équilibre entre génération et consommation, et de réalimenter aussi rapidement que possible les clients concernés. Les modifications temporaires de réseau (les Jumpers (raccordements), les Cuts (séparations) et les Grounds (terres), par exemple) sont utilisées pour reconfigurer temporairement la partie concernée du réseau.

La Figure 76 représente comment une modification du réseau est communiquée d'un acteur à un autre (dans le cas présent, le DMS communique une modification du réseau à l'OMS et aucun **SwitchingPlan** n'est impliqué).



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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)

Figure 76 – Diagramme de séquences SwitchingEvents pour une notification

5.11.2 Charge utile Message

La Figure 77 présente la charge utile de niveau supérieur des **SwitchingEvents** sous forme graphique. Le Tableau 50 définit les attributs en détail.

Tableau 50 – Profil SwitchingEvents

SwitchingEvents				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
SwitchingEvents	SwitchingEvent	[0..*]		
mRID	String	[0..1]	GUID	mRID de ce SwitchingEvent
description	String	[0..1]		Description au format libre de ce SwitchingEvent
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour ce SwitchingEvent
reason	String	[0..1]		Raison en texte libre du **SwitchingEvent**
severity	String	[0..1]		Sévérité de cet événement
type	String	[0..1]		Texte au format libre
		[0..*]		Choix d'actions comme indiqué ci-dessous
Actions				
ClampAction	ClampAction		Voir 5.10.6.	
ClearanceAction	ClearanceAction		Voir 5.10.7.	
ControlAction	ControlAction		Voir 5.10.8.	
CutAction	CutAction		Voir 5.10.9.	
EnergyConsumerAction	EnergyConsumerAction		Voir 5.10.10.	
EnergySourceAction	EnergySourceAction		Voir 5.10.11.	
GenericAction	GenericAction		Voir 5.10.12.	
GroundAction	GroundAction		Voir 5.10.13.	
JumperAction	JumperAction		Voir 5.10.14.	
MeasurementAction	MeasurementAction		Voir 5.10.15.	
ShuntCompensatorAction	ShuntCompensatorAction		Voir 5.10.16.	
SwitchAction	SwitchAction		Voir 5.10.17.	
TagAction	TagAction		Voir 5.10.18.	
VerificationAction	VerificationAction		Voir 5.10.19.	

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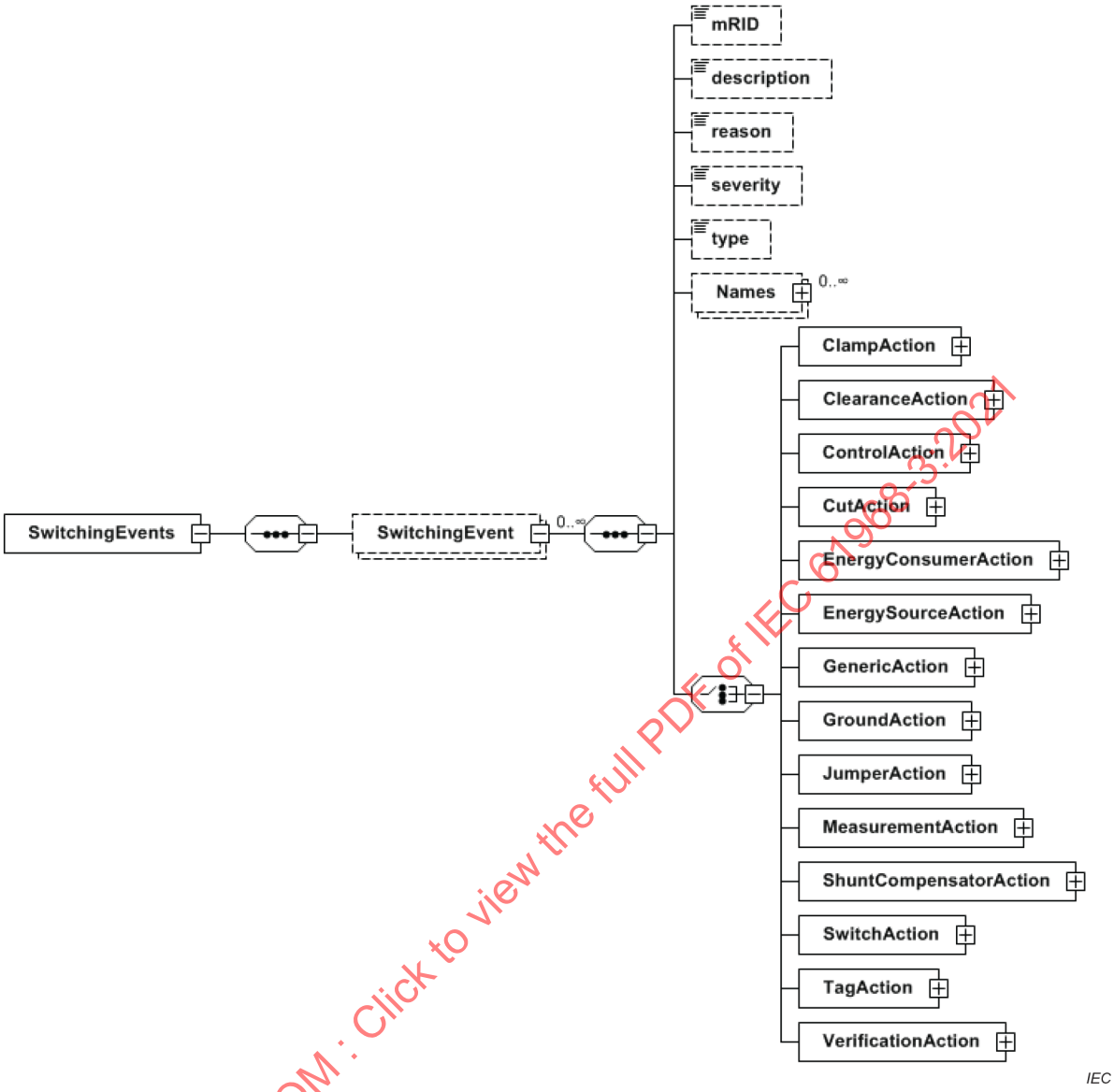


Figure 77 – Charge utile de niveau supérieur SwitchingEvents

La partie la plus importante de la charge utile est un choix de l'une des actions possibles qui ont été réalisées sur le réseau. Les actions sont les mêmes que celles de la charge utile **SwitchingActions**, même si, comme le représente le diagramme de séquences, les **SwitchingEvents** ne nécessitent pas d'être une réponse à des **SwitchingActions**.

5.11.3 Charge utile SwitchingEvents – ClampAction

Le fragment de charge utile **ClampAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **ClampAction** du message **SwitchingActions**. Voir 5.10.6.

5.11.4 Charge utile SwitchingEvents – ClearanceAction

Le fragment de charge utile **ClearanceAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **ClearanceAction** du message **SwitchingActions**. Voir 5.10.7.

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5.11.5 Charge utile **SwitchingEvents – ControlAction**

Le fragment de charge utile **ControlAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **ControlAction** du message **SwitchingActions**. Voir 5.10.8.

5.11.6 Charge utile **SwitchingEvents – CutAction**

Le fragment de charge utile **CutAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **CutAction** du message **SwitchingActions**. Voir 5.10.9.

5.11.7 Charge utile **SwitchingEvents – EnergyConsumerAction**

Le fragment de charge utile **EnergyConsumerAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **EnergyConsumerAction** du message **SwitchingActions**. Voir 5.10.10.

5.11.8 Charge utile **SwitchingEvents – EnergySourceAction**

Le fragment de charge utile **EnergySourceAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **EnergySourceAction** du message **SwitchingActions**. Voir 5.10.11.

5.11.9 Charge utile **SwitchingEvents – GenericAction**

Le fragment de charge utile **GenericAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **GenericAction** du message **SwitchingActions**. Voir 5.10.12.

5.11.10 Charge utile **SwitchingEvents – GroundAction**

Le fragment de charge utile **GroundAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **GroundAction** du message **SwitchingActions**. Voir 5.10.13.

5.11.11 Charge utile **SwitchingEvents – JumperAction**

Le fragment de charge utile **JumperAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **JumperAction** du message **SwitchingActions**. Voir 5.10.14.

5.11.12 Charge utile **SwitchingEvents – MeasurementAction**

Le fragment de charge utile **MeasurementAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **MeasurementAction** du message **SwitchingActions**. Voir 5.10.15.

5.11.13 Charge utile **SwitchingEvents – ShuntCompensatorAction**

Le fragment de charge utile **ShuntCompensatorAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **ShuntCompensatorAction** du message **SwitchingActions**. Voir 5.10.16.

5.11.14 Charge utile **SwitchingEvents – SwitchAction**

Le fragment de charge utile **SwitchAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **SwitchAction** du message **SwitchingActions**. Voir 5.10.17.

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5.11.15 Charge utile **SwitchingEvents – TagAction**

Le fragment de charge utile **TagAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **TagAction** du message **SwitchingActions**. Voir 5.10.18.

5.11.16 Charge utile **SwitchingEvents – VerificationAction**

Le fragment de charge utile **VerificationAction** de la charge utile de message **SwitchingEvents** est le même que le fragment de charge utile **VerificationAction** du message **SwitchingActions**. Voir 5.10.19.

5.11.17 Exemple XML

L'exemple ci-dessous est une réponse induite à l'exemple **SwitchingAction** de 5.10.20, utilisant le même commutateur, avec une exécution réussie.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:SwitchingEvents xmlns:m="http://iec.ch/TC57/2019/SwitchingEvents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/SwitchingEvents# Copy of SwitchingEvents.xsd ">
  <m:SwitchingEvent>
    <m:mRID>0575495a-2767-4875-9134-11fd46045b95</m:mRID>
    <m:description>Response to request to close Switch 1083</m:description>
    <m:reason>Execution through switching plan</m:reason>
    <m:SwitchAction>
      <m:mRID>4dcc0e34-de05-4836-83ff-2afa11a6c8c4</m:mRID>
      <m:description>Request to close Switch 1083</m:description>
      <m:executedDateTime>2019-06-01T08:02:48</m:executedDateTime>
      <m:issuedDateTime>2019-06-01T08:00:00</m:issuedDateTime>
      <m:Crew>
        <m:Names>
          <m:name>James Smedley IV</m:name>
        </m:Names>
      </m:Crew>
      <m:OperatedSwitch>
        <m:mRID>0738a0bd-0f26-499d-9c44-e2e8ce87a065</m:mRID>
        <m:Names>
          <m:name>Switch 1083</m:name>
        </m:Names>
        <m:SwitchPhase>
          <m:closed>true</m:closed>
          <m:phaseSide1>ABC</m:phaseSide1>
          <m:phaseSide2>ABC</m:phaseSide2>
        </m:SwitchPhase>
      </m:OperatedSwitch>
      <m:Operator>
        <m:Names>
          <m:name> Horatio Hornblower </m:name>
        </m:Names>
      </m:Operator>
     <m:SwitchingPlan>
       <m:mRID>6571f4c4-acee-4024-8d1f-6c4a0398e5fa</m:mRID>
       <m:description>Example switching plan</m:description>
       <m:Names>
        <m:name>Switching Plan PO-2019-04-142</m:name>
       </m:Names>
       <m:SwitchingStepGroups>
         <m:description>m:First Group</m:description>
         <m:sequenceNumber>1</m:sequenceNumber>
         <m:SwitchingStep>
           <m:sequenceNumber>1</m:sequenceNumber>
           <m:subStepSequenceNumber>1</m:subStepSequenceNumber>
         </m:SwitchingStep>
       </m:SwitchingStepGroups>
     </m:SwitchingPlan>
    </m:SwitchAction>
  </m:SwitchingEvent>
</m:SwitchingEvents>
```

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5.12 Charge utile **PlannedOutageNotification**

5.12.1 Généralités

NOTE la **PlannedOutageNotification** et la **PlannedOutage** se distinguent par le fait que la **PlannedOutageNotification** est créée avant que le client ne soit mis hors service, alors que la **PlannedOutage** est créée dès le début de la commutation et lorsque les clients sont hors service.

Les **PlannedOutageNotifications** sont utilisées pour informer un système client que les **UsagePoint**s vont être impactés par un **SwitchingPlan**, avant l'exécution du **SwitchingPlan**.

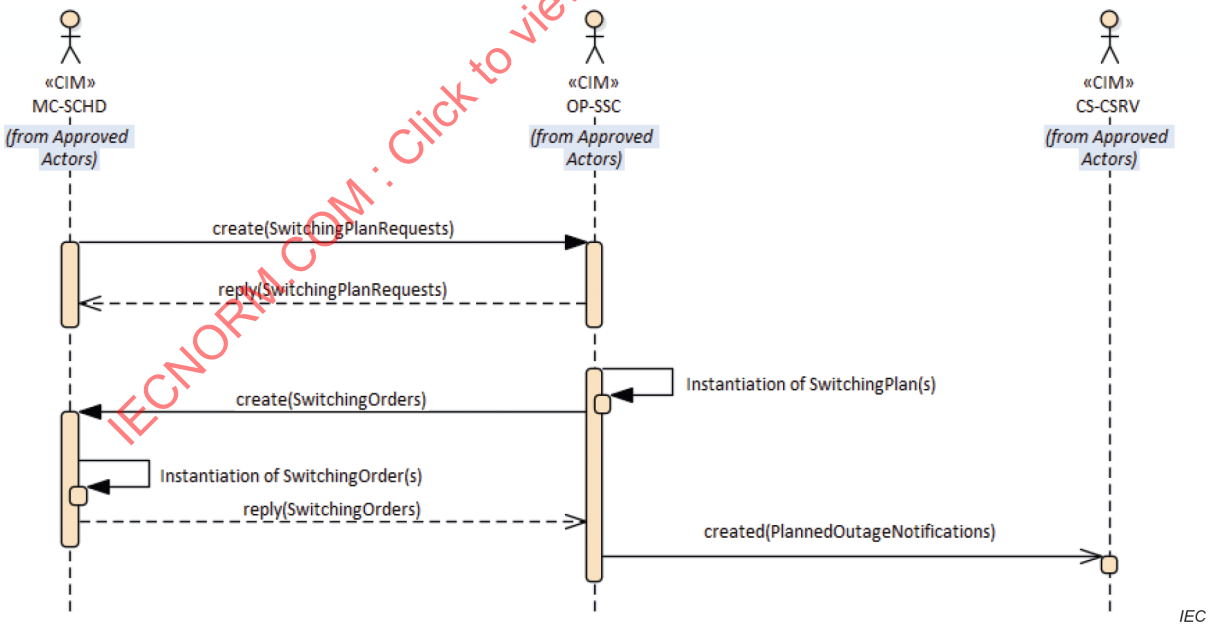
Un diagramme de séquences donnant un exemple de la création d'une **PlannedOutageNotification** est présenté à la Figure 78.

En premier lieu, une **SwitchingPlanRequest** est utilisée pour initier la création d'un **SwitchingPlan**. La **SwitchingPlanRequest** identifie à un niveau élevé que le travail doit être réalisé sur une partie particulière du réseau, à quelle heure et à quelle date. Un **SwitchingPlan Author** consulte les exigences dans la **SwitchingPlanRequest** et écrit un **SwitchingPlan** détaillé à associer à la **SwitchingPlanRequest**.

Dès que le **SwitchingPlan** a été créé et approuvé, une demande de création d'un **SwitchingOrder** est formulée. Le **SwitchingOrder** est utilisé pour planifier le travail des équipes sur le terrain.

Lorsque le **SwitchingOrder** est créé, il définit la date et l'heure d'exécution du travail et la personne qui va l'exécuter. Cela donne les informations de planification nécessaires à la création d'une **PlannedOutageNotification**. La **PlannedOutageNotification** inclut la date/heure de début planifiée et une liste de clients à informer avant l'exécution du **SwitchingPlan**.

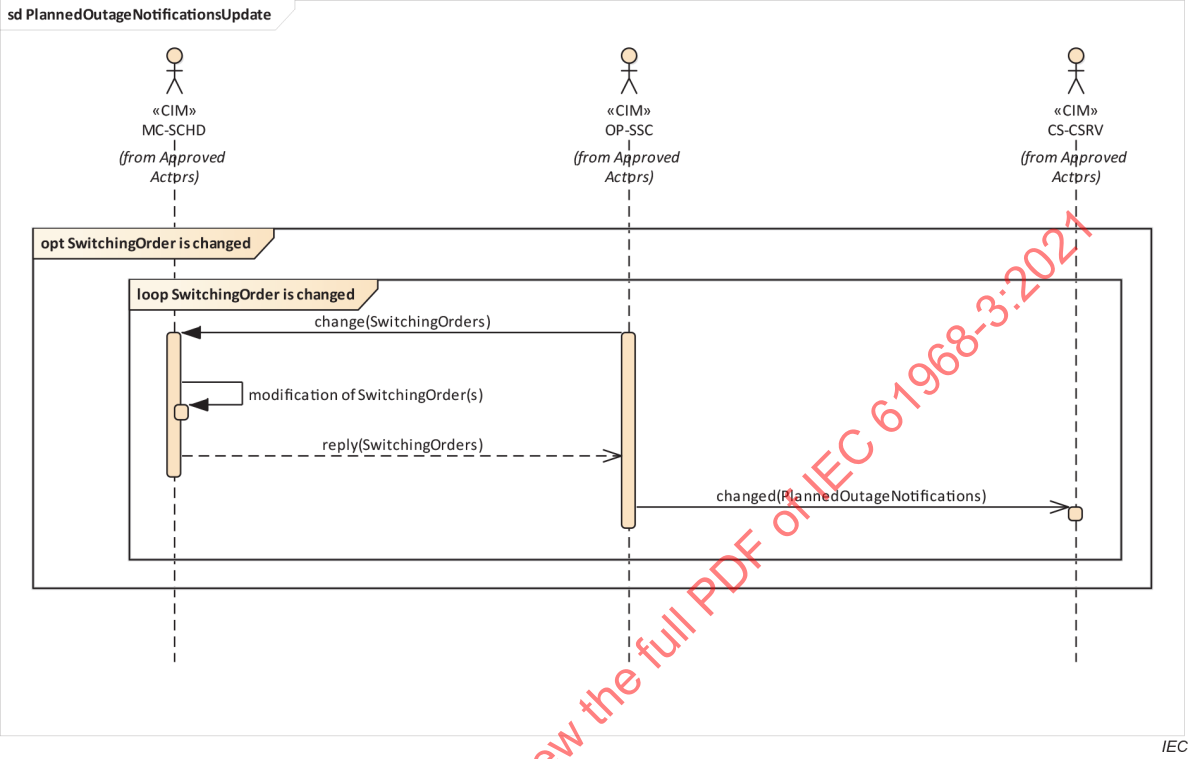
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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
Instantiation of SwitchingPlan(s)	Instanciation de SwitchingPlan(s)
Instantiation of SwitchingOrder(s)	Instanciation de SwitchingOrder(s)

Figure 78 – Diagramme de séquences PlannedOutageNotifications

Les **PlannedOutageNotifications** peuvent être modifiées si le **SwitchingOrder** associé est modifié de manière à avoir un impact sur les **UsagePoint**s qui vont être affectés ou si la date/heure d'exécution planifiée change. Le **SwitchingOrder** peut également être annulé. La modification des **SwitchingOrders** et la modification induite de la **PlannedOutageNotification** sont présentées à la Figure 79.



Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
opt SwitchingOrder is changed	opt SwitchingOrder est modifié
loop SwitchingOrder is changed	loop SwitchingOrder est modifié
modification of SwitchingOrder(s)	modification des SwitchingOrder(s)

Figure 79 – Diagramme de séquences de modification de PlannedOutageNotifications

5.12.2 Charge utile de message

La Figure 80 présente la charge utile de message de niveau supérieur des **PlannedOutageNotifications** sous forme graphique, alors que le Tableau 51 définit les attributs en détail.

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Tableau 51 – Profil PlannedOutageNotifications

PlannedOutageNotifications				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
PlannedOutageNotifications	PlannedOutageNotification	[1..*]		
Attributs de profil				
mRID	String	[0..1]	GUID	
description	String	[0..1]		Champ textuel au format libre qui décrit la **PlannedOutageNotification**
Names	Name	[0..1]	Voir l'Article B.56	Noms lisibles par l'homme associés à la PlannedOutageNotification
comment	String	[0..1]		Texte au format libre
createdDateTime	DateTime	[0..1]		DateTime à laquelle la PlannedOutageNotification a été initialement créée.
lastModifiedDateTime	DateTime	[0..1]		DateTime de la dernière modification du PlannedOutageNotification.
revisionNumber	String	[0..1]		Numéro de révision de cette PlannedOutageNotification
subject	String	[0..1]		Texte au format libre.
title	String	[0..1]		Titre de cette PlannedOutageNotification. Texte au format libre
UsagePoint	UsagePoint	[0..*]	Voir l'Article B.97	UsagePoints qui vont être mis hors tension après l'exécution de ce SwitchingPlan.
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.8.2.	Inclut la date/heure de début et de fin du SwitchingPlan.

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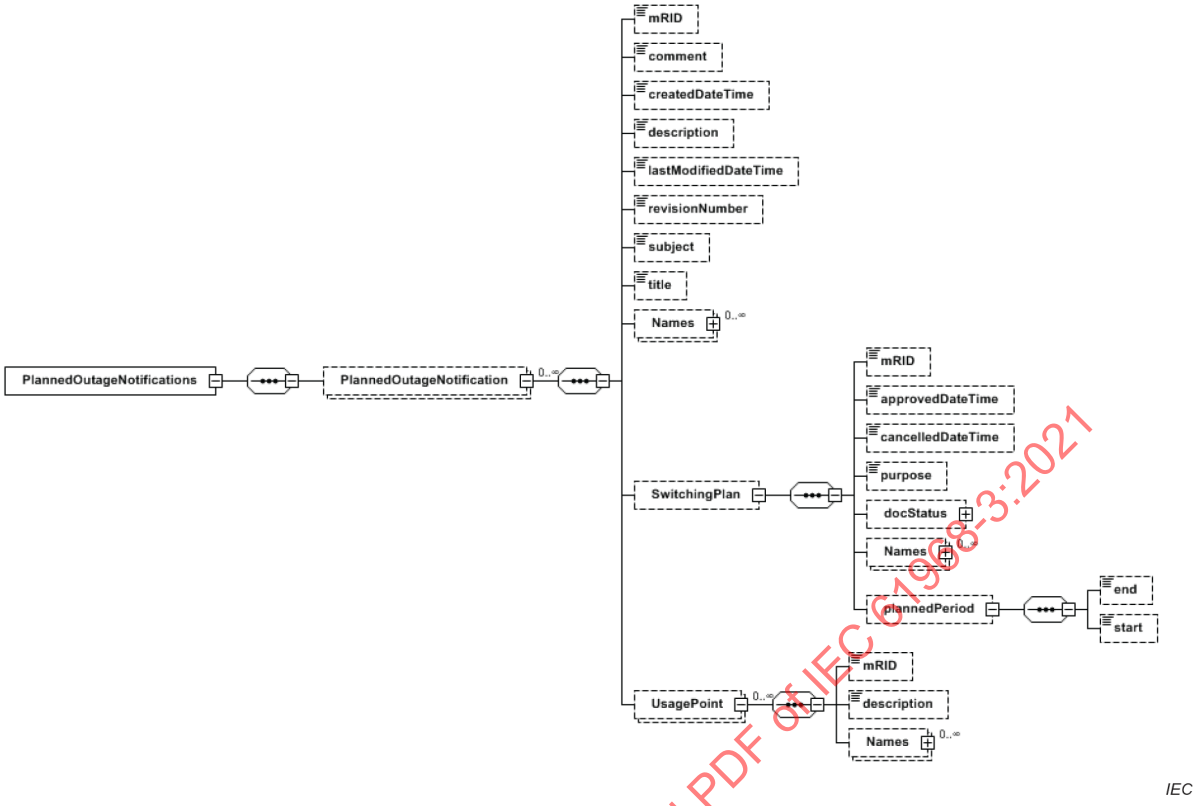


Figure 80 – Charge utile de message PlannedOutageNotifications

Les attributs du **SwitchingPlan** incluent la date de début et de fin (**plannedPeriod.start**, **plannedPeriod.end**) ainsi que le statut du **SwitchingPlan**.

5.12.3 Exemple XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PlannedOutageNotifications xmlns:m="http://iec.ch/TC57/2019/PlannedOutageNotifications#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PlannedOutageNotifications#
PlannedOutageNotifications.xsd ">
  <m:PlannedOutageNotification>
    <m:mRID>a52a3bb6-d05d-43db-8d46-ee629bc09ff6</m:mRID>
    <m:comment>Notification of planned outage</m:comment>
    <m:createdDateTime>2019-05-22T09:30:00</m:createdDateTime>
    <m:description>Notification for example switching plan</m:description>
    <m:lastModifiedDateTime>2019-05-25T16:45:00</m:lastModifiedDateTime>
    <m:revisionNumber>B</m:revisionNumber>
    <m:subject>Revised to exclude Our Lady of Mercy Hospital</m:subject>
    <m:title>New Construction</m:title>
    <m:UsagePoint>
      <m:mRID>326bc1f5-0c97-4ef9-b266-77be10f72fc8</m:mRID>
    </m:UsagePoint>
    <m:UsagePoint>
      <m:mRID>ec035307-40ee-4605-86eb-e1dc4985010a</m:mRID>
    </m:UsagePoint>
    <m:Names>
      <m:name>Planned Outage notification for Switching Plan PO-2019-04-142</m:name>>
    </m:Names>
    <m:SwitchingPlan>
      <m:mRID>6571f4c4-acee-4024-8d1f-6c4a0398e5fa </m:mRID>
      <m:approvedDateTime>2019-04-10T14:14:14</m:approvedDateTime>
      <m:purpose>New Construction</m:purpose>
      <m:docStatus>
        <m:dateTime>2019-05-25T16:45:00</m:dateTime>
        <m:reason>Revised</m:reason>
        <m:value>Approved</m:value>
      </m:docStatus>
      <m:Names>
        <m:name>Switching Plan PO-2019-04-142</m:name>
```

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```
      </m:Names>
      <m:plannedPeriod>
        <m:end>2019-05-01T12:00:00</m:end>
        <m:start>2019-01-01T08:00:00</m:start>
      </m:plannedPeriod>
    </m:SwitchingPlan>
  </m:PlannedOutageNotification>
</m:PlannedOutageNotifications>
```

5.13 Charge utile **PlannedOutages**

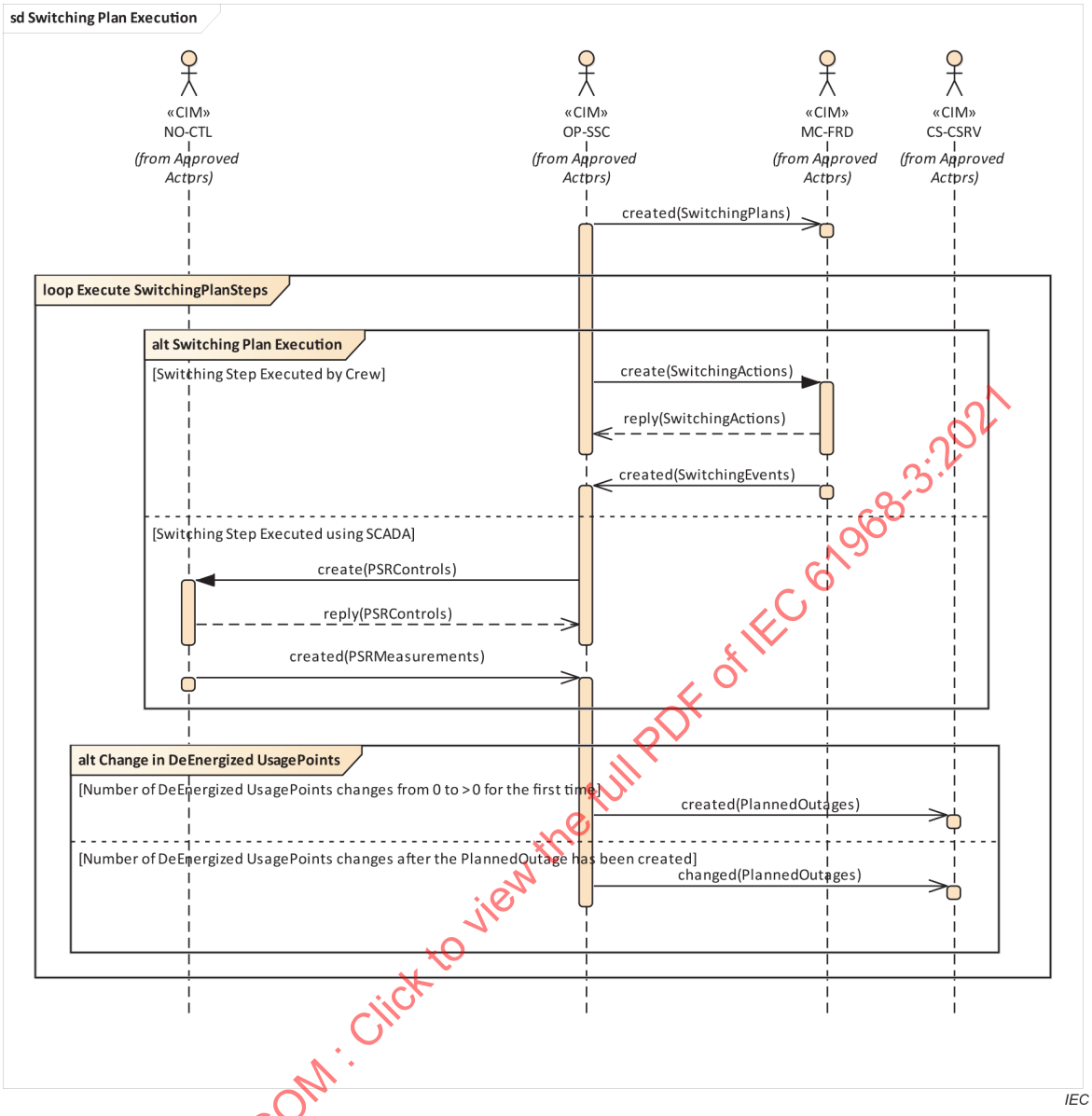
5.13.1 Généralités

Les charges utiles de messages **PlannedOutages** présentées à la Figure 82 communiquent les **PlannedOutages** pour vérifier que les autres parties de l'entreprise de distribution savent qu'une interruption planifiée est en cours.

- Une **PlannedOutage** est créée et change comme indiqué dans le diagramme de séquences de la Figure 81. La **PlannedOutage** est créée lorsque les étapes d'un **SwitchingPlan** sont exécutées, soit par une équipe sur le terrain soit à distance par SCADA, et que les premiers clients sont mis hors tension. Cela est indiqué par le nombre de **DeEnergizedUsagePoints** passant de zéro à une valeur non nulle.
- Une **PlannedOutage** change lorsque le **SwitchingPlan** continue de s'exécuter et que le nombre de clients impactés varie ou que le temps de rétablissement estimé change, par exemple. Le diagramme représente le nombre de clients impactés évoluant au fur et à mesure que le nombre de **DeEnergizedUsagePoints** passe d'une valeur non nulle à une autre valeur. Cela peut inclure un passage d'une valeur non nulle à une valeur nulle.

NOTE la **PlannedOutageNotification** et la **PlannedOutage** se distinguent par le fait que la **PlannedOutageNotification** est créée avant que le client ne soit mis hors service, alors que la **PlannedOutage** est créée dès le début de la commutation et que le premier client est hors service.

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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
SwitchingStep Executed by Crew	SwitchingStep exécutée par l'équipe
SwitchingStep Executed using SCADA	SwitchingStep exécutée à l'aide de SCADA
Number of DeEnergized UsagePoints changes from 0 to >0 for the first time	Le nombre de points d'utilisation hors tension passe pour la première fois de 0 à > 0
Number of DeEnergized UsagePoints changes after the PlannedOutage has been created	Le nombre de points d'utilisation hors tension change après la création de la PlannedOutage

Figure 81 – PlannedOutages – diagramme de séquences

Les informations **PlannedOutage** peuvent être utilisées par différentes applications selon le type et la cause de la **PlannedOutage.** Lors du cycle de vie de ces **PlannedOutage**s, les informations d'interruption sont mises à jour, y compris la modification d'état de l'interruption (l'interruption est en cours, l'interruption est terminée, l'alimentation des clients est partiellement ou complètement rétablie, etc.).

5.13.2 Charge utile de message

Les attributs du profil **PlannedOutages** sont décrits dans le Tableau 52.

Tableau 52 – Profil PlannedOutages

PlannedOutages				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
PlannedOutages	PlannedOutage	[1..*]		
Attributs de profil				
description	String	[0..1]		Champ textuel au format libre qui décrit la **PlannedOutage**
mRID	String	[0..1]	GUID	**mRID** de la **PlannedOutage**
Names	Name	[0..*]	Voir l'Article B.56	Peut être utilisé pour donner des informations supplémentaires telles que le nombre d'interruptions internes.
communityDescriptor	String	[0..1]		Nom décrivant la communauté - il peut s'agir d'un nom ou d'un code de même type.
createdDateTime	DateTime	[0..1]		DateTime à laquelle la PlannedOutage a été initialement créée.
customersRestored	Integer	[0..1]		Nombre de clients qui ont été rétablis dans la zone.
metersAffected	Integer	[0..1]		Nombre de compteurs mis à jour affectés par l'interruption, tel qu'indiqué par l'OMS dans l'entreprise de distribution. Par hypothèse, ce nombre est mis à jour régulièrement tant que l'ensemble de l'interruption n'a pas été résolue.
originalCustomersServed	Integer	[0..1]		Nombre total de clients qui sont servis dans la zone (interrompus et non interrompus).
originalMetersAffected	Integer	[0..1]		Nombre original de compteurs qui ont été affectés, tel qu'indiqué par l'OMS dans l'entreprise de distribution. En d'autres termes, il s'agit du nombre total de compteurs qui étaient hors service au début de l'interruption.
outageKind	OutageStatusKind	[0..1]	Énumération. Voir l'Article C.11	Pour une PlannedOutage, il convient uniquement de confirmer, rétablir ou fermer.
reason	String	[0..1]		Raison de la PlannedOutage
statusKind	CrewStatusKind	[0..1]	Énumération. Voir l'Article C.1	Définit le statut de l'équipe comme étant dépêché ou arrivé, etc. Si plusieurs équipes sont attribuées en même temps à la PlannedOutage, le statusKind doit être le statut dont la priorité est la plus élevée (voir le Tableau 57). Le statut "dépêché" des équipes individuelles est disponible dans la partie FieldDispatchHistory du fragment de charge utile Crew de ce profil. Voir l'Article B.22
subject	String	[0..1]		Chaîne qui décrit l'interruption

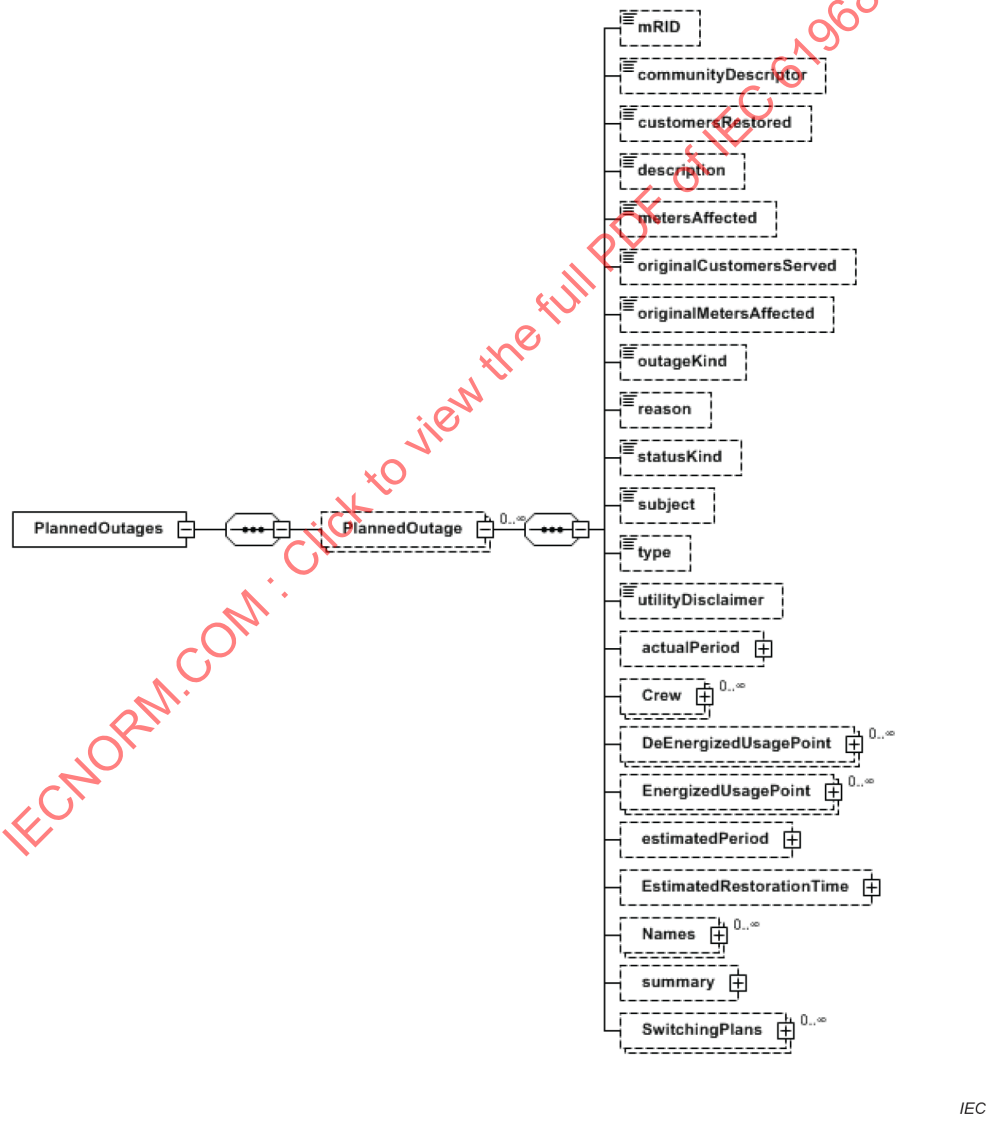
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PlannedOutages				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
type	String	[0..1]		Chaîne qui décrit l'étendue de l'interruption, par exemple client, transformateur de distribution, fusible, disjoncteur à réenclenchement, disjoncteur, etc.
utilityDisclaimer	String	[0..1]		Contient une clause de non-responsabilité que l'entreprise de distribution souhaiterait placer sur les données fournies par une partie prenante. Elle peut être différente selon les parties prenantes. Il convient qu'il s'agisse éventuellement d'un attribut de la classe Organization, mais il est désormais placé ici.
actualPeriod	DateTimeInterval	[0..1]		Période d'interruption actuelle. La fin de la période correspond au temps de rétablissement réel.
Crew	Crew	[0..*]	Voir l'Article B.22	Équipes attribuées à cette PlannedOutage.
DeEnergizedUsagePoint	UsagePoint	[0..*]	Voir l'Article B.27	Liste des points d'utilisation actuellement mis hors tension dans le cadre de cette interruption.
EnergizedUsagePoint	UsagePoint	[0..*]	Voir l'Article B.35	Liste des points d'utilisation qui étaient déjà hors tension dans le cadre de cette interruption, mais qui sont à présent sous tension.
EstimatedPeriod	DateTimeInterval	[0..1]		Durée estimée de la PlannedOutage
EstimatedRestorationTime	EstimatedRestorationTime	[0..1]	Voir l'Article B.38	Temps de restauration estimé pour une seule interruption
Summary	ServicePointOutageSummary	[0..1]	Voir l'Article B.77	Récapitulatif du nombre de clients hors service.
SwitchingPlans	SwitchingPlan	[0..*]	mRID, description et Names uniquement. Voir 5.8.2.	Liste des SwitchingPlans associés à ce PlannedOutage.

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Un **PlannedOutage** inclut

- Le nombre de clients affectés
- L'heure de début/fin réelle
- L'équipe
- Le listes des points d'utilisation (sous tension et hors tension) – voir l'Article B.27 et l'Article B.35
- L'heure de début/fin estimée
- La liste des incidents. En règle générale, un incident est associé à une interruption non planifiée. Toutefois, cela est nécessaire si une interruption planifiée doit être créée après le rétablissement d'une interruption non planifiée.
- La référence au **SwitchingPlan**
- Le récapitulatif des clients hors service



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Figure 82 – Charge utile de message PlannedOutages

5.13.3 Exemple XML

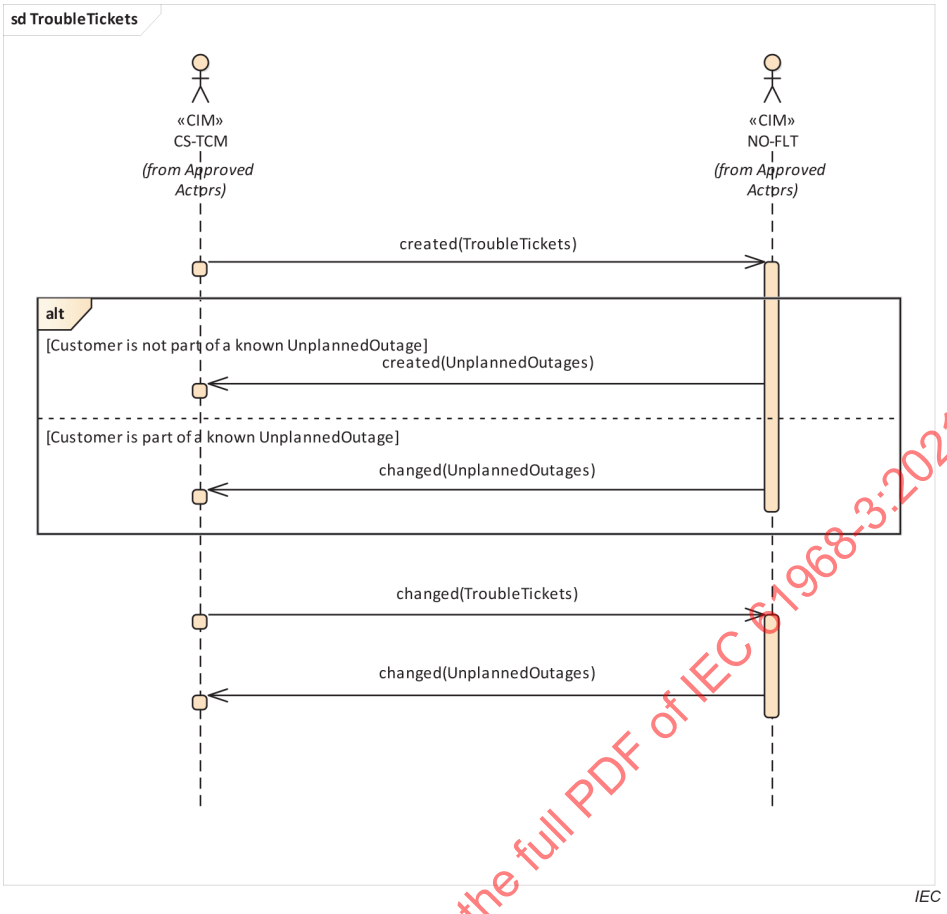
Dans cet exemple, la latitude/longitude de l'interruption planifiée est transmise dans les **DeEnergizedUsagePoints**. Un seul **DeEnergizedUsagePoint** est présenté, mais dans la pratique, il en existe un pour chaque UsagePoint faisant partie de l'interruption planifiée. Ces informations peuvent servir à présenter l'étendue de l'interruption sur une carte géographique.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:PlannedOutages xmlns:m="http://iec.ch/TC57/2019/PlannedOutages/#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/PlannedOutages/# PlannedOutages.xsd ">
  <m:PlannedOutage>
    <m:mRID>0aa85c42-2cb4-46e4-ae4d-380523b8a65c</m:mRID>
    <m:customersRestored>0</m:customersRestored>
    <m:description>Planned Outage in progress for example switching plan</m:description>
    <m:metersAffected>105</m:metersAffected>
    <m:outageKind>confirmed</m:outageKind>
    <m:reason>Planned Outage</m:reason>
    <m:statusKind>arrived</m:statusKind>
    <m:subject>Planned Outage In Progress</m:subject>
    <m:type>Planned</m:type>
    <m:Crew>
      <m:Names>
        <m:name>James Smedley IV</m:name>
      </m:Names>
    </m:Crew>
    <m:DeEnergizedUsagePoint>
      <m:mRID>cf6ca9ee-44c0-4e5e-8539-806042820bf6</m:mRID>
      <m:Names>
        <m:name>UP-121-AA-54343-CAB</m:name>
      </m:Names>
      <m:UsagePointLocation>
        <m:PositionPoints>
          <m:xPosition>55.103921:xPosition</m:xPosition>
          <m:yPosition>-90.203928</m:yPosition>
        </m:PositionPoints>
      </m:UsagePointLocation>
    </m:DeEnergizedUsagePoint>
    <m:estimatedPeriod>
      <m:end>2019-06-03T12:00:00</m:end>
      <m:start>2019-06-03T10:00:00</m:start>
    </m:estimatedPeriod>
    <m:Names>
      <m:name>PO-2019-04-142</m:name>
    </m:Names>
    <m:SwitchingPlans>
      <m:mRID>6571f4c4-acee-4024-8d1f-6c4a0398e5fa</m:mRID>
      <m:description>Example switching plan </m:description>
      <m:Names>
        <m:name>Switching Plan PO-2019-04-142</m:name>
      </m:Names>
    </m:SwitchingPlans>
  </m:PlannedOutage>
</m:PlannedOutages>
```

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5.14 Charge utile **TroubleTickets**

Les **TroubleTickets** sont des messages IEC 61968-8 utilisés par le présent document pour communiquer les incidents, interruptions et informations connexes consignés par le client tout au long du cycle de vie d'un appel sur incident. En règle générale, la gestion des appels sur incident (Trouble Call Management – TCM) reçoit de nouvelles informations d'interruption signalée par les clients. Les systèmes OMS et DMS peuvent utiliser ces informations pour l'analyse des interruptions/défauts. Après identification de l'interruption, une **UnplannedOutage** est créée pour suivre et répondre à l'interruption. La Figure 83 donne un exemple de séquence de création d'une **TroubleTicket**, de modification d'une **TroubleTicket**, de création d'une **UnplannedOutage** et de modification d'une **UnplannedOutage**. D'autres exemples sont donnés à l'Annexe A.



Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
Customer is not part of known UnplannedOutage	Le client ne fait pas partie d'une UnplannedOutage connue
Customer is part of known UnplannedOutage	Le client fait partie d'une UnplannedOutage connue

Figure 83 – Diagramme de séquences TroubleTickets

Pour de plus amples informations sur la charge utile **TroubleTickets**, voir l'IEC 61968-8.

5.15 Charge utile Incidents

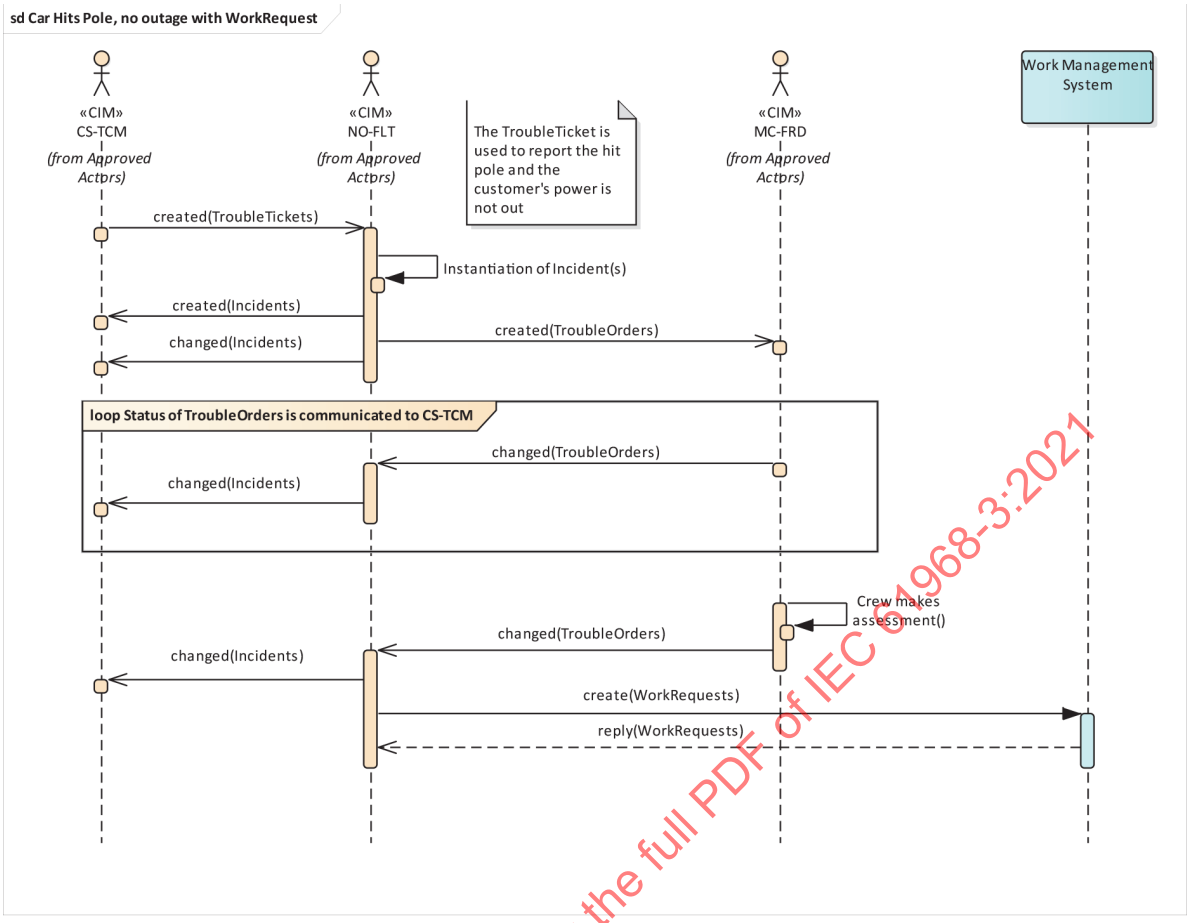
5.15.1 Généralités

Un **Incident** est une description d'une occurrence sur le terrain qui a ou peut avoir un impact sur le réseau. Un incident peut être consigné dans une fiche d'incident ou provenir d'une autre source. Il peut ou peut ne pas être associé à une interruption. Un exemple d'incident qui n'est pas associé à une interruption est un câble signalé au sol, mais qui n'est pas un câble de télévision par câble et ne génère pas d'interruption. Un exemple d'incident associé à une interruption non planifiée est une voiture qui percute un poteau et met les clients hors tension.

La Figure 84 est un diagramme de séquences qui donne un exemple du cycle de vie d'un **Incident**. Dans cet exemple, la fonction Gestion des défauts crée un **Incident** après avoir reçu une **TroubleTicket** qui ne signale aucun symptôme d'interruption. Dans cet exemple, une voiture percute un poteau, et des clients, des passants ou le personnel d'urgence contactent le centre d'appel de l'entreprise de distribution pour signaler l'**Incident**.

Une description complète du cas d'utilisation est proposée en A.8.

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Anglais	Français
Sd Car Hits Pole, no outage with WorkRequest	Sd Une voiture percute un poteau, par d'interruption avec WorkRequest
(from Approved Actors)	(des Acteurs approuvés)
The TroubleTicket is used to report the hit pole and the customer's power is not out	La TroubleTicket est utilisée pour signaler le poteau percuté et l'alimentation du client n'est pas coupée
Work Management System	Système de gestion des travaux
Instantiation of Incident(s)	Instanciation des Incident(s)
loop Status of TroubleOrders is communicated to CS-TCM	loop Statut des TroubleOrders communiqué au CS-TCM
Crew makes assessment()	L'équipe procède à une évaluation

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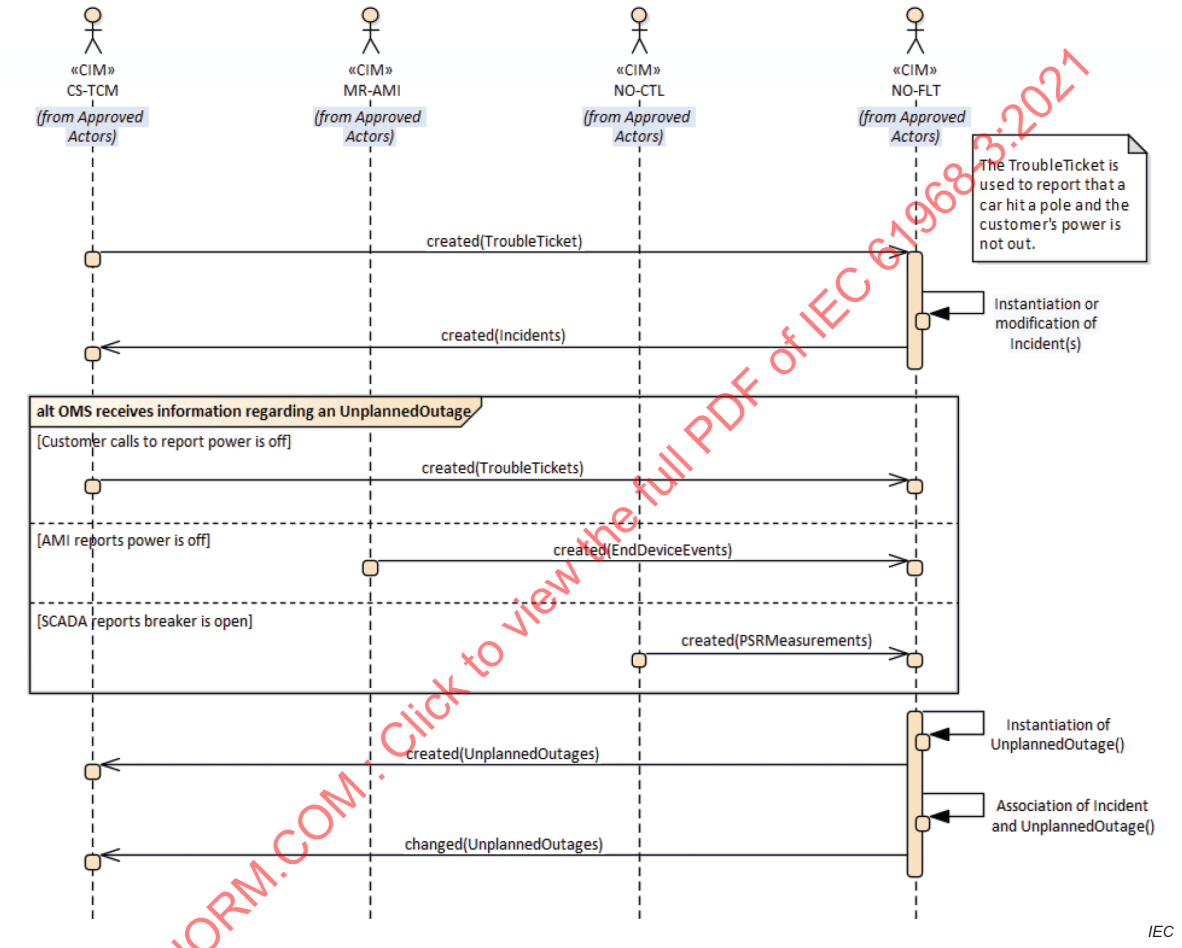
Figure 84 – Diagramme de séquences représentant le cycle de vie d'Incident

Un **Incident** peut être associé à une **UnplannedOutage** pendant le cycle de vie de l'**Incident**. Cela peut se produire, par exemple, lorsque des informations supplémentaires relatives à l'**Incident** sont reçues et qu'une **UnplannedOutage** est créée en conséquence. Ensuite, un utilisateur ou un système automatique associe l'**Incident** à la **UnplannedOutage**.

Un exemple est donné à la Figure 85, dans laquelle un **Incident** est initialement créé en l'absence d'interruption connue. Ensuite, des informations supplémentaires sont reçues d'un autre **TroubleTicket**, d'un **EndDeviceEvent** de l'AMI indiquant qu'un compteur a signalé la perte de puissance ou d'un **PSRMeasurement** provenant de SCADA indiquant qu'un disjoncteur s'est déclenché.

En conséquence de ces entrées, NO-FLT crée une **UnplannedOutage**. Un processus automatisé dans NO-FLT ou un utilisateur associe l'**Incident** à la **UnplannedOutage**. Il en résulte que l'**Incident** est associé à la **UnplannedOutage** et qu'une notification **changed** (modifiée) pour la **UnplannedOutage** est envoyée à la CS-TCM. L'exemple de diagramme ne représente pas de changed(**Incidents**) explicites dès que l'**Incident** a été associé à l'**UnplannedOutage**, car il est pris pour hypothèse que le destinataire fait cette association de son côté de l'interface et suit l'**Incident** avec la **UnplannedOutage**.

Une description complète du cas d'utilisation est donnée à l'Article A.9.



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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
The TroubleTicket is used to report the car hit the pole and the customer's power is not out	La TroubleTicket est utilisée pour signaler que la voiture a percuté le poteau et que l'alimentation du client n'est pas coupée
Instantiation or modification of Incident(s)	Instanciation ou modification des Incident(s)
alt OMS receives information regarding an UnplannedOutage	alt OMS reçoit des informations relatives à une UnplannedOutage
(Customer calls to report power is off)	(le client appelle pour signaler que l'alimentation est coupée)
(AMI reports power is off)	(AMI signale que l'alimentation est coupée)
(SCADA reports breaker is open)	(SCADA signale que le disjoncteur est ouvert)
Instantiation of UnplannedOutage()	Instanciation des UnplannedOutage()
Association of Incident and UnplannedOutage()	Association d'Incident et d'UnplannedOutage()

Figure 85 – Diagramme de séquences présentant l'association de l'Incident à la UnplannedOutage

5.15.2 Charge utile de message

La charge utile de message d'**Incidents** est présentée à la Figure 86. Un **Incident** peut être associé à zéro, un ou plusieurs **TroubleTickets** (voir 5.14), à zéro, un ou plusieurs **Hazard** (voir B.46) et à zéro ou une **UnplannedOutage** (voir 5.17.3).

Les attributs du profil **Incidents** sont décrits dans le Tableau 53.

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Tableau 53 – Profil Incidents

Incidents					
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**	**Profils utilisés dans, en plus de ce profil.**
Incidents	Incident	[1..*]			
Attributs de profil					
description	String	[0..1]		Champ textuel au format libre qui décrit l'**Incident**	TroubleOrders UnplannedOutages
mRID	String	[0..1]	GUID	mRID de l'Incident.	TroubleOrders UnplannedOutages
Names	Name	[0..*]	Voir l'Article B.56	Peut être utilisé pour donner des informations supplémentaires telles que le nombre d'incidents internes.	TroubleOrders UnplannedOutages
cause	String	[0..1]		Peut ne pas être connue tôt dans le cycle de vie de l'**Incident**, mais peut être renseignée dès que l'information est connue.	TroubleOrders
createdDateTime	DateTime	[0..1]		DateTime à laquelle l'Incident a été initialement créé.	TroubleOrders
lastModifiedDateTime	DateTime	[0..1]		DateTime de la dernière modification de l'Incident.	TroubleOrders
Assets	Asset	[0..*]	Voir l'Article B.9	Liste des **Assets** associés à cet Incident, le cas échéant. Même en l'absence d'**Assets**, l'association peut être utilisée pour identifier les **PowerSystemResource**s associées à l'**Incident** ainsi qu'au **Feeder** et au **Substation**, le cas échéant.	
Hazard	Hazard	[0..*]	Voir l'Article B.46	Conditions dangereuses associées à cet Incident, le cas échéant.	TroubleOrders UnplannedOutages
Location	Location	[0..1]	Voir l'Article B.52	Donne des informations géographiques plus précises que la description ci-dessus.	
status	Status	[0..1]	Voir l'Article B.79	Utilisé pour indiquer si l'**Incident** est ouvert ou fermé.	TroubleOrders
TroubleTickets	TroubleTicket	[0..*]	Voir 5.14.	mRID, description et Names uniquement.	
UnplannedOutage	UnplannedOutage	[0..1]	Voir 5.17.3.	mRID, description et Names uniquement.	

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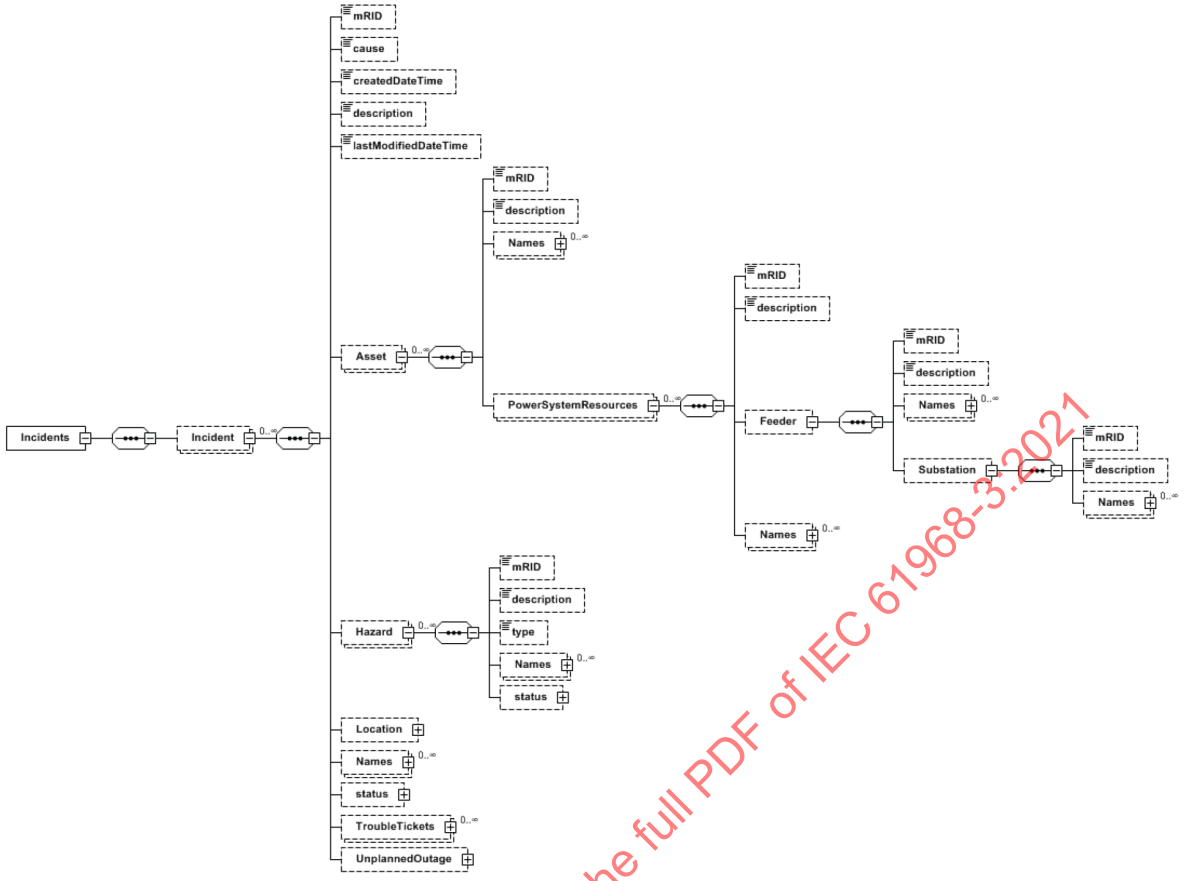


Figure 86 – Charge utile Incident

5.15.3 Exemple XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:Incidents xmlns:m="http://iec.ch/TC57/2019/Incidents#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/Incidents# Incidents.xsd ">
  <m:Incident>
    <m:mRID>a80f0cb3-5e58-401d-8f26-1e4d6011d07a</m:mRID>
    <m:cause>Car Hit Pole</m:cause>
    <m:createdDateTime>2019-06-03T11:25:00</m:createdDateTime>
    <m:description>Car hit pole at 17 Station Road in Sidcup, South of Police
Station</m:description>
    <m:lastModifiedDateTime>2019-06-03T11:26:00</m:lastModifiedDateTime>
    <m:Hazard>
      <m:type>Car hit pole ; pole burning</m:type>
      <m:status>
        <m:dateTime>2019-06-03T11:27:00</m:dateTime>
        <m:reason>New</m:reason>
        <m:value>Unresolved</m:value>
      </m:status>
    </m:Hazard>
    <m:Location>
      <m:direction>17 Station Road in Sidcup, South of Police Station</m:direction>
      <m:mainAddress>
        <m:postalCode>DA17 6BW</m:postalCode>
        <m:streetDetail>
          <m:addressGeneral>Station Road</m:addressGeneral>
          <m:number>17</m:number>
        </m:streetDetail>
        <m:townDetail>
          <m:name>Sidcup</m:name>
        </m:townDetail>
      </m:mainAddress>
    </m:Location>
    <m:Names>
      <m:name>Incident #890911</m:name>
```

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```
    </m:Names>
    <m:status>
      <m:dateTime>2019-06-03T11:31:00</m:dateTime>
      <m:reason>New</m:reason>
      <m:value>Unresolved</m:value>
    </m:status>
    <m:TroubleTickets>
      <m:mRID>c95251c5-bf5f-4657-a9fb-0178fdff3f70</m:mRID>
      <m:description>Car hit pole at 17 Station Road</m:description>
      <m:Names>
        <m:name>Ticket # 4398402</m:name>
      </m:Names>
    </m:TroubleTickets>
  </m:Incident>
</m:Incidents>
```

5.16 Charge utile **EquipmentFaults**

5.16.1 Généralités

Un **EquipmentFault** est un défaut appliqué au niveau de la borne, externe à l'équipement. Cette classe n'est pas utilisée pour spécifier les défauts internes à l'équipement.

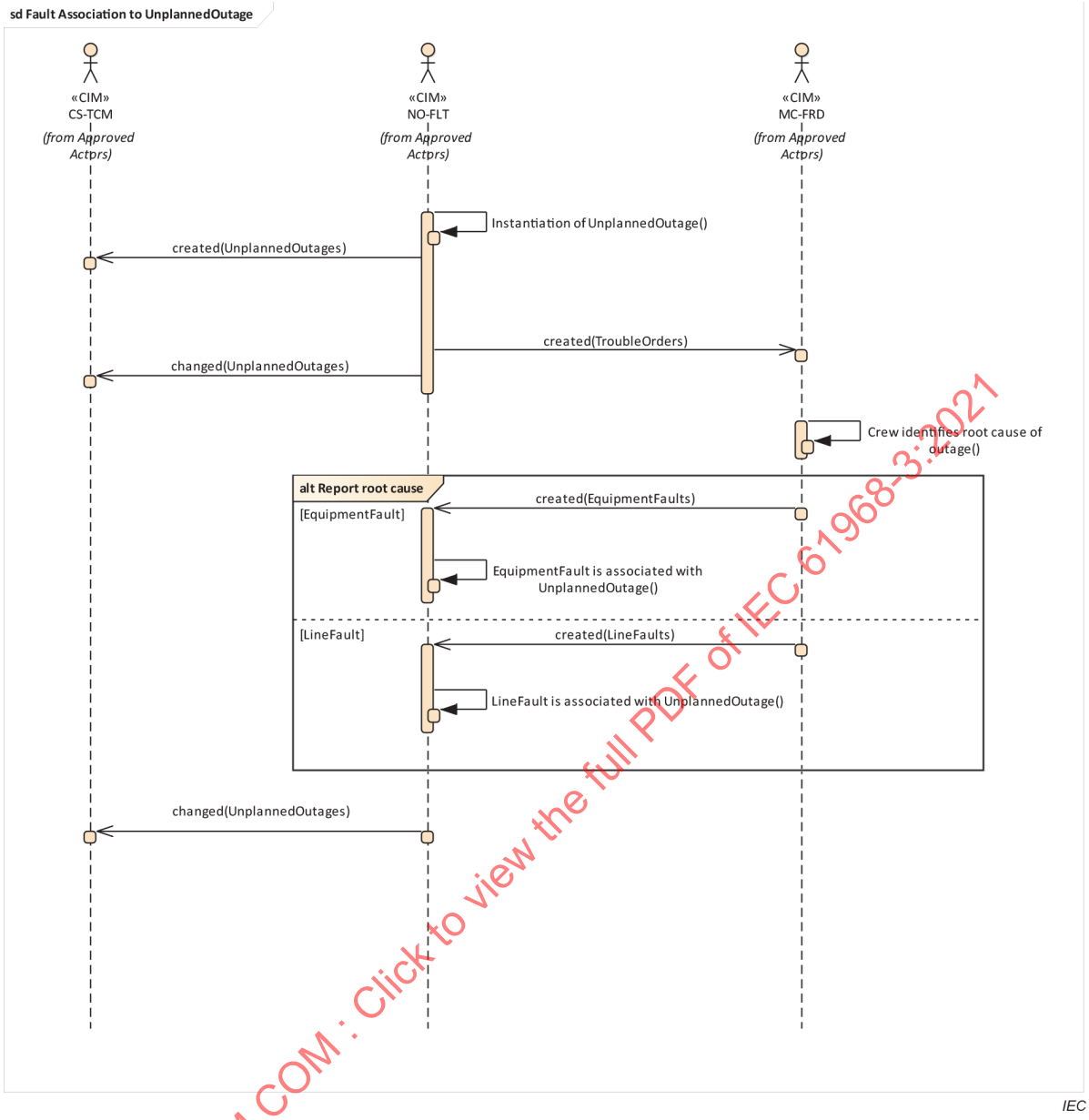
Les charges utiles de messages **EquipmentFaults**, présentées à la Figure 89, communiquent les informations détaillées relatives au défaut dans le cadre des messages **UnplannedOutages**. Les **EquipmentFaults** définissent tous les types de défauts qui se produisent sur un équipement conducteur, à l'exception des lignes, qui sont couvertes par des **LineFaults** (voir 5.17). Ces informations sont ajoutées dès que le défaut est détecté et confirmé par une équipe. Le défaut de l'équipement est identifié par l'équipement conducteur concerné et peut avoir un lien avec le bien correspondant.

Un diagramme de séquences qui donne un moyen possible d'associer un **EquipmentFault** à une **UnplannedOutage** est présenté à la Figure 87 (les événements qui déclenchent l'instanciation et la création de la **UnplannedOutage** sont ignorés par souci de concision).

Le diagramme présente la création des **UnplannedOutages**, puis des **TroubleOrders** envoyés à une équipe sur le terrain. L'équipe sur le terrain identifie ensuite la cause profonde de l'interruption non planifiée, et cette information est envoyée dans un message **EquipmentFaults** à la salle de commande. L'élément **EquipmentFaults** peut également être utilisé dans la charge utile **TroubleOrders**.**UnplannedOutage** (voir 5.21.2.3) pour atteindre le même objectif.

Le diagramme présente également une alternative, dans laquelle un **LineFaults** est envoyé en lieu et place d'un **EquipmentFaults** (voir 5.17).

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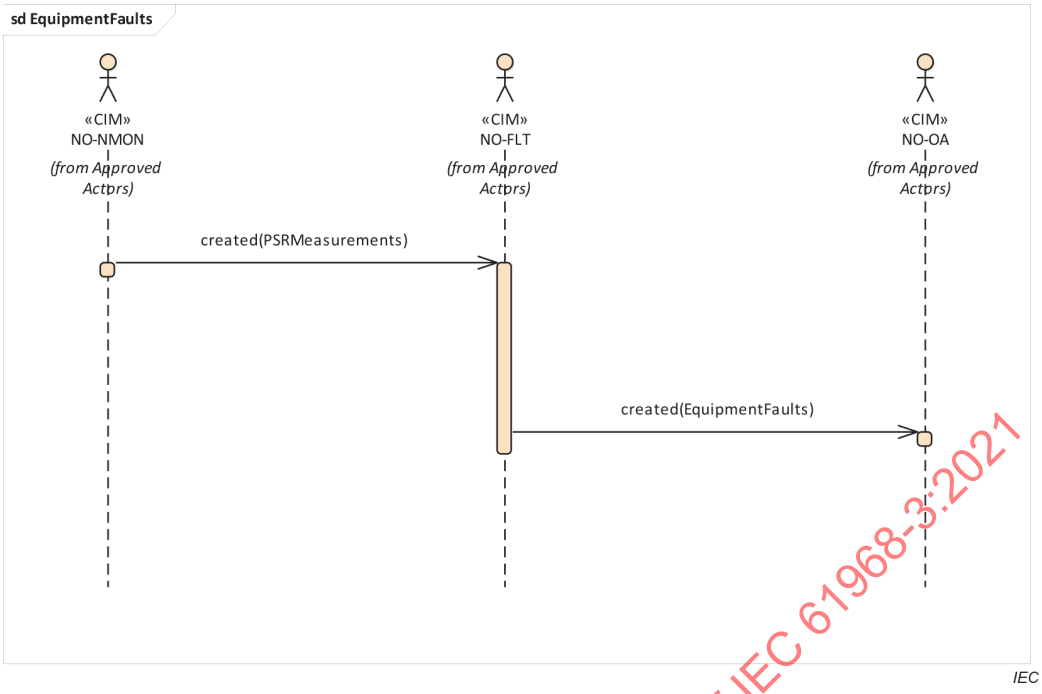
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Anglais	Français
sd FaultAssociation to UnplannedOutage	sd FaultAssociation à UnplannedOutage
(from Approved Actors)	(des Acteurs approuvés)
Instantiation of UnplannedOutage()	Instanciation des UnplannedOutage()
Crew identifies root cause of outage()	L'équipe identifie la cause profonde de l'interruption()
alt Report root case	alt Signalisation de la cause profonde
EquipmentFault is associated to UnplannedOutage()	EquipmentFault est associé à UnplannedOutage()
LineFault is associated to UnplannedOutage()	LineFault est associé à UnplannedOutage()

Figure 87 – Association de LineFaults/EquipmentFaults à UnplannedOutage

Les charges utiles de messages **EquipmentFaults** peuvent également être utilisées pour communiquer les informations de défaut (pour signaler les cas d'utilisation, par exemple).

Un autre exemple de création d'un **EquipmentFault** est présenté à la Figure 88. Cela peut être utilisé lorsque la fonction FLISR réside dans un système différent du système de gestion des interruptions et que les informations **EquipmentFault** doivent être communiquées entre les deux systèmes.



Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)

Figure 88 – Diagramme de séquences EquipmentFaults

5.16.2 Charge utile de message

La charge utile de message de **EquipmentFaults** est présentée sous forme graphique à la Figure 89. Les attributs sont décrits dans le Tableau 54.

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Tableau 54 – Charge utile EquipmentFaults

Faults: LineFaults				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
EquipmentFaults	EquipmentFault	[1..*]		
Attributs de profil				
description	String	[0..1]		Champ textuel au format libre qui décrit l'**EquipmentFault.**
mRID	String	[0..1]	GUID	mRID de l'EquipmentFault.
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour l'EquipmentFault.
kind	PhaseConnectedFaultKind	[0..1]	Voir l'Article C.13	Type de défaut de phase.
occuredDateTime	DateTime	[0..1]		Date et heure auxquelles le défaut s'est produit.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases participant au défaut. Les connexions de défaut dans ces phases sont spécifiées plus en détail par le type de défaut.
FaultCauseTypes	FaultCauseType	[0..*]	Voir l'Article B.40	Type de cause du défaut. Il peut y avoir zéro, une ou plusieurs causes de défaut (la météo et une défaillance de l'équipement, par exemple).
FaultyEquipment	Equipment	[0..1]	Voir l'Article B.37	Équipement qui fait l'objet du défaut.
Location	Location	[0..1]	Voir l'Article B.52	Emplacement géographique du défaut.
Terminal	Terminal	[0..1]	Voir l'Article B.90	Borne reliée au bus auquel le défaut est appliqué.

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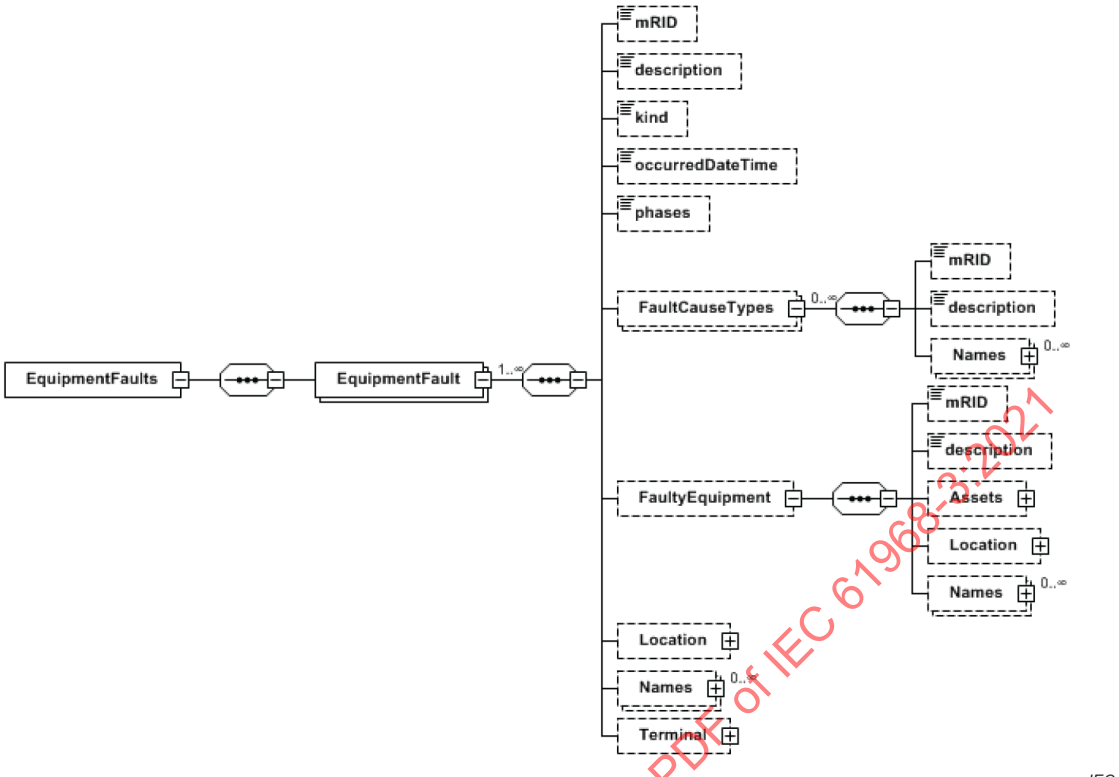


Figure 89 – Charge utile de message EquipmentFaults

5.16.3 Exemple XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:EquipmentFaults xmlns:m="http://iec.ch/TC57/2019/EquipmentFaults#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/EquipmentFaults# EquipmentFaults.xsd ">
  <m:EquipmentFault>
    <m:mRID>d1e0d296-9bc5-4c3d-6383-e9bf93c20ac9</m:mRID>
    <m:occurredDateTime>2019-06-03T11:49:00</m:occurredDateTime>
    <m:phases>A</m:phases>
    <m:FaultCauseTypes>
      <m:Names>
        <m:name>Over current</m:name>
      </m:Names>
    </m:FaultCauseTypes>
    <m:FaultyEquipment>
      <m:mRID>445ebf37-a17a-4820-b450-b939c5769a12</m:mRID>
      <m:Assets>
        <m:Names>
          <m:name>Furman 34kV F06 R-066</m:name>
        </m:Names>
      </m:Assets>
      <m:Location>
        <m:direction>At intersection of Gatehouse Drive and Dead Mouse Creek</m:direction>
        <m:mainAddress>
          <m:townDetail>
            <m:name>Thorton Heath</m:name>
            <m:stateOrProvince>Arizona</m:stateOrProvince>
          </m:townDetail>
        </m:mainAddress>
      </m:Location>
      <m:Names>
        <m:name>Furman 34kV F06 R-066</m:name>
      </m:Names>
    </m:FaultyEquipment>
  </m:EquipmentFault>
</m:EquipmentFaults>
```

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5.17 Charge utile **LineFaults**

5.17.1 Généralités

Une **LineFault** est un défaut qui se produit sur un segment de ligne en courant alternatif à un certain point sur la longueur.

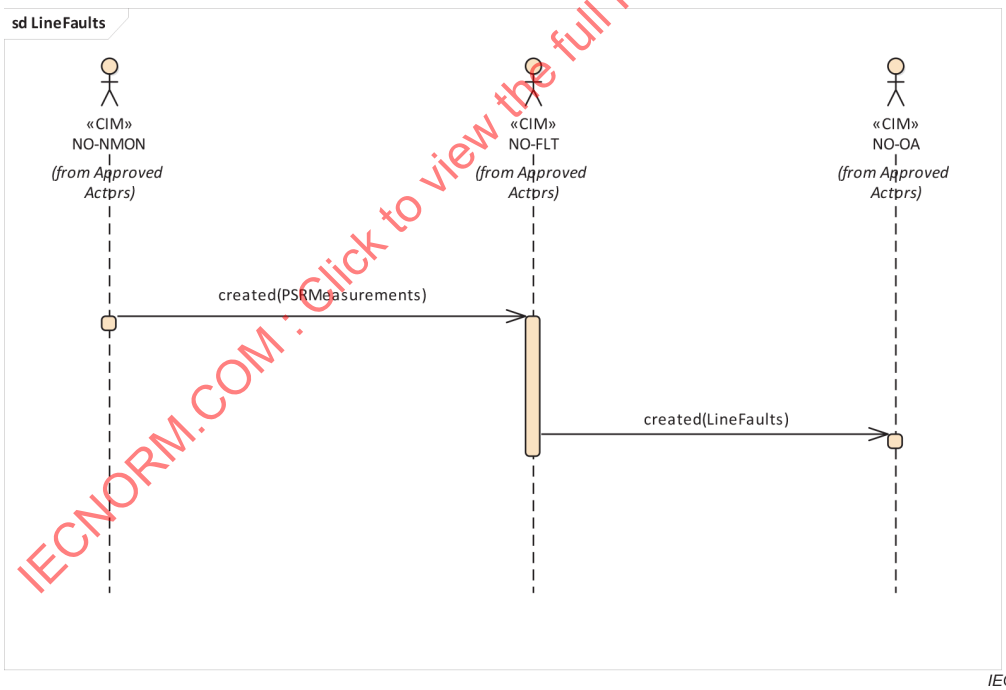
Les messages **LineFaults** communiquent les informations détaillées relatives au défaut dans le cadre des messages **UnplannedOutages**. Les **LineFaults** définissent tous les types de défauts qui se produisent sur des segments de ligne en courant alternatif. Ces informations sont ajoutées dès que le défaut est détecté et confirmé par une équipe. Le défaut est identifié par le segment de ligne en courant alternatif concerné et peut avoir un lien avec le bien correspondant.

Un diagramme de séquences présentant un moyen possible d'associer une **LineFault** à une **UnplannedOutage** est présenté à la Figure 87.

Les charges utiles de messages **LineFaults** peuvent également être utilisées pour communiquer les informations de défaut (pour signaler les cas d'utilisation, par exemple).

Un autre exemple de création d'un **LineFault** est présenté à la Figure 90. Cela peut être utilisé lorsque la fonction FLISR réside dans un système différent du système de gestion des interruptions et que les informations **LineFault** doivent être communiquées entre les deux systèmes.

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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)

Figure 90 – Diagramme de séquences LineFaults

5.17.2 Charge utile de message

La Figure 91 présente la charge utile de message **LineFaults** sous forme graphique. Les détails sont donnés dans le Tableau B.68.

Tableau 55 – Charge utile LineFaults

Faults: LineFaults				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
LineFaults	LineFault	[1..*]		
Attributs de profil				
description	String	[0..1]		Champ textuel au format libre qui décrit le **LineFault.**
mRID	String	[0..1]	GUID	mRID du LineFault.
Names	Name	[0..*]	Voir l'Article B.56	Noms lisibles par l'homme pour le LineFault.
kind	PhaseConnectedFaultKind	[0..1]	Voir l'Article C.13	Type de défaut de phase.
lengthFromTerminal1	Length	[0..1]		La longueur par rapport à l'endroit où se trouve le défaut est déterminée en commençant par la borne avec le numéro de séquence 1 du segment de ligne défectueux.
occuredDateTime	DateTime	[0..1]		Date et heure auxquelles le défaut s'est produit.
phases	PhaseCode	[0..1]	Voir l'Article C.12	Phases participant au défaut. Les connexions de défaut dans ces phases sont spécifiées plus en détail par le type de défaut.
ACLineSegment	ACLineSegment	[0..1]	Voir l'Article B.4	ACLineSegment dans lequel s'est produit le défaut.
FaultCauseTypes	FaultCauseType	[0..*]	Voir l'Article B.40	Type de cause du défaut. Il peut y avoir zéro, une ou plusieurs causes de défaut (la météo et un câble au sol, par exemple).
impedance	FaultImpedance	[0..1]	Voir l'Article B.39	Impédance de défaut. Son utilisation est décrite par "kind".
Location	Location	[0..1]	Voir l'Article B.52	Emplacement géographique du défaut.

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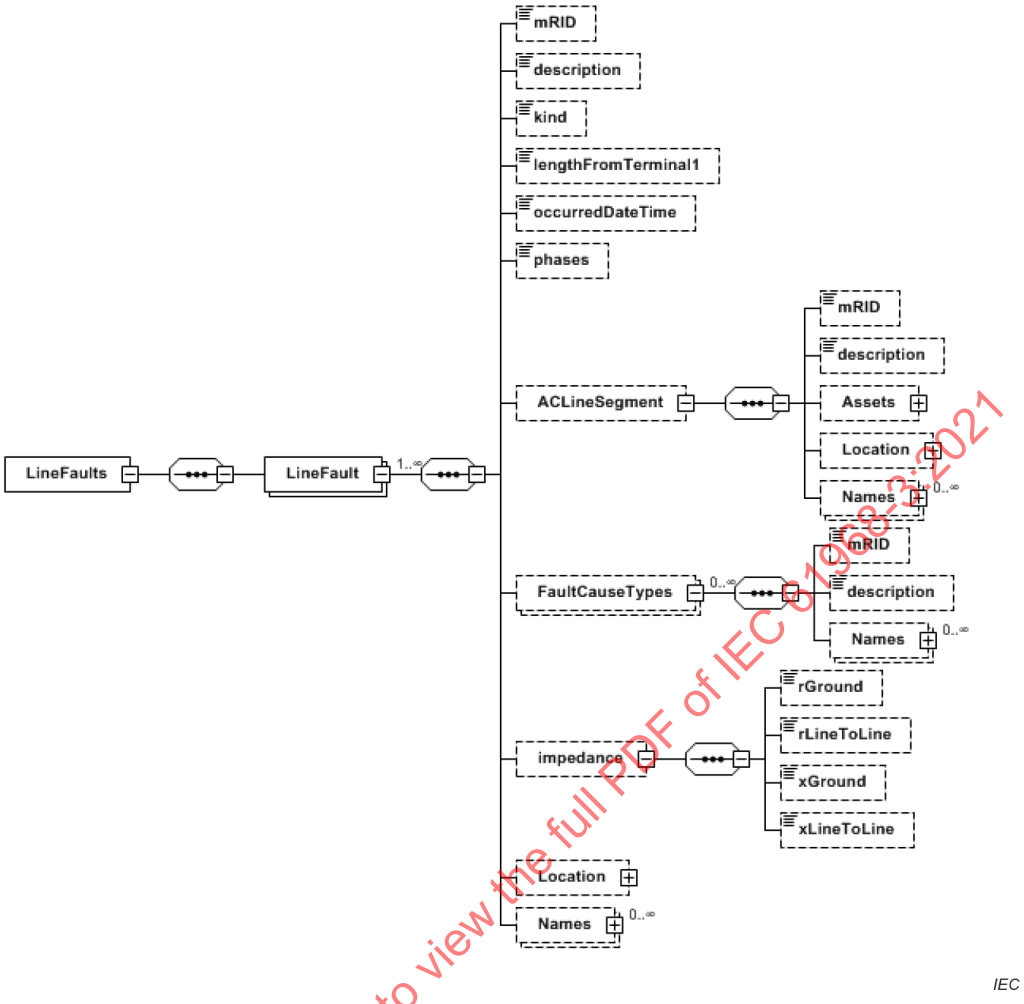


Figure 91 – Charge utile de message LineFaults

5.17.3 Exemple XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:LineFaults xmlns:m="http://iec.ch/TC57/2019/LineFaults#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/LineFaults# LineFaults.xsd ">
  <m:LineFault>
    <m:mRID>cce3f88e-7ecb-442e-8aa6-8dab3bb04795</m:mRID>
    <m:kind>lineOpen</m:kind>
    <m:lengthFromTerminal1>125,0</m:lengthFromTerminal1>
    <m:occurredDateTime>2019-06-03T12:02:00</m:occurredDateTime>
    <m:phases>A</m:phases>
    <m:ACLineSegment>
      <m:mRID>b7e3453e-63ec-4203-898e-d23b8876f1f7</m:mRID>
    </m:ACLineSegment>
    <m:Location>
      <m:PositionPoints>
        <m:xPosition>35.7718409</m:xPosition>
        <m:yPosition>-78.6801357</m:yPosition>
      </m:PositionPoints>
    </m:Location>
  </m:LineFault>
</m:LineFaults>
```

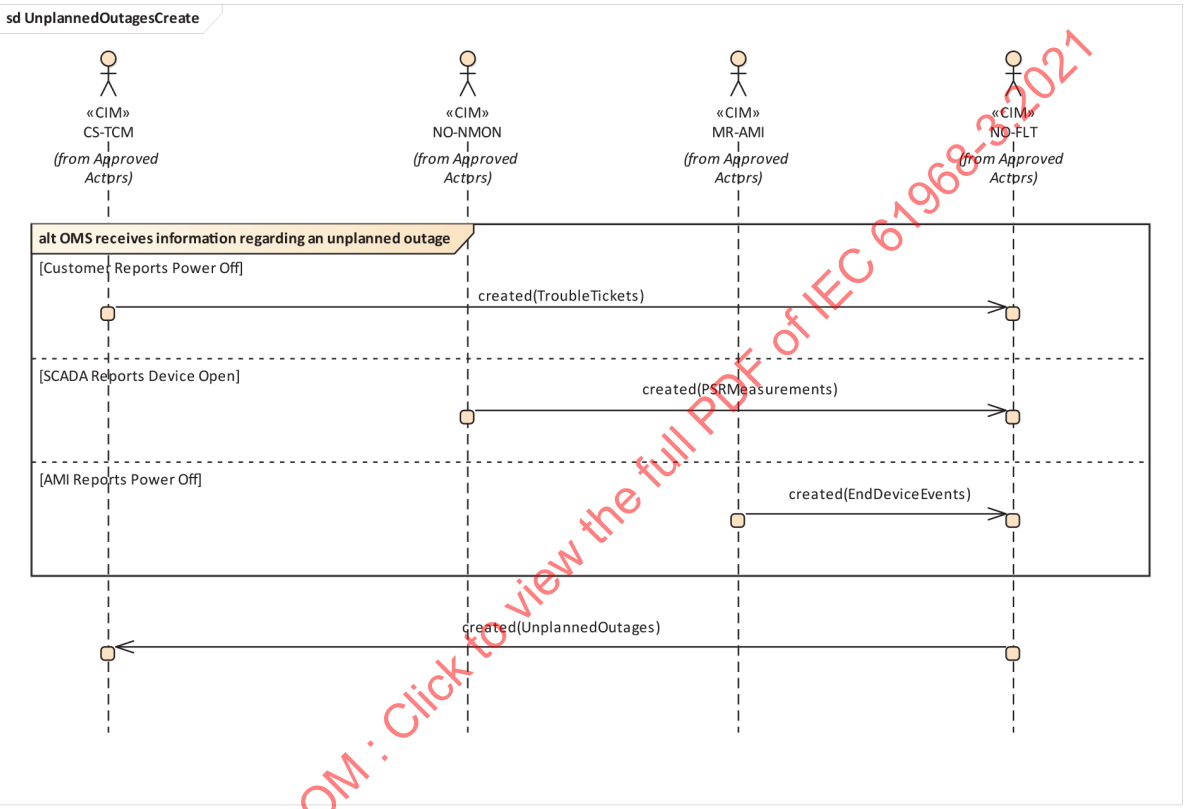
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5.18 Charge utile **UnplannedOutages**

5.18.1 Généralités

Une interruption non planifiée fait référence à un état imprévu dans lequel l'énergie n'est pas délivrée.

Les charges utiles de messages **UnplannedOutage** communiquent les interruptions non planifiées. Une **UnplannedOutage** peut être créée comme indiqué dans le diagramme de séquences de la Figure 92. Des **UnplannedOutage**s peuvent se produire après des défauts (des défauts de court-circuit et des lignes à terre, par exemple).



Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
alt OMS receives information regarding an unplanned outage	alt OMS reçoit des informations relatives à une interruption non planifiée
Customer Reports Power Off	Le client signale une coupure d'alimentation
SCADA reports device open	SCADA signale l'ouverture du dispositif
AMI Reports Power Off	AMI signale une coupure d'alimentation

Figure 92 – Diagramme de séquences UnplannedOutages

Une **UnplannedOutage** peut être créée en conséquence de l'un des déclencheurs suivants:

- après que des dispositifs à distance ont détecté une interruption (un déclenchement de dispositif détecté par SCADA, par exemple). SCADA (NO-CTL) crée un **PSRMeasuresments** et l'envoie à NO-FLT, qui crée l'**UnplannedOutage**;
- AMI détecte une dernière notification de mise hors tension provenant d'un compteur. MR-AMI crée un **EndDeviceEvent** et l'envoie à NO-FLT, qui crée l'**UnplannedOutage**;
- un client signale que son alimentation est coupée. Le service client (CS-TCM) crée une **TroubleTicket** et l'envoie à NO-FLT, qui crée l'**UnplannedOutage**.

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Les informations **UnplannedOutage** peuvent être utilisées par différentes applications selon le type et la cause de l'UnplannedOutage.

- Après qu'une UnplannedOutage a été confirmée, la gestion de défauts demande un plan de commutation pour l'isolement et la restauration de services. En fonction de cette demande, une application (c'est-à-dire une Switch Action Scheduling – Programmation des actions de commutation) détermine les étapes nécessaires à l'isolement du défaut et à la restauration de la puissance des îlots sains du réseau. Les variantes peuvent donner des informations supplémentaires qui aident l'utilisateur à choisir la meilleure alternative.
- Lors du cycle de vie des interruptions, les informations d'interruption sont mises à jour, pour indiquer par exemple la modification d'état de l'interruption (temps de restauration prévu, l'alimentation des clients est partiellement ou complètement rétablie, etc.).

Des informations détaillées relatives à l'équipement ou la ligne faisant l'objet d'un défaut sont communiquées dans le cadre d'une **UnplannedOutage** en tant qu'**EquipmentFault** et que **LineFault** (voir 5.16 pour **EquipmentFault** et 5.16.3 pour les profils **LineFault**). Une **UnplannedOutage** peut inclure zéro (c'est-à-dire que le défaut n'est pas encore détecté) à plusieurs défauts de l'équipement et/ou de la ligne.

5.18.2 Charge utile de message

La Figure 93 présente la charge utile pour les **UnplannedOutages** à un niveau élevé.

Les attributs du profil **UnplannedOutages** sont décrits dans le Tableau 56.

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Tableau 56 – Profil UnplannedOutages

UnplannedOutages					
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**	**Profils utilisés dans, en plus de ce profil.**
UnplannedOutages	UnplannedOutage	[1..*]			
Attributs de profil					
description	String	[0..1]		Champ textuel au format libre qui décrit l'**UnplannedOutage**	TroubleOrders
mRID	String	[0..1]	GUID	**mRID** de l'**UnplannedOutage**	TroubleOrders
Names	Name	[0..*]	Voir l'Article B.56	Peut être utilisé pour donner des informations supplémentaires telles que le nombre d'interruptions internes.	TroubleOrders
cause	String	[0..1]		Cause de cette interruption. Il s'agit de la cause présentée aux entités externes. En d'autres termes, la cause est météorologique, une défaillance de l'équipement, etc. Note: Actuellement, il s'agit d'un texte libre. Il peut être remplacé par une autre classe associée en présence de plusieurs causes (par exemple, OutageCauseType, qui hérite d'IdentifiedObject). Il convient de noter qu'EquipmentFault et que LineFault prennent en charge plusieurs FaultCauseTypes, de manière à pouvoir capturer les informations et les récapituler dans le champ du message dévolu à la cause. Peut ne pas être connue tôt dans le cycle de vie de l'**UnplannedOutage**, mais peut être renseignée dès que l'information est connue.	TroubleOrders
causeKind	OutageCauseKind	[0..1]	Voir l'Article C.9	Cette énumération décrit la cause principale de l'interruption - planifiée, non planifiée, etc.	TroubleOrders
comment	String	[0..1]		Commentaires de l'opérateur associés à l'interruption.	TroubleOrders
communityDescriptor	String	[0..1]		Nom décrivant la communauté - il peut s'agir d'un nom ou d'un code de même type.	
createdDateTime	DateTime	[0..1]		DateTime à laquelle l'UnplannedOutage a été initialement créée.	
customersRestored	Integer	[0..1]		Nombre de clients qui ont été rétablis dans la zone.	TroubleOrders
lastModifiedDateTime	DateTime	[0..1]		DateTime de la dernière modification de l'UnplannedOutage.	

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UnplannedOutages					
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**	**Profils utilisés dans, en plus de ce profil.**
metersAffected	Integer	[0..1]		Nombre de compteurs mis à jour affectés par l'interruption, tel qu'indiqué par le système OMS dans l'entreprise de distribution. Par hypothèse, ce nombre est mis à jour régulièrement tant que l'ensemble de l'interruption n'a pas été résolue.	TroubleOrders
originalCustomersServed	Integer	[0..1]		Nombre total de clients qui sont servis dans la zone (interrompus et non interrompus).	
originalMetersAffected	Integer	[0..1]		Nombre original de compteurs qui ont été affectés, tel qu'indiqué par l'OMS dans l'entreprise de distribution. En d'autres termes, il s'agit du nombre total de compteurs qui étaient hors service au début de l'interruption.	
outageKind	OutageStatusKind	[0..1]	Voir l'Article C.11	Définit si l'interruption a été vérifiée ou si elle est uniquement estimée	TroubleOrders
reportedStartTime	DateTime	[0..1]		DateTime du premier appel ou de l'événement AMI à l'origine de l'interruption	TroubleOrders
statusKind	CrewStatusKind	[0..1]	Énumération. Voir l'Article C.1	Définit le statut de l'équipe comme étant dépêché ou arrivé, etc. Si plusieurs équipes sont attribuées en même temps à l'UnplannedOutage, le statusKind doit être le statut dont la priorité est la plus élevée (voir le Tableau 57). Le statut "dépêché" des équipes individuelles est disponible dans la partie FieldDispatchHistory du fragment de charge utile Crew de ce profil. Voir l'Article B.22	TroubleOrders
subject	String	[0..1]		Chaîne qui décrit l'interruption	TroubleOrders
type	String	[0..1]		Chaîne qui décrit l'étendue de l'interruption, par exemple client, transformateur de distribution, fusible, disjoncteur à réenclenchement, disjoncteur, etc.	TroubleOrders
utilityDisclaimer	String	[0..1]		Contient une clause de non-responsabilité que l'entreprise de distribution souhaiterait placer sur les données fournies par une partie prenante. Elle peut être différente selon les parties prenantes. Il convient qu'il s'agisse éventuellement d'un attribut de la classe Organization, mais il est désormais placé ici.	
actualPeriod	DateTimeInterval	[0..1]		Période d'interruption actuelle. La fin de la période correspond au temps de rétablissement réel.	TroubleOrders
Crew	Crew	[0..*]	Voir l'Article B.22	Équipes attribuées à cette UnplannedOutage.	

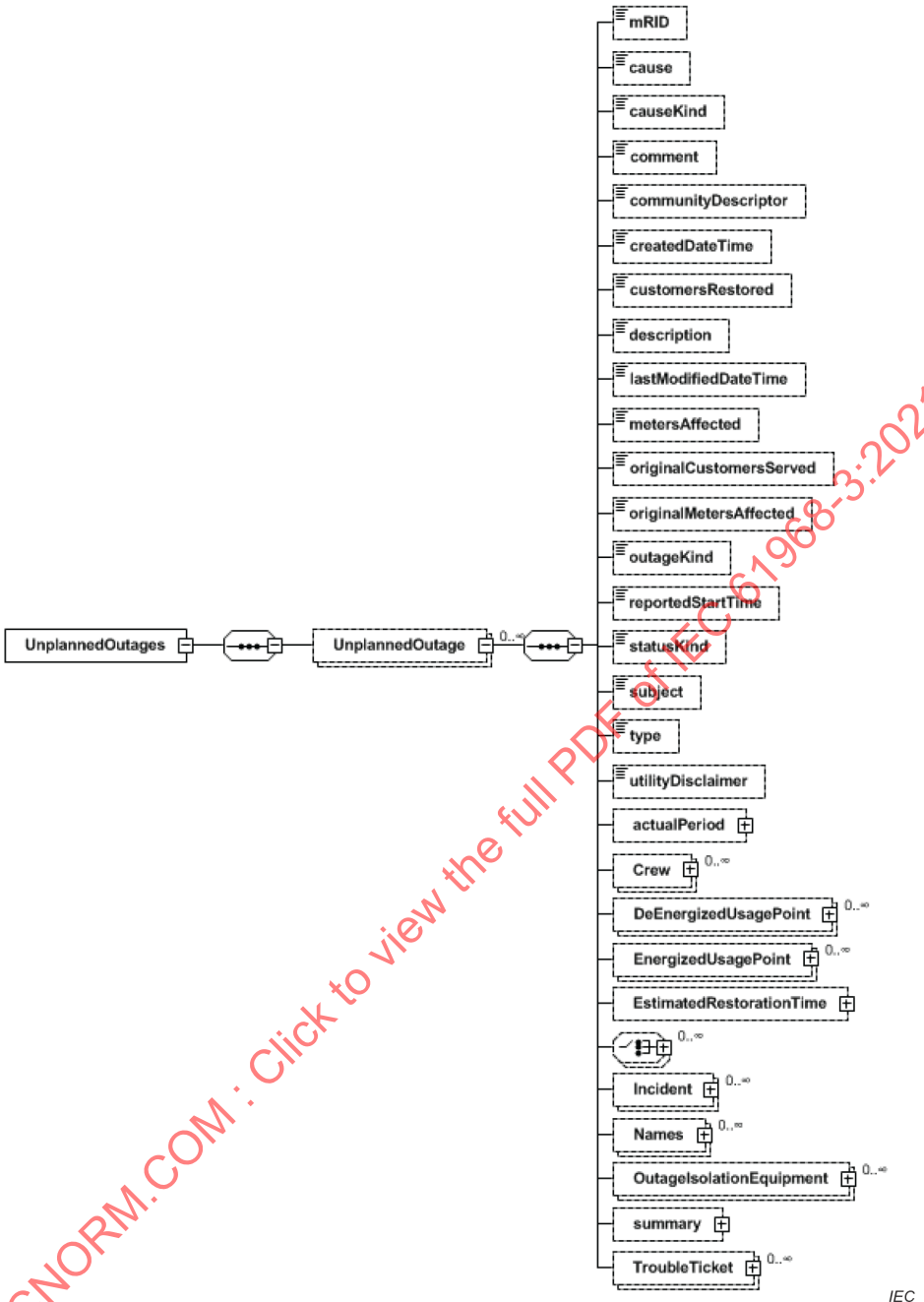
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UnplannedOutages					
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**	**Profils utilisés dans, en plus de ce profil.**
DeEnergizedUsagePoint	UsagePoint	[0..*]	Voir l'Article B.27	Liste des points d'utilisation actuellement mis hors tension dans le cadre de cette interruption.	TroubleOrders
EnergizedUsagePoint	UsagePoint	[0..*]	Voir l'Article B.35	Liste des points d'utilisation qui étaient déjà hors tension dans le cadre de cette interruption, mais qui sont à présent sous tension.	TroubleOrders
EstimatedRestorationTime	EstimatedRestorationTime	[0..1]	Voir l'Article B.38	Temps de restauration estimé pour une seule interruption	TroubleOrders
Défaut	EquipmentFault ou LineFault	[0..*]	EquipmentFault – voir 5.16 LineFault – voir 5.17	Plusieurs EquipmentFaults peuvent être associés à une UnplannedOutage. Par conséquent, chaque EquipmentFault comporte son propre Location, quel que soit l'emplacement de l'UnplannedOutage. L'EquipmentFault comporte également une phase et un attribut FaultyEquipment qui identifie l'endroit où le défaut a été prédit. L'attribut FaultyEquipment identifie les noms (FaultEquipment.Names) et le type de l'équipement (FaultyEquipment.PSRType). Plusieurs LineFaults peuvent être associés à une UnplannedOutage. Une LineFault peut également être prédite en fonction des résultats d'une analyse de court-circuit et, par conséquent, il peut y avoir plusieurs emplacements candidats pour le défaut prédit, lesquels ayant tous le même courant de court-circuit. Par conséquent, chaque LineFault comporte son propre Location et sa propre phase, quel que soit l'emplacement de l'UnplannedOutage. La LineFault comporte également un ACLineSegment et un attribut lengthFromTerminal1. Ils peuvent être utilisés par des applications réseau pour afficher la LineFault dans un schéma de réseau, par exemple.	TroubleOrders
Incident	Incident	[0..*]	Voir 5.15.	Liste des Incidents associés à cette UnplannedOutage	
OutageIsolationEquipment	ConductingEquipment	[0..*]	Voir l'Article B.63	L'attribut OutageIsolationEquipment de la charge utile est présenté à la Figure B.29 et à l'Article B.63. Cet attribut peut être utilisé pour définir la limite de l'interruption si une UnplannedOutage a été identifiée et isolée par l'ouverture des commutateurs ou d'un autre équipement conducteur, soit automatiquement par une fonction telle que FLISR, soit par une équipe qui ouvre les commutateurs en aval du défaut et qui réalimente ces clients à partir d'une autre ligne d'alimentation. Il peut y avoir plusieurs OutageIsolationEquipment, chacun d'eux comportant ses propres emplacements géographiques, identifiant électrique et phase, utilisant l'attribut Terminal.	TroubleOrders

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UnplannedOutages					
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**	**Profils utilisés dans, en plus de ce profil.**
Summary	ServicePointOutageSummary	[0..1]	Voir l'Article B.77	Récapitulatif du nombre de clients hors service.	
TroubleTickets	TroubleTicket	[0..*]	Voir 5.14.	Liste des TroubleTickets associés à cette UnplannedOutage. mRID, description et Names uniquement	

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Figure 93 – Charge utile de message UnplannedOutages – niveau le plus élevé

La Figure 94 présente la charge utile de message **UnplannedOutages**, détail **LineFault**. Voir 5.16.3 pour une description du détail **LineFault**.

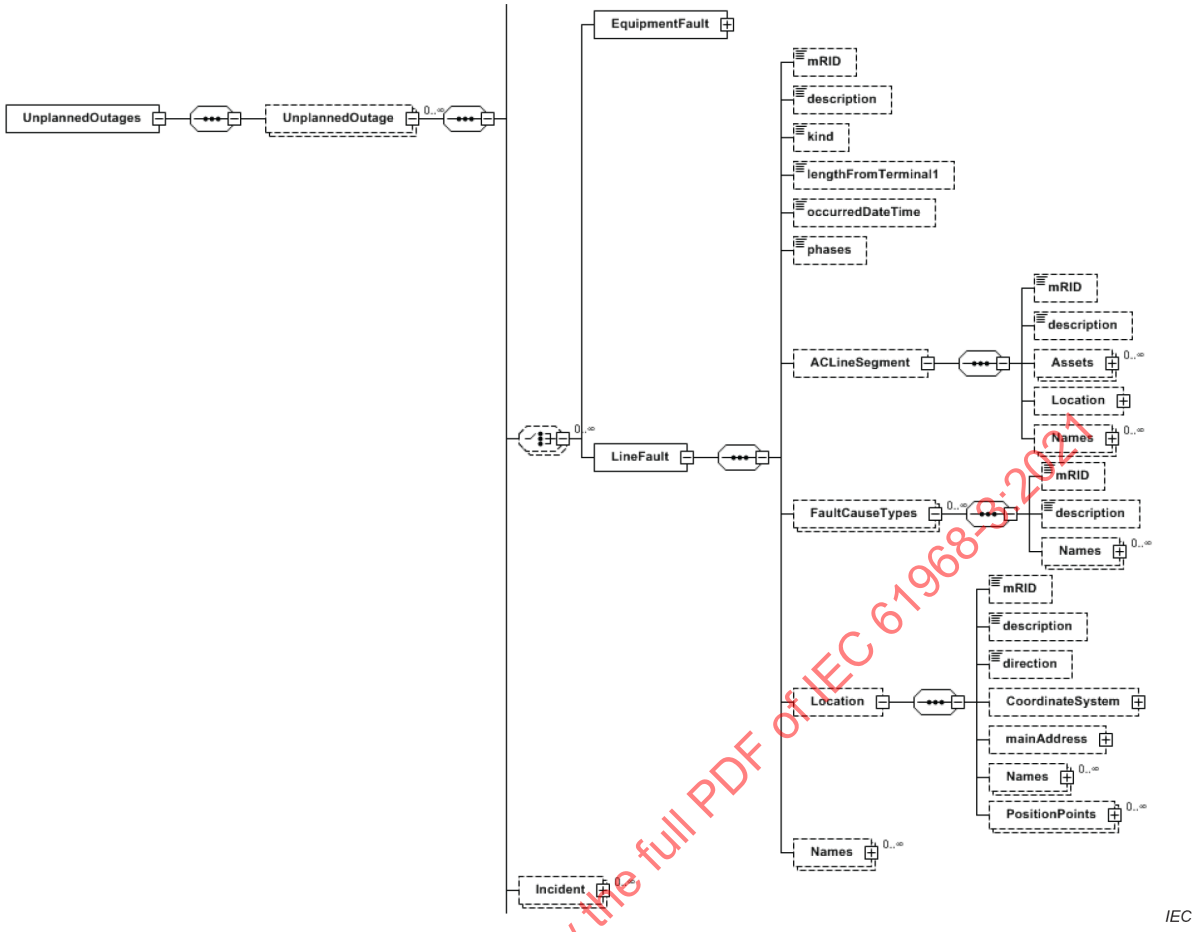


Figure 94 – Charge utile de message UnplannedOutages, détail LineFault

La Figure 95 présente la charge utile pour les UnplannedOutages, détail **EquipmentFault**. Voir 5.16 pour une description de la charge utile.

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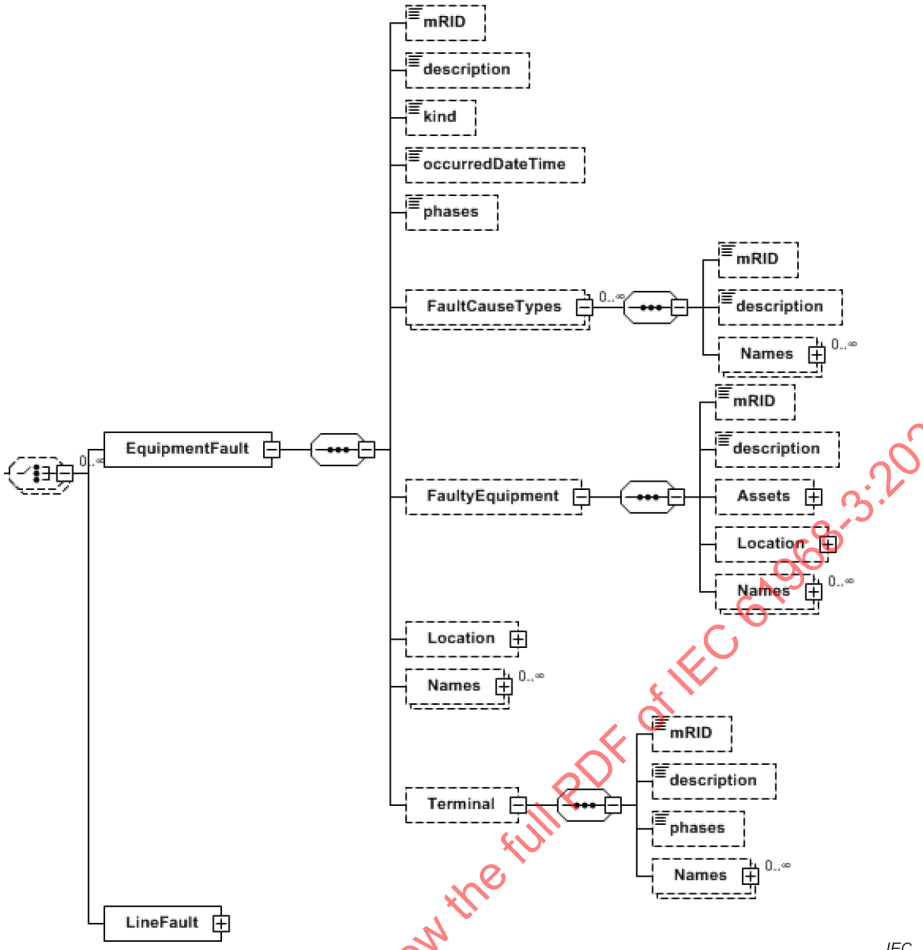


Figure 95 – Charge utile de message UnplannedOutages, détail EquipmentFault

Tableau 57 – Priorité de statusKind lorsque plusieurs équipes sont assignées

Statut de l'équipe	Priorité, 1 = la plus élevée
arrived	1
enroute	2
assigned	3
awaitingCrewAssignment	4
fieldComplete	5

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5.18.3 Exemple XML

```
<?xml version="1.0" encoding="UTF-8"?>
<m:UnplannedOutages xmlns:m="http://iec.ch/TC57/2019/UnplannedOutages/#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://iec.ch/TC57/2019/UnplannedOutages/# UnplannedOutages.xsd ">
  <m:UnplannedOutage>
    <m:mRID>357e3411-e68e-40d4-9b2e-fd48491fdbae</m:mRID>
    <m:cause>Weather</m:cause>
    <m:causeKind>lightningStrike</m:causeKind>
    <m:communityDescriptor>Buncome County</m:communityDescriptor>
    <m:createdDateTime>2019-06-03T12:43:00</m:createdDateTime>
    <m:customersRestored>0</m:customersRestored>
    <m:lastModifiedDateTime>2019-06-03T12:43:00</m:lastModifiedDateTime>
    <m:metersAffected>1206</m:metersAffected>
    <m:outageKind>predicted</m:outageKind>
    <m:reportedStartTime>2019-06-03T12:39:00</m:reportedStartTime>
    <m:statusKind>assigned</m:statusKind>
```

```
<m:type>Recloser</m:type>
</m:actualPeriod>
<m:Crew>
  <m:FieldDispatchHistory>
    <m:FieldDispatchStep>
      <m:dispatchStatus>assigned</m:dispatchStatus>
      <m:occurredDateTime>2019-06-03T12:45:00</m:occurredDateTime>
      <m:sequenceNumber>1</m:sequenceNumber>
    </m:FieldDispatchStep>
    <m:Names>
      <m:name>James Smedley IV</m:name>
    </m:Names>
  </m:FieldDispatchHistory>
  <m:Names>
    <m:name>James Smedley IV</m:name>
  </m:Names>
</m:Crew>
<m:DeEnergizedUsagePoint>
  <m:mRID>cf6ca9ee-44c0-4e5e-8539-806042820bf6</m:mRID>
  <m:CustomerAgreement>
    <m:Customer>
      <m:kind>commercialIndustrial</m:kind>
      <m:locale>en</m:locale>
      <m:specialNeed>iceCreamMaker</m:specialNeed>
      <m:Names>
        <m:name>Nice Ice Creams Inc.</</m:name>
      </m:Names>
      <m:Organisation>
        <m:electronicAddress>
          <m:email1>jenny@nice-ice-creams.com</m:email1>
        </m:electronicAddress>
        <m:phone1>
          <m:areaCode>919</m:areaCode>
          <m:cityCode>555</m:cityCode>
          <m:localNumber>1234</m:localNumber>
        </m:phone1>
      </m:Organisation>
    </m:Customer>
  </m:CustomerAgreement>
  <m:Meters>
    <m:Names>
      <m:name>Meter CDS-1020910234</m:name>
    </m:Names>
  </m:Meters>
  <m:UsagePointLocation>
    <m:accessMethod>Gate code 44312</m:accessMethod>
    <m:siteAccessProblem>Bad dogs</m:siteAccessProblem>>
    <m:mainAddress>
      <m:postalCode>27606</m:postalCode>
      <m:streetDetail>
        <m:name>Main Campus Drive </m:name>
        <m:number>901</m:number>
      </m:streetDetail>
      <m:townDetail>
        <m:name>Raleigh</m:name>
        <m:stateOrProvince>NC</m:stateOrProvince>
      </m:townDetail>
    </m:mainAddress>
  </m:UsagePointLocation>
</m:DeEnergizedUsagePoint>
<m:EstimatedRestorationTime>
  <m:confidenceKind>low</m:confidenceKind>
  <m:ert>2019-06-03T14:30:00</m:ert>
  <m:ertSource>Automatic calculation</m:ertSource>
</m:EstimatedRestorationTime>
<m:LineFault>
  <m:mRID>cce3f88e-7ecb-442e-8aa6-8dab3bb04795</m:mRID>
  <m:kind>lineOpen</m:kind>
  <m:lengthFromTerminal1>125,0</m:lengthFromTerminal1>
  <m:occurredDateTime>2019-06-03T12:02:00</m:occurredDateTime>
  <m:phases>A</m:phases>
  <m:ACLineSegment>
    <m:mRID>b7e3453e-63ec-4203-898e-d23b8876f1f7</m:mRID>
  </m:ACLineSegment>
  <m:Location>
    <m:PositionPoints>
      <m:xPosition>35.7718409</m:xPosition>
      <m:yPosition>-78.6801357</m:yPosition>
```

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```
        </m:PositionPoints>
      </m:Location>
    </m:LineFault>
    <m:Names>
      <m:name>Outage #1039212</m:name>
    </m:Names>
    <m:OutageIsolationEquipment>
      <m:mRID>80304bce-c43b-4584-80cf-04b5c1daebc0</m:mRID>
      <m:description>m:description</m:description>
      <m:Assets>
        <m:Names>
          <m:name>R-0483</m:name>
        </m:Names>
      </m:Assets>
      <m:Location>
        <m:direction>2 spans west of Old Hickory Road at gas station</m:direction>
        <m:PositionPoints>
          <m:xPosition>35.019823</m:xPosition>
          <m:yPosition>-76.23092</m:yPosition>
        </m:PositionPoints>
      </m:Location>
      <m:Names>
        <m:name>R-0483</m:name>
      </m:Names>
    </m:OutageIsolationEquipment>
    <m:TroubleTickets>
      <m:mRID>c95251c5-bf5f-4657-a9fb-0178fdff3f70</m:mRID>
      <m:description>Lights out</m:description>
      <m:Names>
        <m:name>Ticket # 4398402</m:name>
      </m:Names>
    </m:TroubleTickets>
  </m:UnplannedOutage>
</m:UnplannedOutages>
```

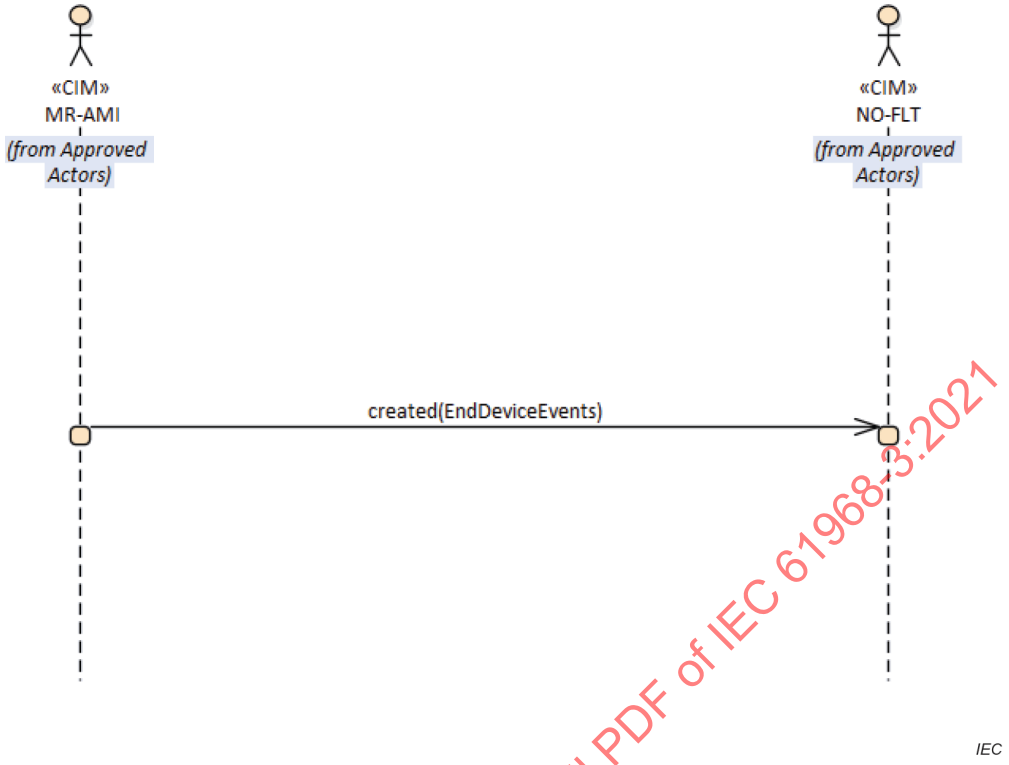
5.19 Charge utile de message Metering

5.19.1 EndDeviceEvents

Les charges utiles de messages **EndDeviceEvent** sont conçues pour signaler les modifications d'état d'un dispositif de comptage. Ces informations peuvent être utilisées par des applications (pour la gestion des interruptions, par exemple). La Figure 96 représente un diagramme de séquences pour **EndDeviceEvents**.

Un ou plusieurs compteurs signalent l'état d'arrêt de l'alimentation. Ces informations peuvent indiquer une interruption dans la zone correspondante du réseau.

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Figure 96 – EndDeviceEvents

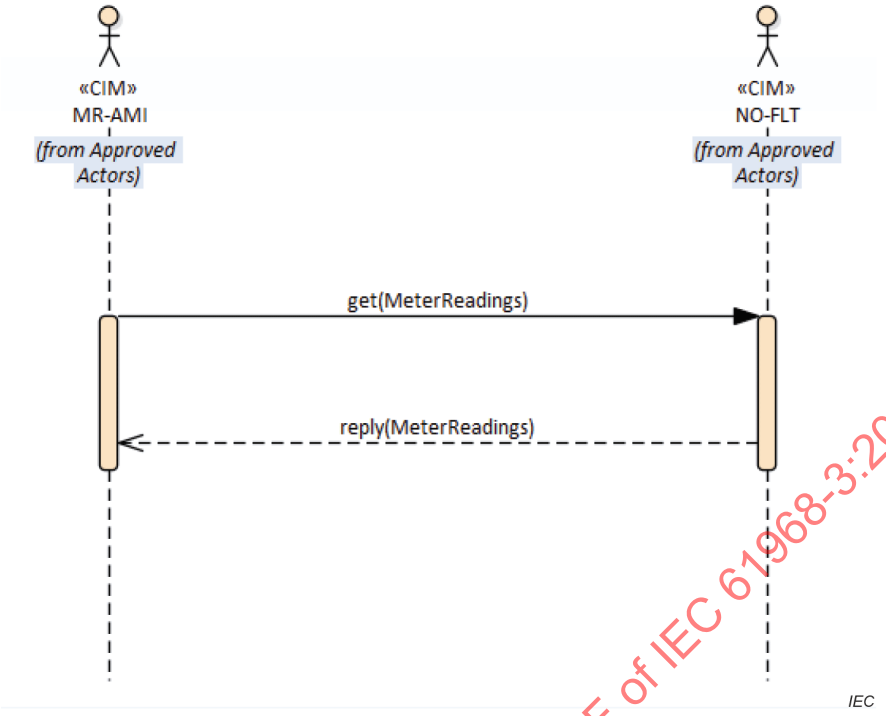
Pour de plus amples informations sur la charge utile **EndDeviceEvents**, voir l'IEC 61968-9.

5.19.2 MeterReadings

Les charges utiles de messages **MeterReading** sont conçues pour lire l'état d'un ou de plusieurs dispositifs de comptage. Ces informations peuvent être utilisées par des applications (pour la gestion des interruptions, par exemple). La Figure 97 représente une séquence de relevé de compteur type.

L'état d'un ou de plusieurs dispositifs de comptage est demandé pour vérifier si l'alimentation est rétablie dans la zone correspondante du réseau.

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(from Approved Actors)	(des Acteurs approuvés)

Figure 97 – Diagramme de séquences MeterReadings

Pour de plus amples informations sur la charge utile **MeterReadings**, voir l'IEC 61968-9.

5.20 Charge utile de message Work

5.20.1 Charge utile WorkRequests

Les charges utiles de messages **WorkRequests** sont conçues pour signaler des demandes de travail de maintenance, y compris la progression des travaux. Des exemples de travail demandé dans le contexte du présent document sont:

- demande d'un numéro de demande de travail pendant des réparations d'interruption non planifiée. Cela peut être utilisé pour l'enregistrement des temps, par exemple;
- demande d'effacer les arborescences avant de procéder à une restauration de l'interruption ou pour empêcher les futures interruptions;
- demande de procéder à des réparations permanentes après avoir apporté une correction d'urgence pour restaurer l'alimentation après une interruption non planifiée.

Une **WorkRequest** peut être communiquée entre différentes parties pendant son cycle de vie (voir la Figure 98):

- create (WorkRequests) – OMS -> WMS;
- reply (WorkRequests) – WMS -> OMS;
- changed (WorkRequests) – WMS -> OMS (statut modifié ou la demande est satisfaite)

Des exemples plus détaillés sont donnés aux Articles A.8 et A.9.

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Figure 98 – Diagramme de séquences WorkRequests

Pour de plus amples informations sur la charge utile **WorkRequests**, voir l'IEC 61968-6.

5.21 TroubleOrders

5.21.1 Généralités

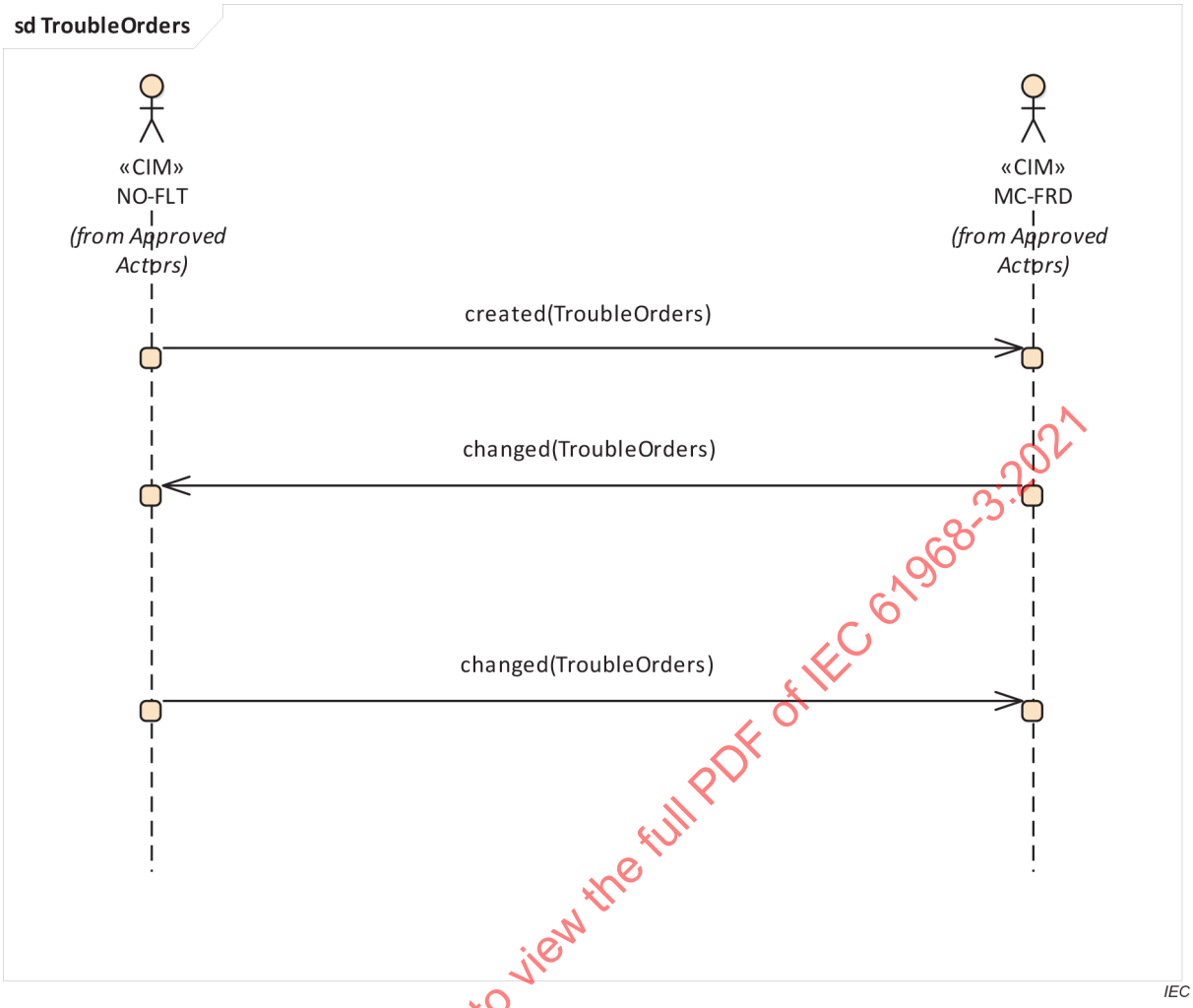
Les charges utiles de messages **TroubleOrders** communiquent des demandent de réponse à des **Incidents** et/ou des **UnplannedOutages**, y compris le travail en cours reçu de l'équipe sur le terrain. La charge utile inclut également des **TroubleTicket**s associés au **TroubleOrder**.

- La charge utile est utilisée pour signaler un **Incident** et/ou une **UnplannedOutage** et/ou un ou plusieurs **TroubleTickets**.
- La charge utile inclut l'emplacement dans lequel le travail doit être réalisé.
- Afin de prendre en charge l'attribution de plusieurs équipes au même Incident ou UnplannedOutage, la charge utile **TroubleOrder** contient une ou plusieurs **WorkTasks**. Une **WorkTask** par équipe est attribuée au **TroubleOrder**. Les **WorkTasks** suivent la progression de chaque équipe dans son travail du **TroubleOrder**.

Comme le représente l'exemple de la Figure 99, un bon d'incident peut être communiqué entre différentes parties au cours de son cycle de vie:

- un **TroubleOrder** est créé pour initier le travail;
- un **TroubleOrder** est modifié au fur et à mesure que les équipes exécutent le travail et que le statut change;
- un **TroubleOrder** est modifié si des équipes supplémentaires sont attribuées au **TroubleOrder**;
- un **TroubleOrder** est modifié si des informations supplémentaires sont reçues et sont à l'origine de la modification de **l'UnplannedOutage** ou de l'**Incident**.

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Figure 99 – TroubleOrders

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5.21.2 Charge utile de message

5.21.2.1 Généralités

Le niveau supérieur de la charge utile **TroubleOrders est présenté à la** Figure 100. Au niveau supérieur, les éléments essentiels d'un **TroubleOrder** sont un **Incident** ou une **UnplannedOutage** (ou les deux) et la liste des **TroubleTickets** qui leur ont été associées. De plus, le **Location** prévu ou confirmé de l'**Incident** ou de l'**UnplannedOutage** est défini dans la **WorkTask**. C'est à cet endroit qu'une équipe est en général envoyée pour démarrer une enquête initiale. Les instructions adressées à l'équipe peuvent être placées dans le champ **comments** du **TroubleOrder**.

Une ou plusieurs **WorkTask**s peuvent être associées au **TroubleOrder**. Lors de la création d'un **TroubleOrder**, il doit y avoir au moins une **WorkTask**. Il doit y avoir une **WorkTask** distincte pour chaque **crew** attribuée au **TroubleOrder**, de manière à pouvoir suivre l'heure d'arrivée estimée (ETA - Estimated Time to Arrive) et les autres statuts associés à chaque équipe.

Les attributs du profil **TroubleOrders** sont décrits dans le Tableau 58.

Tableau 58 – Profil TroubleOrders

Incidents				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
TroubleOrders	TroubleOrder	[1..*]		
Attributs de profil				
description	String	[0..1]		Champ textuel au format libre qui décrit le **TroubleOrder**
mRID	String	[0..1]	GUID	mRID du TroubleOrder.
Names	Name	[0..*]	Voir l'Article B.56	Peut être utilisé pour donner des identifiants supplémentaires tels que le numéro TroubleOrder interne.
comment	String	[0..1]		Commentaire au format libre associé au TroubleOrder
createdDateTime	DateTime	[0..1]		DateTime à laquelle le TroubleOrder a été initialement crée.
lastModifiedDateTime	DateTime	[0..1]		DateTime de la dernière modification du TroubleOrder.
revisionNumber	String	[0..1]		Numéro de révision de ce document.
subject	String	[0..1]		Objet du document. Texte au format libre.
title	String	[0..1]		Titre du document. Texte au format libre.
type	String	[0..1]		Type de TroubleOrder.
Incident	Incident	[0..1]	Voir 5.21.2.2	Incident associé, le cas échéant.
Issuer	Issuer	[0..1]	Voir l'Article B.47	Personne qui a adressé le TroubleOrder à l'équipe sur le terrain ou au système de gestion de la main-d'œuvre.
status	Status	[0..1]	Voir l'Article B.79	Utilisé pour indiquer si le **TroubleOrder** est ouvert ou fermé. Les valeurs possibles de status.value sont "Open", "Closed".
TroubleTicket	TroubleTicket	[0..*]	Voir 5.21.2.4	Liste des TroubleTickets associés à ce TroubleOrder
UnplannedOutage	UnplannedOutage	[0..1]	Voir 5.21.2.3.	L'UnplannedOutage, le cas échéant, associée à ce TroubleOrder
WorkTask	WorkTask	[0..*]	Voir 5.21.2.5	L'ensemble des WorkTasks associées à ce TroubleOrder

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Figure 100 – Charge utile de message de niveau supérieur TroubleOrders

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5.21.2.2 Charge utile TroubleOrders – Incident

Le composant **Incident** des **TroubleOrders** est présenté à la Figure 101. Cette partie de la charge utile a pour objet de décrire les détails de **Hazard**.

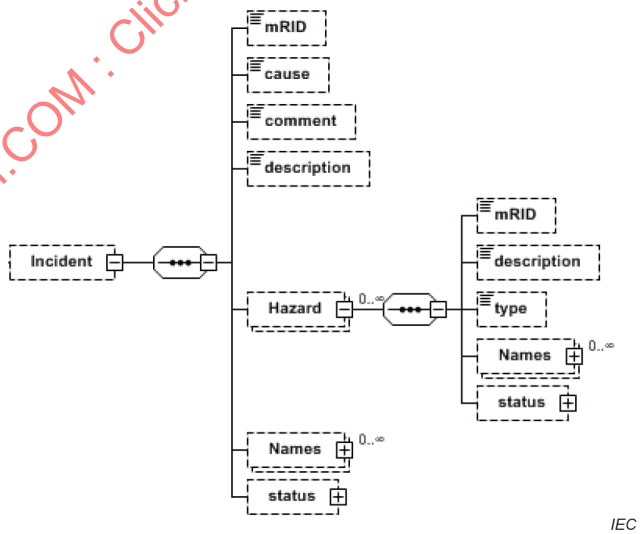


Figure 101 – TroubleOrders – Fragment de charge utile Incident

5.21.2.3 Charge utile TroubleOrders – UnplannedOutage

L'élément **UnplannedOutage** des **TroubleOrders** est présenté à la Figure 102. Les attributs de l'**UnplannedOutage** qui apparaissent dans le profil **TroubleOrders** sont décrits en détail en 5.18.2.

La charge utile contient des informations suffisantes pour extraire l'équipe vers l'emplacement de l'**UnplannedOutage**. **comment** et **description** sont des champs textuels au format libre qui décrivent l'**UnplannedOutage**, alors que **Location** donne des informations plus précises relatives à l'emplacement géographique. **Names** peut être utilisé pour donner des identifiants supplémentaires tels que le numéro d'interruption interne.

Lorsque cette charge utile est utilisée pour dépêcher une équipe sur une **UnplannedOutage**, les informations suivantes peuvent être renseignées comme indiqué ci-dessous:

- **metersAffected** – décompte du nombre de compteurs actuellement prédits ou confirmés comme étant hors tension par cette interruption. Peut être utilisé pour aider à déterminer la priorité de restauration;
- **reportedStartTime** – date/heure de la première perte d'alimentation par le client;
- **Names** – peut être utilisé pour acheminer le numéro d'interruption interne;
- **type** – chaîne qui décrit l'étendue de l'interruption, par exemple client, transformateur de distribution, fusible, disjoncteur à réenclenchement, disjoncteur, etc;
- **description** – commentaires relatifs à l'interruption;
- **outageIsolationEquipment** – dans le cas d'une configuration en réseau radial, il s'agit d'un seul élément de l'équipement dans lequel l'interruption a été prédite ou confirmée. Dans le cas d'une configuration en réseau maillé, il peut y avoir plusieurs éléments de l'équipement d'isolation d'interruption. Voir l'Article B.63.

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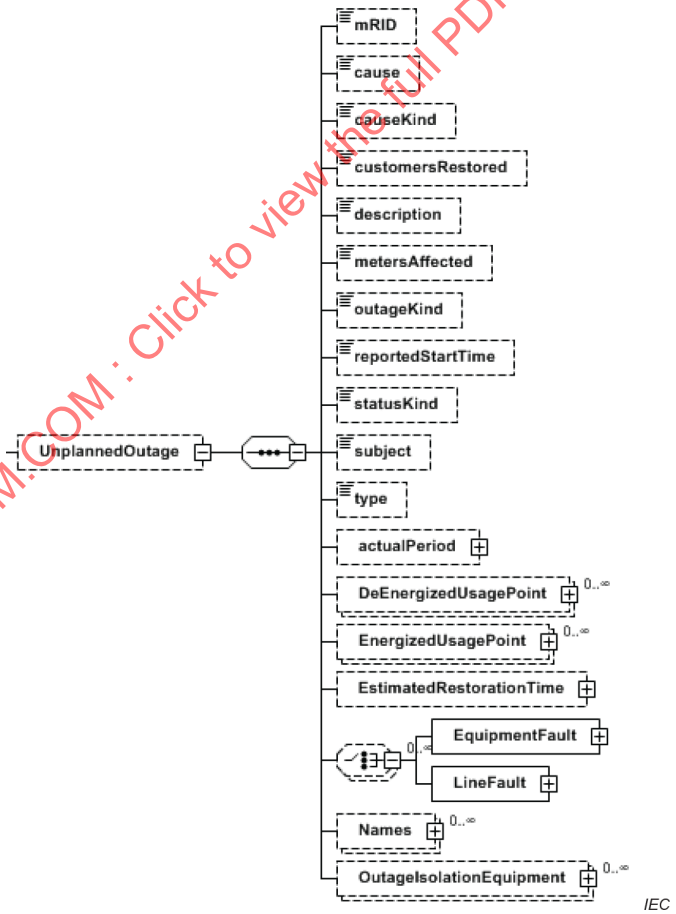
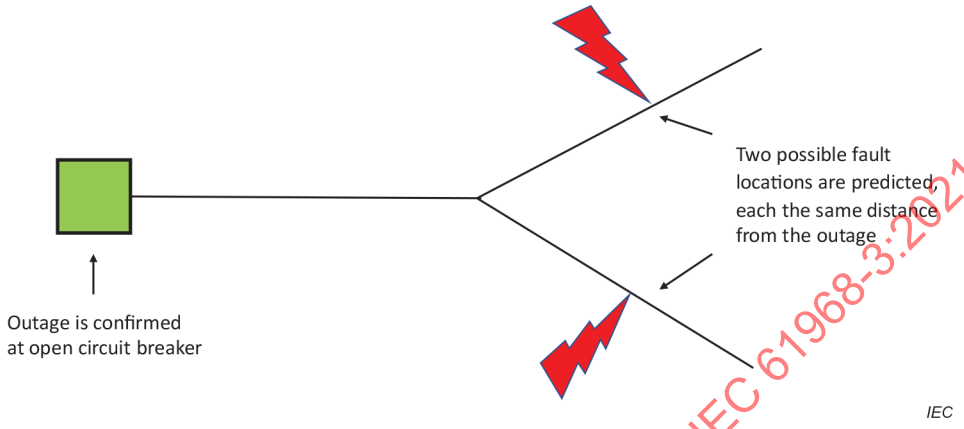


Figure 102 – TroubleOrders – Fragment de charge utile UnplannedOutage

Lorsqu'une équipe sur le terrain est dépêchée à une **UnplannedOutage**, elle doit connaître son emplacement prédit ou confirmé. L'emplacement géographique est fourni dans l'élément **TroubleOrder.Location** du message **TroubleOrder**.

Des informations supplémentaires relatives à l'emplacement peuvent être fournies dans la charge utile afin d'aider l'équipe à répondre à l'interruption non planifiée. Elles sont composées d'informations relatives à l'emplacement de l'interruption non planifiée et des informations relatives à l'emplacement du défaut. L'emplacement du défaut est celui du défaut lui-même (un câble à terre, par exemple). L'emplacement de l'interruption non planifiée est celui du dispositif qui s'est déclenché après le défaut (un disjoncteur à réenclenchement ou un court-circuit, par exemple). Cette distinction présentée à la Figure 103.



Anglais	Français
Outage is confirmed at open circuit breaker	L'interruption est confirmée au niveau du disjoncteur ouvert
Two possible fault locations are predicted, each the same distance from the outage	Deux emplacements de défaut possibles sont prédits, chacun à la même distance de l'interruption

Figure 103 – Distinction entre l'emplacement de l'interruption et l'emplacement du défaut

Si l'emplacement du défaut est disponible, **LineFault** et/ou **EquipmentFault** peuvent apparaître dans la charge utile **TroubleOrders** initiale lorsqu'elle est envoyée à l'équipe sur le terrain. De plus, l'équipe sur le terrain peut identifier l'emplacement réel du défaut, qui est communiqué à la salle de commande dans les éléments **LineFault** et/ou **EquipmentFault** de la charge utile.

Les différents cas d'utilisation des informations relatives à l'emplacement de l'interruption et du défaut sont présentés dans le Tableau 59. Le tableau présente également la manière dont **UnplannedOutage.type** détermine à quel endroit apparaissent les informations dans la charge utile.

Tableau 59 – Informations supplémentaires relatives à l'emplacement de l'interruption

Cas d'utilisation	UnplannedOutage.type	Informations supplémentaires relatives à l'emplacement de l'interruption	Informations supplémentaires relatives à l'emplacement du défaut
Interruption du client prédite ou confirmée	Customer	L'emplacement de l'interruption est disponible dans **DeEnergizedUsagePoints.UsagePointLocation**. Il peut s'avérer nécessaire de connaître le numéro de compteur lorsque l'interruption est prévue dans un immeuble d'appartements, par exemple, ou en présence de plusieurs compteurs à la même adresse. Le numéro de compteur est disponible dans **DeEnergizedUsagePoints.Meters.Names**	
Interruption du transformateur de service prédite ou confirmée	Transformateur de service	L'emplacement de l'interruption est disponible dans **OutageIsolationEquipment.Location**, qui spécifie l'emplacement du transformateur.	

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Cas d'utilisation	UnplannedOutage.type	Informations supplémentaires relatives à l'emplacement de l'interruption	Informations supplémentaires relatives à l'emplacement du défaut
Interruption prédite ou confirmée de l'équipement sur un réseau radial	Equipment	L'emplacement de l'interruption est disponible dans **OutageIsolationEquipment.Location**, qui spécifie l'emplacement du dispositif de protection.	
Interruption prédite ou confirmée de l'équipement sur un réseau maillé	Equipment	L'emplacement de l'interruption est disponible dans **OutageIsolationEquipment.Location**, qui spécifie l'emplacement d'un ou de plusieurs dispositifs de protection.	
Les informations relatives à l'interruption prédite de l'équipement et à l'emplacement du défaut sont disponibles	Equipment	L'emplacement de l'interruption est disponible dans **OutageIsolationEquipment.Location**, qui spécifie l'emplacement d'un ou de plusieurs dispositifs de protection.	**LineFault** et/ou **EquipmentFault** identifient un ou plusieurs emplacements dans lesquels le défaut réel est réputé s'être produit.

La partie **DeEnergizedUsagePoint** de la charge utile est présentée à la Figure B.8 et est décrite à l'Article B.27.

L'attribut **EquipmentFault** de la charge utile est présenté à la Figure 104.

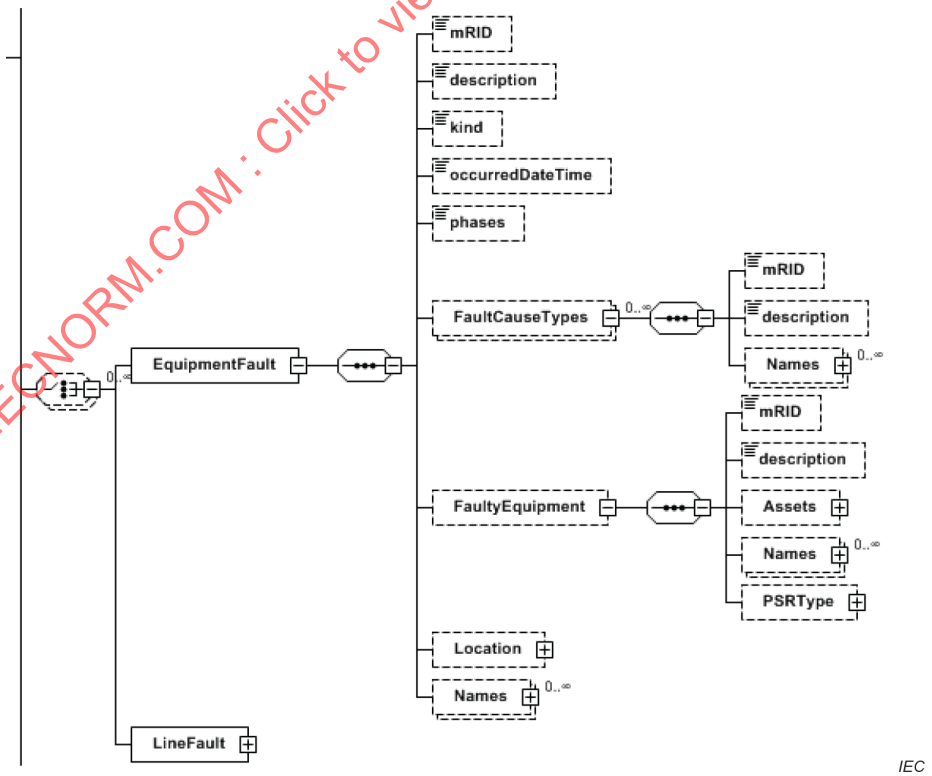


Figure 104 – TroubleOrders, UnplannedOutage, fragment de charge utile EquipmentFault

L'attribut **LineFault** de la charge utile est présenté à la Figure 105.

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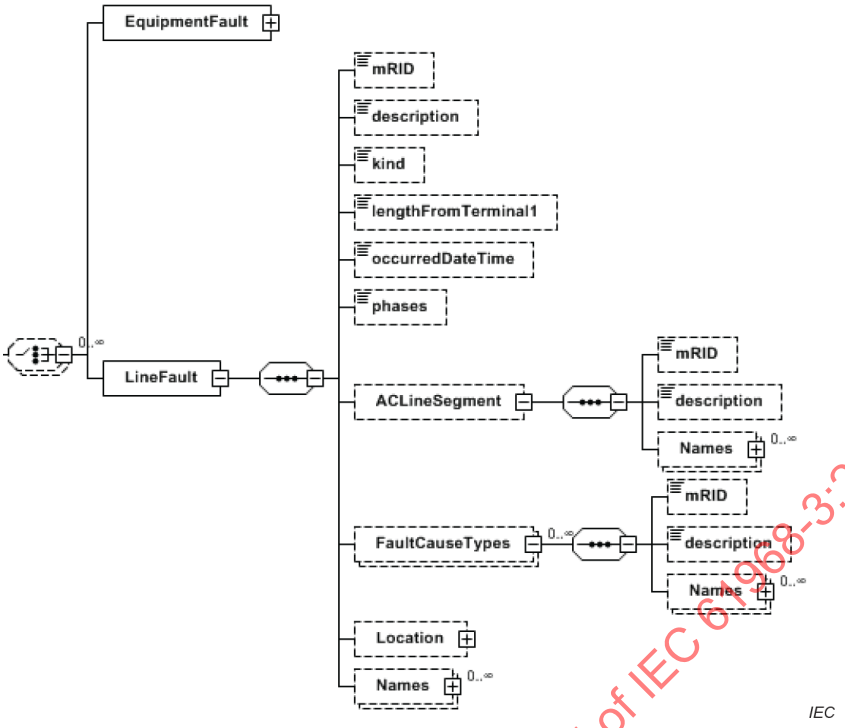


Figure 105 – TroubleOrders, UnplannedOutage, fragment de charge utile LineFault

Les autres attributs d'**UnplannedOutage** sont:

- **outageKind** – énumération qui définit si l'interruption est **closed**, **confirmed**, **partiallyRestored**, **predicted** ou **restored**;
- **statusKind** – énumération qui définit le statut de l'ensemble de l'équipe pour l'**UnplannedOutage**. Les valeurs sont **arrived**, **assigned**, **awaitingCrewAssignment**, **enroute** ou **fieldComplete**;
- **actualPeriod** – utilisé pour consigner la mise hors tension réelle et les temps de restauration de l'**UnplannedOutage**, à l'aide des attributs **start** et **end**. Voir la Figure 106.

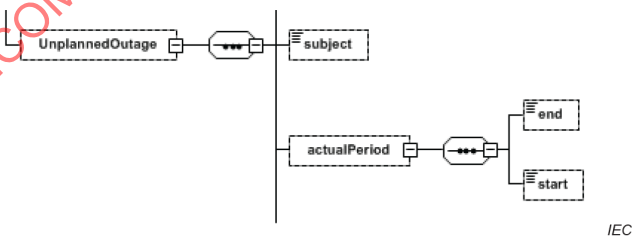


Figure 106 – TroubleOrders, UnplannedOutage, fragment de charge utile actualPeriod

5.21.2.4 Charge utile TroubleOrders – TroubleTicket

La partie **TroubleTicket** de la charge utile est présentée à la Figure 107.

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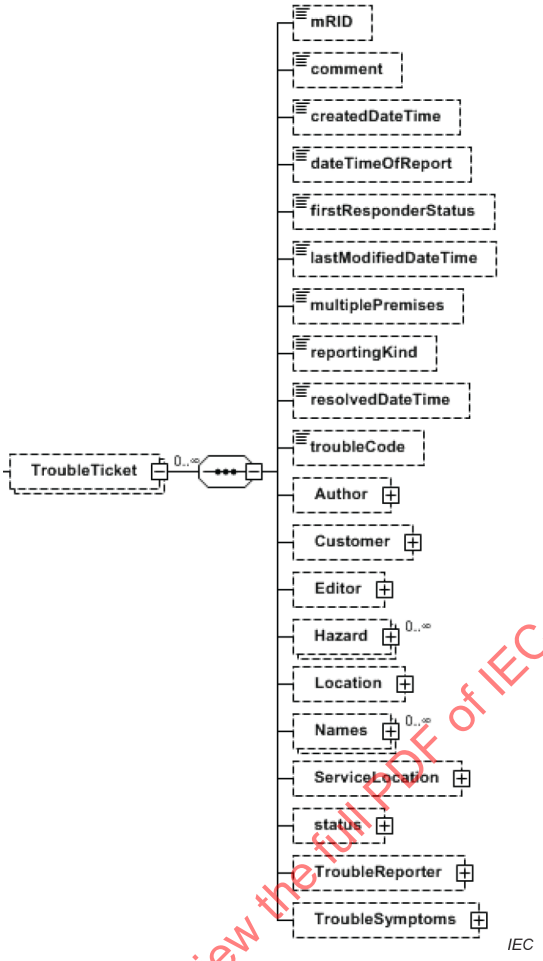


Figure 107 – TroubleOrders – Fragment de charge utile TroubleTicket

De nombreux **TroubleTickets** pouvant être associés à une **UnplannedOutage**, il peut ne pas se révéler pratique d'envoyer la totalité des **TroubleTickets** avec le **TroubleOrder**. Il revient à la mise en œuvre de déterminer le nombre de **TroubleTickets** à envoyer et lesquels envoyer. Par exemple, seuls les **TroubleTickets** comportant un **Hazard** ou un client avec des **specialNeeds** peuvent être envoyés. Les attributs du fragment **TroubleTicket** sont présentés dans le Tableau 60.

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Tableau 60 – Attributs de TroubleTicket

Customer: TroubleTicket				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	**mRID** du TroubleTicket
description	String	[0..1]		Description au format libre du TroubleTicket
Names	Name	[0..*]	Voir l'Article B.56	Peut être utilisé pour donner des identifiants supplémentaires tels que le numéro TroubleTicket interne.
comment	String			Tous les commentaires que le client a formulés et qui peuvent aider à diagnostiquer la source de l'interruption
createdDateTime	DateTime	[0..1]		Date et heure de création de cet enregistrement d'activité (différentes de "status.dateTime", qui est l'heure du changement d'état de l'objet associé, le cas échéant). Heure de création de TroubleTicket. Peuvent être différentes (ultérieures) de l'heure d'enregistrement du TroubleTicket. Par exemple, un IVR peut recevoir les informations quelques secondes ou minutes avant la création réelle du ticket.
dateTimeOfReport	DateTime	[0..1]		Date et heure d'enregistrement du dysfonctionnement.
firstResponderStatus	String	[0..1]		Indique si le premier intervenant (la police, les pompiers, par exemple) a été informé et s'il est sur site ou en route.
lastModifiedDateTime	DateTime	[0..1]		Date et heure de la dernière modification du TroubleTicket.
multiplePremises	Boolean	[0..1]		Défini sur true si le rapport d'interruption a indiqué que l'alimentation d'autres voisins est également coupée.
reportingKind	TroubleReportingKind	[0..1]	Voir l'Article C.24	Indique comment le client a signalé l'incident. Énumération qui définit la manière dont le client a signalé le ticket. Valeurs: call, email, ivr, letter, other
resolvedDateTime	DateTime	[0..1]		Date et heure auxquelles cette fiche incident a été résolue.
troubleCode	String	[0..1]		Code de l'incident (par exemple: mise hors tension, voyants clignotants, alimentation électrique partielle, etc.).
Author	Author	[0..1]	Voir l'Article B.13	Personne qui a créé la TroubleTicket, en règle générale le représentant du service client qui a entré le TroubleTicket.

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Customer: TroubleTicket				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
Client	Customer	[0..1]	Voir l'Article B.25	Définit le nom du client. "locale" est la langue parlée, alors que "kind" est une énumération avec des valeurs: commercialIndustrial, residential, etc. specialNeed est utilisé pour indiquer le soutien vital, etc.
Editor	Editor	[0..1]	Voir l'Article B.31	Personne qui a apporté les dernières modifications à TroubleTicket.
Hazard	Hazard	[0..*]	Voir l'Article B.46	Définit si une condition dangereuse est associée au TroubleTicket. Peut être nul, un ou plusieurs.
Location	Location	[0..1]	Voir l'Article B.52	Définit l'emplacement du dysfonctionnement identifié par la **TroubleTicket** lorsqu'elle fait référence à un dysfonctionnement qui n'est pas associé à un **ServiceLocation** (une voiture qui percute un poteau, par exemple).
ServiceLocation	ServiceLocation	[0..1]	Voir l'Article B.76	Un ServiceLocation est un emplacement immobilier, souvent appelé "locaux".
status	Status	[0..1]	Voir l'Article B.79	Peut être utilisé pour consigner les modifications apportées au statut du TroubleTicket
TroubleReporter	TroubleReporter	[0..1]	Voir l'Article B.94	Personne qui signale le dysfonctionnement.
TroubleSymptoms	TroubleSymptoms	[0..1]	Voir l'Article B.94	Ensemble de symptômes qui définissent le type de dysfonctionnement signalé.

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5.21.2.5 Charge utile TroubleOrders – WorkTask

Le niveau supérieur de la charge utile **WorkTask** est présenté à la Figure 108 et la Figure 109. Lors de l'attribution initiale, il ne peut y avoir qu'une seule **WorkTask** pour le **TroubleOrder** et un petit sous-ensemble d'attributs est défini, tels que:

- **comment**, **subject**, **title**: texte au format libre indiquant toutes les informations relatives au travail à exécuter;
- **kind** (énumération, les valeurs incluent: inspection, maintenance, repair, other);
- **statusKind** (énumération indiquant le statut de la tâche. Les valeurs incluent: **approved**, **canceled**, **closed**);
- informations **crews**. Voir la description des informations relatives à l'équipe ci-dessous;
- **priority** définit la priorité relative de la **WorkTask** et est un composé. La partie **rank** du composé est un entier qui définit l'ordre de priorité;
- **workLocation**, qui peut être différent de l'emplacement du **TroubleOrder** global, tel que défini par les différents emplacements dans les éléments **UnplannedOutage**, **TroubleTicket** et **Incident** de la charge utile.

Les attributs détaillés de **WorkTask** sont décrits dans le Tableau 61.

Tableau 61 – Attributs de WorkTask

Work: WorkTask				
Attribut	**Type de données**	**Cardinalité**	**Commentaires**	**Description**
mRID	String	[0..1]	GUID	mRID de la WorkTask
description	String	[0..1]		Description au format libre de la WorkTask.
Names	Name	[0..*]	Voir l'Article B.56	Liste lisible par l'homme de noms associés à la WorkTask
comment	String	[0..1]		Chaîne textuelle au format libre associée à la WorkTask
completedDateTime	DateTime	[0..1]		Date et heure d'exécution de la tâche.
contractorCost	Money	[0..1]		Total des coûts du prestataire associé à la tâche.
createdDateTime	DateTime	[0..1]		Date et heure de création de WorkTask.
crewETA	DateTime	[0..1]		Heure d'arrivée estimée, de manière à pouvoir informer la police/les pompiers de l'arrivée de l'équipe.
estimatedCompletionTime	DateTime	[0..1]		Date/heure estimée de l'exécution de la WorkTask.
kind	WorkKind	[0..1]	Voir l'Article C.34	Type de travaux.
laborCost	Money	[0..1]		Total des coûts de main-d'œuvre associé à la tâche.
laborHours	Hours	[0..1]		Heures de travail étendues sous la tâche.
lastModifiedDateTime	DateTime	[0..1]		Date et heure de la dernière modification de WorkTask.
materialCost	Money	[0..1]		Total des coûts de matériau associé à la tâche.
startedDateTime	DateTime	[0..1]		Date et heure de début de la tâche.
statusKind	WorkStatusKind	[0..1]	Voir l'Article C.35	Type de statut, spécifique à un travail.
subject	String	[0..1]		Texte au format libre
taskKind	WorkTaskKind	[0..1]	Voir l'Article C.36	Type de travaux.
title	String	[0..1]		Texte au format libre
Assets	Assets	[0..*]	Voir l'Article B.9	Définit les biens impliqués dans la WorkTask, le cas échéant.
Crews	Crew	[0..1]	Voir l'Article B.22	Type d'équipe demandé pour cette WorkTask ou équipe affectée à cette WorkTask.
priority	Priority	[0..1]	Voir l'Article B.69	Définition de propriété.
SwitchingPlan	SwitchingPlan	[0..1]	Voir 5.8.2.	mRID, description et Names uniquement.
WorkActivityRecords	WorkActivityRecord	[0..*]	Voir l'Article B.100	Consigne les informations relatives au statut du travail ou d'une tâche liée au travail à un instant donné.
WorkLocation	WorkLocation	[0..1]	Voir l'Article B.52	Hérite de Location et a les mêmes attributs.

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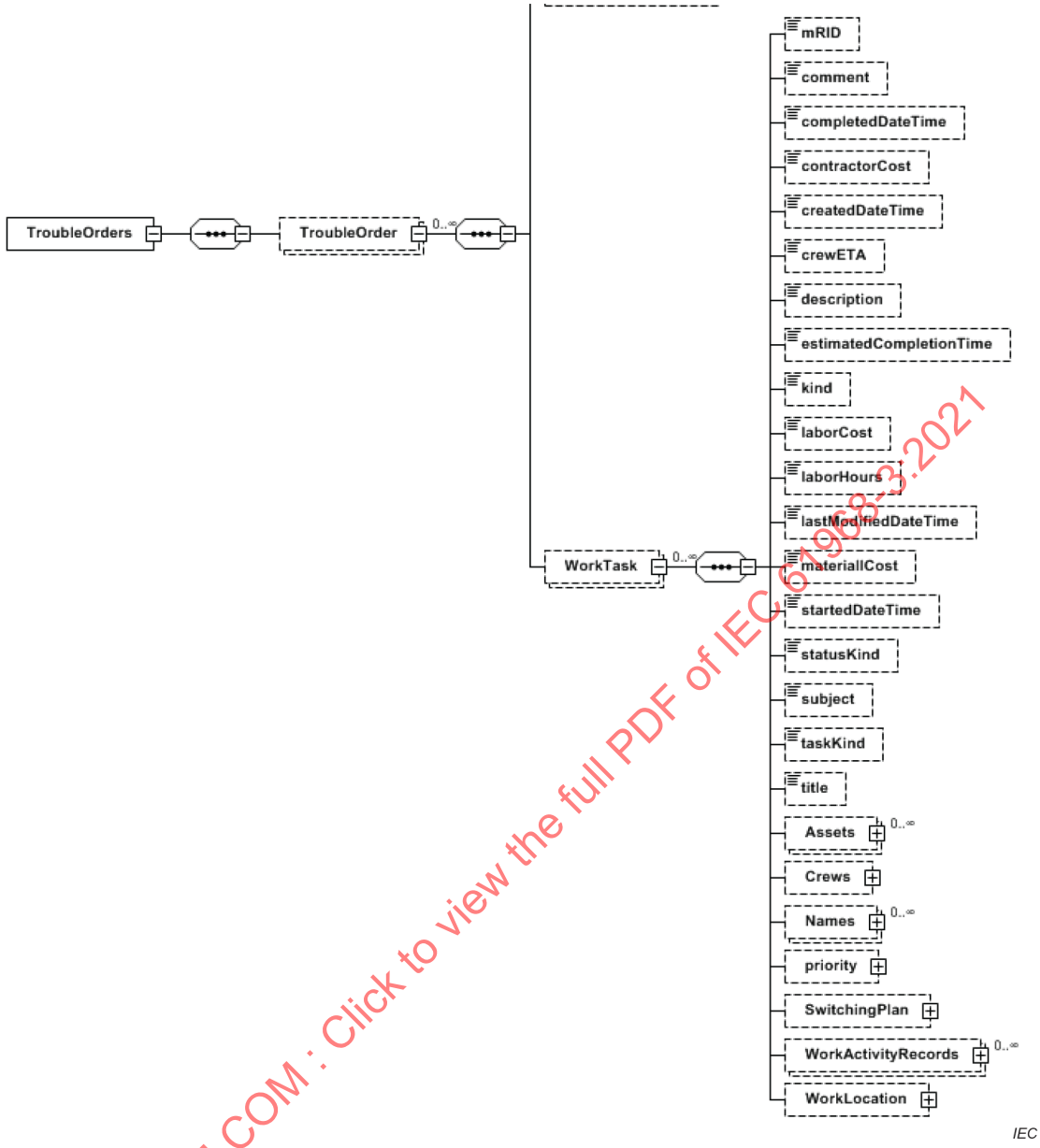


Figure 108 – TroubleOrders – Fragment de charge utile WorkTask (1)

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Les informations relatives à **Crews** pour la **WorkTask** sont présentées à la Figure B.5. La charge utile peut être utilisée de deux manières différentes, en fonction de l'endroit où la fonction d'affectation de l'équipe est réalisée. L'affectation de l'équipe implique de déterminer l'équipe la plus à même d'exécuter le travail à l'emplacement défini par **WorkLocation** et avec les compétences définies par **CrewType**. Par exemple, l'affectation de l'équipe peut être réalisée dans un système OMS ou dans un système mobile de gestion de la main-d'œuvre.

WorkLocation est une classe qui hérite de **Location** et, dans sa charge utile de message, il a les mêmes attributs que la classe **Location**.

Si la fonction d'affectation d'équipe est réalisée par la fonction métier qui initie le **TroubleOrder**, la charge utile **TroubleOrder** identifie les **Crew**, **CrewType** et/ou **CrewMembers** spécifiques. Dans le cas contraire, si l'affectation est assurée par la fonction métier qui reçoit le **TroubleOrder**, le **CrewType** peut être renseigné en laissant **Crew** et/ou **CrewMembers** vide.

L'élément **FieldDispatchHistory** est utilisé pour suivre les changements de statut "dépêché" de l'équipe liés à cette **WorkTask** et est en général rempli au fur et à mesure que l'homme de terrain exécute les étapes du cycle de vie de la **WorkTask**. À chaque changement de l'état "dépêché" de l'équipe, une nouvelle **FieldDispatchStep** est ajoutée à la charge utile.

La Figure 109 présente les éléments **priority**, **SwitchingPlan** et **WorkLocation** de la charge utile **WorkTask**. **Priority** et **WorkLocation** ont déjà été décrits. **SwitchingPlan** est une référence à un **SwitchingPlan** utilisé pour coordonner la commutation pour le travail identifié par le **TroubleOrder**.

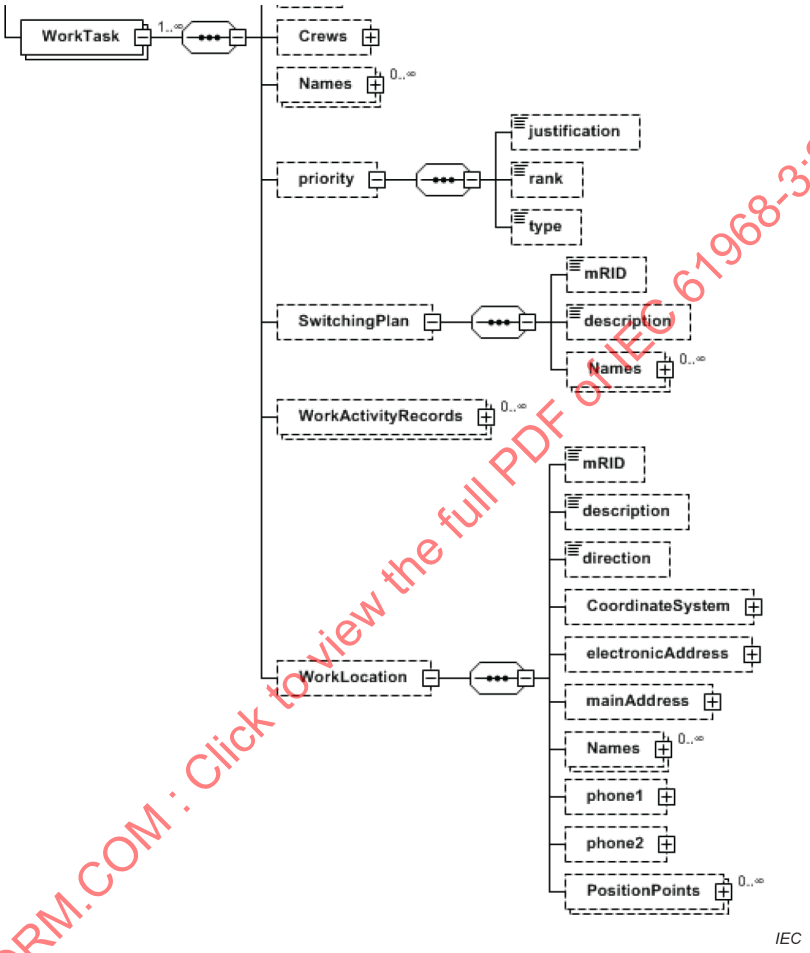


Figure 109 – TroubleOrders – Fragment de charge utile WorkTask (2)

La partie **WorkActivityRecords** de la charge utile est présentée à la Figure 110. Elle est utilisée pour consigner toutes les activités réalisées par l'équipe sur le terrain. Voir l'Article B.102 pour une description des éléments.

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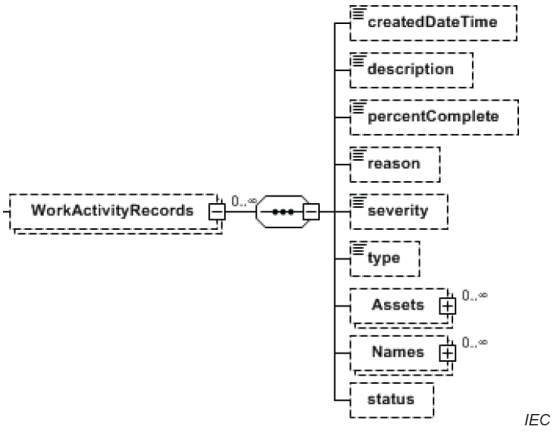


Figure 110 – TroubleOrders – Fragment de charge utile WorkTask WorkActivityRecords

La partie **Assets** de **WorkActivityRecords** est présentée à la Figure 111. Voir l'Article B.102 pour une description de **WorkActivityRecord**. Les attributs incluent:

- **AssetContainer** – conteneur de **Asset**, tel que **Cabinet**, **Ductbank**, **Pole**, **Tower** ou **UndergroundStructure**;
- **AssetInfo** – données de type telles que le type de conducteur ou le type de dispositif;
- **Ownerships** – personne qui détient le bien (un poteau qui est partagé, par exemple);
- **PowerSystemResources** – bien qui concerne le réseau électrique.

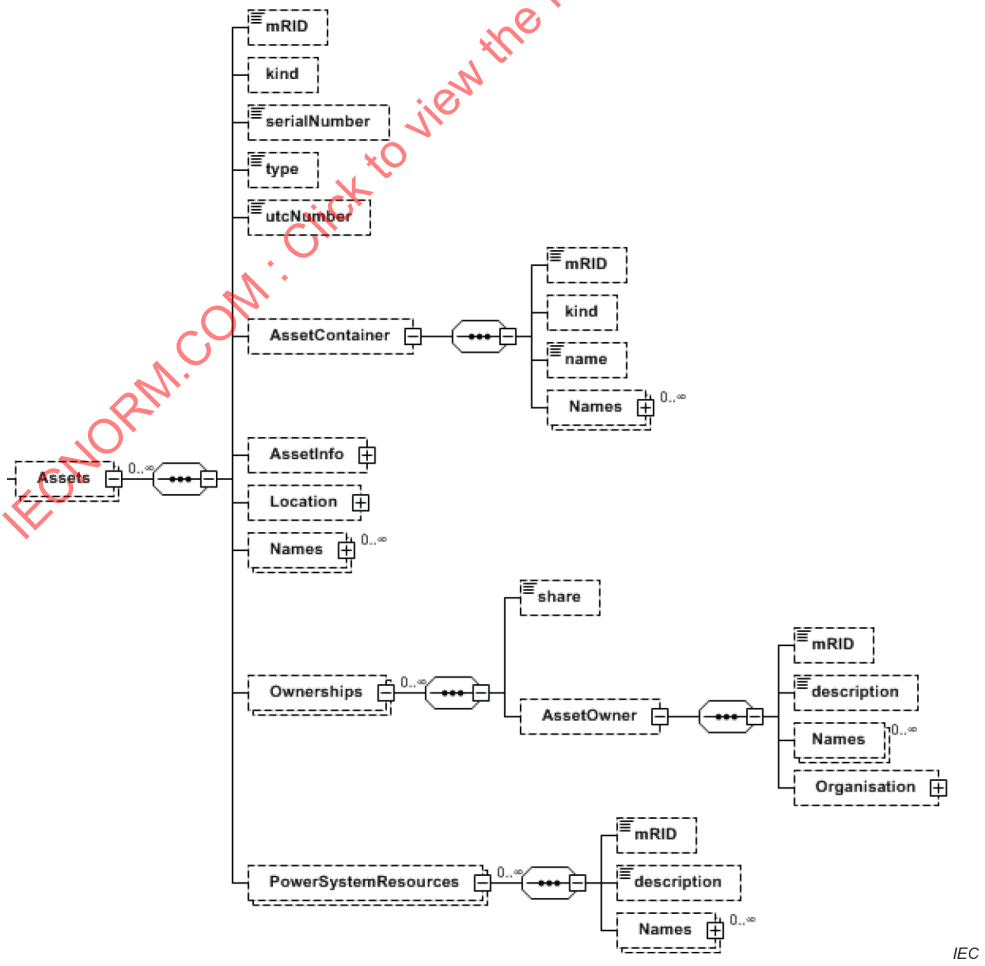


Figure 111 – TroubleOrders – Charge utile WorkTask, WorkActivityRecords, Assets

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5.21.3 Exemple XML d'un **Incident TroubleOrder**

L'exemple XML ci-dessous présente un message **TroubleOrder** auquel est associé un **Incident**. Il est utilisé pour communiquer une demande de dépanneur à dépêcher pour un **Incident**. Cela est indiqué dans la partie "crew" de la charge utile comportant une équipe vide, mais un type d'équipe "Trouble Shooter".

L'**Incident** a été signalé à partir d'un seul **TroubleTicket** qui fait également partie de ce message, mais les détails de l'**Incident** sont dans l'**Incident** lui-même. L'**Incident** est référencé par la **TroubleTicket**.

```
<?xml version="1.0" encoding="UTF-8"?>
<m:TroubleOrders xmlns:m="http://iec.ch/TC57/2019/TroubleOrders#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
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    <m:createdDateTime>2019-05-31T08:03:00</m:createdDateTime>
    <m:description>Car hit pole at Jackson and Spear in Ontario</m:description>
    <m:lastModifiedDateTime>2019-05-31T08:03:00</m:lastModifiedDateTime>
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    <m:type>TroubleOrder for Incident</m:type>
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      <m:comment>Car hit a pole at Jackson and Spear.  No power reported out.</m:comment>
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      <m:status>
        <m:dateTime>2019-05-31T08:11:00</m:dateTime>
        <m:value>Associated with Trouble Order 19201</m:value>
      </m:status>
    </m:Incident>
    <m:Issuer>
      <m:Names>
        <m:name>Officer Forest Gump</m:name>
      </m:Names>
    </m:Issuer>
    <m:Names>
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          </m:Names>
        </m:CrewType>
```

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```
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Spear</m:comment>
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      <m:lastModifiedDateTime>2019-05-31T08:09:00</m:lastModifiedDateTime>
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        </m:Names>
      </m:Author>
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        </m:Names>
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      </m:Editor>
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    </m:TroubleTicket>
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```

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6 Conventions du document

6.1 Définitions de charges utiles de messages

6.1.1 Généralités

Les diagrammes de charges utiles de messages et les tableaux présentés dans le présent document doivent être considérés comme normatifs.

Les cas d'utilisation et les diagrammes de séquences présentés dans le présent document sont donnés à titre d'information uniquement. Ils représentent des exemples d'utilisation des charges utiles de messages normatives.

6.1.2 Obligatoire/Facultatif

Les charges utiles de messages spécifiées dans la présente Norme ont été déduites des cas d'utilisation de l'Annexe A, qui répondent à des besoins métier sous-jacents pour un échange d'informations particulier. Chaque cas d'utilisation s'inscrit dans un contexte donné pour l'utilisation du CIM. Les diagrammes de charges utiles de messages décrivent les éléments qui sont transmis. Les éléments placés dans les cadres en pointillés doivent être considérés comme facultatifs dans un contexte donné. Les éléments placés dans les cadres en ligne continue doivent être considérés comme obligatoires dans un contexte donné. S'il convient qu'un diagramme décrive une classe complète comme étant obligatoire ou facultative, il convient que le lecteur comprenne bien qu'il s'agit de l'utilisation de la classe qui est obligatoire ou facultative, et ne considère donc pas que chaque élément au sein de la classe est de ce fait obligatoire ou facultatif. A cet effet, le lecteur doit se référer à la définition normative de la classe.

6.2 Messages synchrones/asynchrones

L'utilisation de messages asynchrones ou synchrones dans les diagrammes de séquences du présent document est indiquée à titre représentatif uniquement, et n'a pas de caractère normatif.

6.3 Échanges de messages

6.3.1 Généralités

Voir l'IEC 61968-100 pour des informations supplémentaires relatives aux échanges de messages.

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Annexe A
(informative)

Cas d'utilisation

A.1 Généralités

La présente annexe donne des exemples de cas d'utilisation d'exploitation du réseau liés à la détection d'interruption de réseau et à la réponse donnée. Il est important de noter que les cas d'utilisation et les diagrammes de séquences fournis dans la présente partie de l'IEC 61968 sont par nature informatifs, et sont destinés à donner des exemples d'utilisation de charges utiles de messages normatives. La présente partie de l'IEC 61968 n'a pas vocation à normaliser les processus métier spécifiques.

Le cas d'utilisation FLISR décrit le flux de travaux nécessaire pour informer les systèmes opérationnels d'une interruption et de la localisation du défaut, et pour y répondre par un isolement du défaut et la restauration des îlots sains du réseau. FLISR est l'acronyme de Fault Location, Isolation and Service Restoration (Localisation de défaut, isolement et restauration de services). Si une interruption est détectée par SCADA ou prévue par une analyse d'interruption, les meilleures informations sont en général obtenues de l'association de l'interruption à un dispositif de protection qui a été déclenché. La localisation de défaut fait référence à des observations, des signaux et des analyses supplémentaires nécessaires à l'identification de la véritable cause de l'interruption (généralement un défaut de ligne en aval du dispositif de protection). L'isolement est le processus de commutation et de séparation permettant d'isoler en toute sécurité la localisation du défaut pour procéder à des réparations. Le processus de restauration de l'alimentation des îlots sains du réseau autour de la zone isolée est appelé "restauration de services". Il existe deux cas d'utilisation FLISR, l'un pour la commande de boucle fermée automatique et l'autre dans lequel les équipes procèdent à la commutation manuellement.

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A.2 FLISR pour l'interruption détectée par SCADA, commutation SCADA

A.2.1 Description du cas d'utilisation

A.2.1.1 Nom du cas d'utilisation

Identification du cas d'utilisation		
ID	**Domaine(s)**	**Nom du cas d'utilisation**
	Gestion des interruptions, Gestion des travaux, Gestion de la distribution	FLISR pour l'interruption détectée par SCADA, commutation SCADA

A.2.1.2 Gestion de version

Changements de gestion de version / Version	Date (jj/mm/aaaa)	Nom Auteur(s) ou Comités	Domaine d'expertise / Domaine / Rôle	Titre	Statut d'approbation projet, pour commentaires, pour vote, final
1	30/04/2019	WG14 Partie 3 Équipe	Gestion des interruptions, Gestion de la distribution et Gestion des travaux		Projet

A.2.1.3 Domaine d'application et objectifs du cas d'utilisation

Domaine d'application et objectifs du cas d'utilisation	
Cas métier connexe	FLISR reposant sur la commande centralisée, IEC 61850-90-6
Domaine d'application	Ce cas d'utilisation concerne la réception d'un événement de disjoncteur ouvert ainsi que la génération et l'exécution automatiques d'un plan de commutation pour isoler le défaut et restaurer la partie saine de la ligne d'alimentation en alimentant sa partie aval à partir d'une autre ligne d'alimentation.

A.2.1.4 Récit du cas d'utilisation

Récit du cas d'utilisation
Brève description – 3 phrases au maximum
Le flux de travaux FLISR prend pour hypothèse un réseau autorégénérateur, la surveillance et la commande du système étant assurées par SCADA et la réponse automatique aux interruptions étant gérée par la fonction Gestion de défauts d'un DMS. La Figure A.1 représente le diagramme de séquence du flux de messages avec une description du flux de messages du tableau en A.2.4.2. Le cas d'utilisation décrit une situation dans laquelle un DSO peut exiger l'approbation d'un TSO avant de transférer la charge, comme lorsque le transfert porte sur un plus grand nombre de MVA entre différents postes.
Description complète
Le flux de travaux FLISR prend pour hypothèse un réseau autorégénérateur, la surveillance et la commande du système étant assurées par SCADA et la réponse automatique aux interruptions étant gérée par la fonction Gestion de défauts d'un DMS. La Figure A.1, représente le diagramme de séquence du flux de messages avec une description du flux de messages du tableau en A.2.4.2. Le cas d'utilisation décrit une situation dans laquelle un DSO peut exiger l'approbation d'un TSO avant de transférer la charge, comme lorsque le transfert porte sur un plus grand nombre de MVA entre différents postes. Lorsque la fonction Surveillance du réseau (NO-MON, alias SCADA) détecte une modification imprévue de l'état d'un dispositif de protection, elle en informe la fonction Gestion des défauts (NO-FLT, alias OMS). NO-FLT crée une **UnplannedOutage** et envoie les informations à la fonction Assistance à la clientèle (CS-TCM). A ce stade, la fonction Assistance à la clientèle est susceptible d'informer la fonction Gestion de défauts de la présence de fiches incident. La fonction Gestion de défauts peut établir une corrélation entre les fiches et l'interruption, puis informer la fonction Assistance à la clientèle de l'incident utilisé pour gérer le problème. La fonction Gestion de défauts évalue différentes alternatives et crée un plan de commutation pour isoler le problème et restaurer l'alimentation des îlots sains du réseau. La fonction Gestion de défauts évalue une ou plusieurs variations du plan de commutation et choisit celle qui assure le meilleur équilibre de courant de retour dans les circuits avoisinants. La fonction Gestion de défauts détermine alors si une approbation externe du plan de commutation est exigée. Si c'est le cas, l'opérateur en est informé et aucun plan de commutation n'est exécuté. Il est possible qu'après avoir obtenu l'autorisation d'exécuter le plan de commutation, ce dernier puisse être exécuté ultérieurement sous le contrôle de l'opérateur. Cela ne relève pas du domaine d'application de ce cas d'utilisation. Si aucune approbation externe n'est exigée, la fonction Gestion de défauts envoie le **SwitchingPlan** à la Programmation des actions de commutation (OP-SSC). La Programmation des actions de commutation invite la fonction Commande/Contrôle du réseau à exécuter chaque étape du plan de commutation sélectionné. A l'exécution de chaque étape, la fonction Gestion de défauts reçoit une notification des modifications apportées au réseau en raison de la commutation, ainsi que les balises opérationnelles de sécurité pour les dispositifs spécifiques. La fonction Gestion de défauts indique à la fonction Assistance à la clientèle à quel moment l'alimentation des clients qui ont appelé a été rétablie pendant le processus.

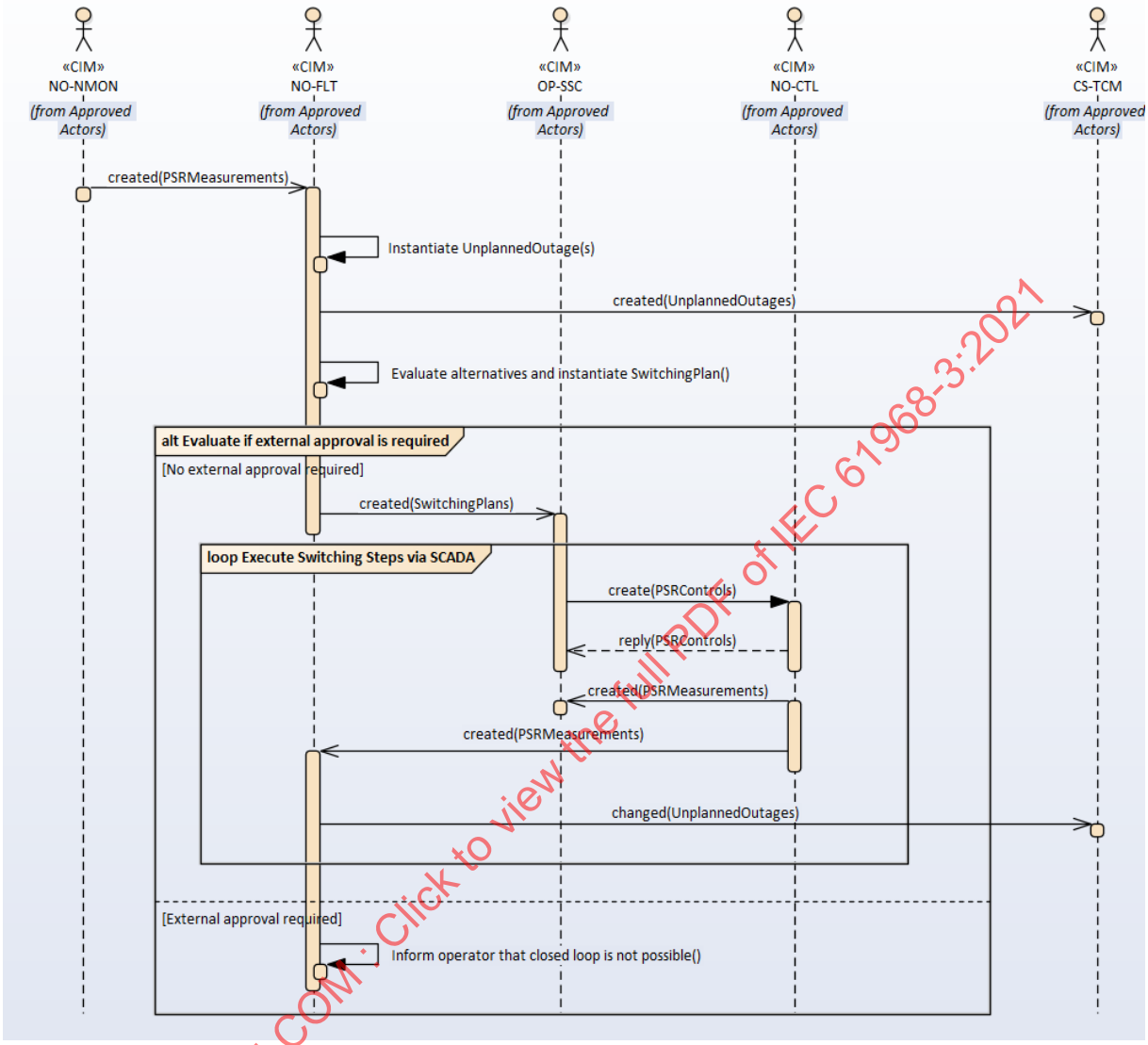
A.2.1.5 Remarques générales

Remarques générales

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A.2.2 Schémas de cas d'utilisation

Schéma du cas d'utilisation



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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
Instantiate UnplannedOutage(s)	Instancier les UnplannedOutage(s)
Evaluate alternatives and instantiate SwitchingPlan()	Évaluer les alternatives et instancier SwitchingPlan()
alt Evaluate if external approval is required	alt Evaluer si une approbation externe est exigée
loop Execute Switching Steps par SCADA	loop Exécuter les étapes de commutation par l'intermédiaire de SCADA
External approval required	Approbation externe exigée
inform operator that closed loop is not possible()	informer l'opérateur que le boucle fermée n'est pas possible()

A.2.3 Détails techniques

A.2.3.1 Acteurs: Personnes, systèmes, applications, bases de données, système d'alimentation et autres parties prenantes

Ce cas d'utilisation est écrit à l'aide des acteurs suivants:

Acteurs			
Regroupement (Communauté)		**Description du groupe**	
Exploitation du réseau Service client (CS)		IEC 61968-1 Fonction métier Modèle d'interface de référence (IRM)	
Nom de l'acteur **Voir Liste des acteurs**	**Type d'acteur** **Voir Liste des acteurs**	**Description de l'acteur** **Voir Liste des acteurs**	**Informations supplémentaires spécifiques à ce cas d'utilisation**
NO-NMON	Système	Exploitation du réseau – Surveillance du réseau. Reçoit les modifications apportées aux valeurs de mesure provenant du champ.	
NO-FLT	Système	Exploitation du réseau – Gestion de défauts. Analyse les données entrantes provenant de différentes sources, puis crée et gère les interruptions non planifiées pour suivre les clients qui ne sont pas alimentés.	
OP-SSC	Système	Exploitation du réseau - Planification de séquence de commutation.	
NO-CTL	Système	Fonction métier dans SCADA qui envoie les commandes à distance aux dispositifs sur le terrain.	
CS-TCM	Système	Service client – Gestion des appels sur incident. Reçoit des appels de la part de clients et indique le statut des interruptions non planifiées aux clients.	

A.2.3.2 Conditions préalables, hypothèses, post-conditions, événements

Conditions de cas d'utilisation			
Acteur/Système/Informations/Contrat	**Événement déclencheur**	**Conditions préalables**	**Hypothèse**
	Déclenchement d'un disjoncteur en raison d'un défaut		Même si la fonction FLISR peut traiter plusieurs mesurages provenant de différents dispositifs de détection des défauts, un seul PSRMeasurements est présenté dans ce cas d'utilisation.

A.2.3.3 Références/Questions

Références						
N°	**Type de référence**	**Référence**	**Status**	**Impact sur le cas d'utilisation**	**Auteur/Organisation**	**Lien**
	Normes	IEC 61968-3, IEC-61968-8		Le cas d'utilisation est utilisé pour valider ces normes.		

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A.2.3.4 Informations supplémentaires relatives au cas d'utilisation pour la Classification / le Mapping

Informations relatives à la classification
Relation avec d'autres cas d'utilisation
L'IEC 16850-90-6 décrit en détail l'interaction entre les dispositifs de terrain et la fonction FLISR. Ce cas d'utilisation porte sur les interactions entre FLISR, les plans de commutation et le service client.
Niveau de profondeur
Cas d'utilisation au niveau du système qui présente et guide la mise en œuvre du système.
Hiérarchisation
Relation générique, régionale ou nationale
Vue
Autres mots clés pour la classification

A.2.4 Analyse étape par étape du cas d'utilisation

A.2.4.1 Conditions préalables

Conditions du scénario					
N°	**Nom du scénario**	**Acteur principal**	**Événement déclencheur**	**Condition préalable**	**Post-Condition**
A.2.4.2	FLISR pour l'interruption détectée par SCADA, commutation SCADA	NO-NMON	Un disjoncteur s'ouvre en raison d'un défaut en aval		L'emplacement du défaut est identifié et une commutation automatique est réalisée afin d'isoler le défaut et de réduire le plus possible le nombre de clients non alimentés.

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A.2.4.2 Étapes

Scénario							
Nom du scénario:	FLISR pour l'interruption détectée par SCADA, commutation SCADA						
N° d'étape	**Événement**	**Nom du processus/de l'activité**	**Description du processus/de l'activité**	**Service**	**Producteur des informations (Acteur)**	**Destinataire des informations (Acteur)**	**Informations échangées**
1	Un défaut s'est produit sur le réseau et un disjoncteur s'est déclenché.	Fonctionnement de l'équipement de protection	Notification du changement d'état d'un dispositif de protection en raison d'une interruption.	created	NO-NMON	NO-FLT	**PSRMeasurements**
2	Analyse de défaut	FLISR	Selon les informations relatives au courant de défaut, NO-FLT informe d'une interruption avec la localisation du défaut de câble au sol en aval du dispositif de protection déclenché. À ce stade, l'interruption et la localisation du défaut sont confirmées.	created	NO-FLT	CS-TCM	**UnplannedOutages**
3	Création d'un plan de commutation	FLISR	Notification d'un nouveau plan de commutation afin d'isoler l'interruption et restaurer l'alimentation des îlots sains du réseau.	created	NO-FLT	OP-SSC	**SwitchingPlans**
4	Exécution du plan de commutation	FLISR	Demande de fonctionnement d'un commutateur commandé par SCADA pour l'exécution du plan de commutation.	create	OP-SSC	NO-CTL	**PSRControls**
5	Exécution de l'étape de commutation	SCADA	Confirmation que **PSRControls** a été reçu et est en cours de traitement.	reply	NO-CTL	OP-SSC	**PSRControls**
6	Confirmation de l'exécution de l'étape de commutation	SCADA	Notification de modification d'état d'un commutateur par suite d'une opération de commutation. La Planification de séquence de commutation l'utilise pour exécuter l'étape suivante de la séquence.	created	NO-CTL	OP-SSC	**PSRMeasurements**
7	Confirmation de l'exécution de l'étape de commutation	SCADA	Notification de modification d'état d'un commutateur par suite d'une opération de commutation. L'analyse d'interruption l'utilise pour déterminer le changement du nombre de clients pour l'UnplannedOutage, le cas échéant.	created	NO-CTL	NO-FLT	**PSRMeasurements**
8	Communication de la variation du nombre de clients	Analyse d'interruption	Notification de la restauration de l'alimentation des clients associés à l'**UnplannedOutage**	Changed	NO-FLT	CS-TCM	**UnplannedOutages**

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A.2.5 Informations échangées

Informations échangées		
Nom des informations échangées	**Description des informations échangées**	**Exigences relatives aux données des informations** **R-ID**
PSRMeasurements	Variations des valeurs discrètes et analogiques par rapport au terrain.	
PSRControls	Commandes d'ouverture et de fermeture des commutateurs.	
SwitchingPlans	Séquence d'ouverture et de fermeture des commandes pour isoler un défaut et restaurer l'alimentation pour un nombre maximal de clients.	
UnplannedOutages	Nombre de clients affectés et liste des points d'utilisation hors tension.	

A.2.6 Termes et définitions communs

Termes et définitions communs	
Terme	**Définition**

A.3 FLISR pour Trouble Call (appel sur incident) et interruption d'AMI, commutation par l'équipe

A.3.1 Description du cas d'utilisation

A.3.1.1 Nom du cas d'utilisation

Identification du cas d'utilisation		
ID	**Domaine(s)**	**Nom du cas d'utilisation**
	Gestion des interruptions, Gestion des travaux, Gestion de la distribution	FLISR pour Trouble Call (appel sur incident) et interruption d'AMI, commutation par l'équipe

A.3.1.2 Gestion de version

Changements de gestion de version / Version	Date (jj/mm/aaaa)	Nom Auteur(s) ou Comités	Domaine d'expertise / Domaine / Rôle	Titre	Statut d'approbation projet, pour commentaires, pour vote, final
1	24/05/2019	WG14 Partie 3 Équipe	Gestion des interruptions, Gestion de la distribution et Gestion des travaux		Projet

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A.3.1.3 Domaine d'application et objectifs du cas d'utilisation

Domaine d'application et objectifs du cas d'utilisation	
Cas métier connexe	FLISR reposant sur la commande centralisée, IEC 61850-90-6
Domaine d'application	Ce cas d'utilisation couvre la réception d'un événement de disjoncteur ouvert et la dépêche d'une équipe pour déterminer l'emplacement du défaut. Il concerne la génération et l'exécution automatiques d'un plan de commutation pour isoler le défaut et restaurer la partie saine de la ligne d'alimentation en alimentant sa partie aval à partir d'une autre ligne d'alimentation. La commutation est réalisée manuellement par une équipe sur le terrain ou par un opérateur dans une salle de commande qui envoie les commandes de contrôle depuis la séquence de commutation.

A.3.1.4 Récit du cas d'utilisation

Récit du cas d'utilisation
Brève description – 3 phrases au maximum
Ce flux de travaux FLISR prend pour hypothèse un réseau n'ayant pas la possibilité de détecter automatiquement un défaut et n'apportant pas de réponse automatique à l'interruption. Toutes les activités liées à l'enquête et à la commutation sont réalisées par une équipe sur le terrain. Le cas d'utilisation décrit une situation dans laquelle un DSO peut exiger l'approbation d'un TSO avant de transférer la charge, comme lorsque le transfert porte sur un plus grand nombre de MVA entre différents postes.
Description complète
Une interruption non planifiée peut être créée après avoir reçu une combinaison de TroubleTickets de la part du CIS ou d'EndDeviceEvents de la part de l'AMI. Cela donne lieu à la dépêche d'une équipe à l'emplacement prévu de l'interruption non planifiée afin de déterminer l'emplacement du défaut. Dès que l'équipe a trouvé le défaut, elle communique cette information à la salle de commande, et un plan de commutation est écrit pour isoler le défaut et, dans la mesure du possible, mettre sous tension les clients en amont et en aval du défaut. La fonction Gestion de défauts détermine alors si une approbation externe du plan de commutation est exigée. Si c'est le cas, l'opérateur en est informé et aucun plan de commutation n'est exécuté. Si aucune approbation externe n'est exigée, la fonction Exploitation du réseau fournit le plan de commutation sélectionné à la Gestion de la main-d'œuvre. Une équipe sur le terrain exécute chaque étape du plan de commutation sélectionné. La fonction Gestion de la main-d'œuvre tient la fonction l'Exploitation du réseau informée de la progression du plan de commutation. Après l'exécution de chaque étape, la fonction Exploitation du réseau informe la fonction Gestion de défauts des modifications apportées au réseau en raison de la commutation, des raccordements et des séparations, ainsi que les balises opérationnelles de sécurité pour les dispositifs spécifiques. Une partie ou toutes les étapes peuvent être exécutées à l'aide des commandes SCADA, en lieu et place de l'équipe sur le terrain qui les exécute. Pour vérifier la restauration de l'alimentation des clients, la fonction Gestion de défauts peut envoyer un ping à la fonction Compteur. La fonction Gestion de défauts indique à la fonction Assistance à la clientèle les clients dont elle pense que leur alimentation a été rétablie. S'il apparaît qu'un client n'est toujours pas alimenté lorsque la fonction Assistance à la clientèle rappelle des clients, elle soumet une nouvelle Fiche incident à la fonction Gestion de défauts.

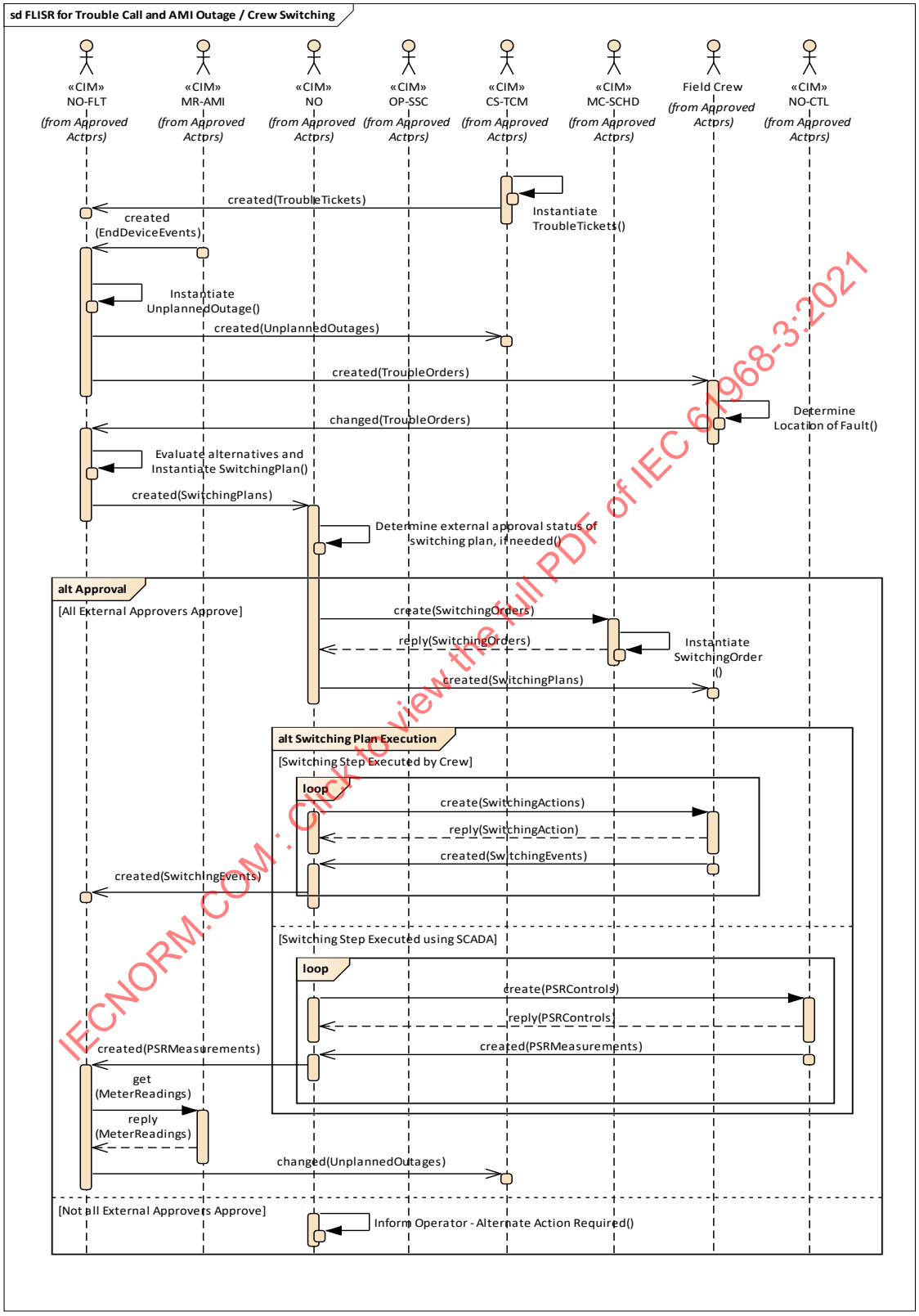
A.3.1.5 Remarques générales

Remarques générales

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A.3.2 Schémas de cas d'utilisation

Schéma du cas d'utilisation



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Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
Instantiate TroubleTicket()	Instancier TroubleTicket()
Instantiate UnplannedOutage()	Instancier UnplannedOutage()
Determine Location of Fault()	Déterminer l'emplacement du défaut()
Evaluate alternatives and Instantiate SwitchingPlan()	Évaluer les alternatives et instancier SwitchingPlan()
Determine external approval status of SwitchingPlan(), if needed()	Déterminer le statut d'approbation externe de SwitchingPlan(), le cas échéant
alt Approval	alt Approbation
All External Approvers Approve	Tous les approbateurs externes approuvent
Instantiate SwitchingOrder()	Instancier SwitchingOrder ()
alt Switching Plan Execution	alt Excution du plan de commutation
Switching Step Executed by Crew	Étape de commutation exécutée par l'équipe
loop	boucle
Switching Step Executed by SCADA	Étape de commutation exécutée par SCADA
Not all External Approvers Approve	Tous les approbateurs externes n'approuvent pas
Inform operator – Alternate Action Required	Informer l'opérateur – Autre action exigée

A.3.3 Détails techniques

A.3.3.1 Acteurs: Personnes, systèmes, applications, bases de données, système d'alimentation et autres parties prenantes

Ce cas d'utilisation est écrit à l'aide des acteurs suivants

Acteurs			
Regroupement (Communauté)		**Description du groupe**	
Exploitation du réseau Service client (CS) Maintenance et Construction (MC) Relevé de compteur (MR)		IEC 61968-1 Fonction métier Modèle d'interface de référence (IRM)	
Nom de l'acteur **Voir Liste des acteurs**	**Type d'acteur** **Voir Liste des acteurs**	**Description de l'acteur** **Voir Liste des acteurs**	**Informations supplémentaires spécifiques à ce cas d'utilisation**
NO-NMON	Système	Exploitation du réseau – Surveillance du réseau Reçoit les modifications apportées aux valeurs de mesure provenant du champ.	
NO-FLT	Système	Exploitation du réseau – Gestion de défauts. Analyse les données entrantes provenant de différentes sources, puis crée et gère les interruptions non planifiées pour suivre les clients qui ne sont pas alimentés.	
OP-SSC	Système	Exploitation du réseau - Planification de séquence de commutation.	
NO-CTL	Système	Fonction métier dans SCADA qui envoie les commandes à distance aux dispositifs sur le terrain.	
CS-TCM	Système	Service client – Gestion des appels sur incident. Reçoit des appels de la part de clients et indique le statut des interruptions non planifiées aux clients.	
MR-AMI	Système	Infrastructure de compteur avancée	
MC-SCHD	Système		

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A.3.3.2 Conditions préalables, hypothèses, post-conditions, événements

Conditions de cas d'utilisation			
Acteur/Système/Informations/ Contrat	**Événement déclencheur**	**Conditions préalables**	**Hypothèse**
	Déclenchement d'un disjoncteur en raison d'un défaut		

A.3.3.3 Références/Questions

Références						
N°	**Type de référence**	**Référence**	**Status**	**Impact sur le cas d'utilisation**	**Auteur/Organisation**	**Lien**
	Normes	IEC 61968-3, IEC 61968-6, IEC 61968-8, IEC-61968-9		Le cas d'utilisation est utilisé pour valider ces normes.		

A.3.3.4 Informations supplémentaires relatives au cas d'utilisation pour la Classification / le Mapping

Informations relatives à la classification
Relation avec d'autres cas d'utilisation
L'IEC 16850-90-6 décrit en détail l'interaction entre les dispositifs de terrain et la fonction FLISR. Ce cas d'utilisation porte sur les interactions entre la localisation manuelle des défauts, les équipes sur le terrain, les plans de commutation et le service client.
Niveau de profondeur
Cas d'utilisation au niveau du système qui présente et guide la mise en œuvre du système.
Hiérarchisation
Relation générique, régionale ou nationale
Vue
Autres mots clés pour la classification

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A.3.4 Analyse étape par étape du cas d'utilisation

A.3.4.1 Conditions préalables

Conditions du scénario					
N°	**Nom du scénario**	**Acteur principal**	**Événement déclencheur**	**Condition préalable**	**Post-Condition**
A.3.4.2	FLISR pour Trouble Call (appel sur incident) et interruption d'AMI, commutation par l'équipe	NO-FLT	Un disjoncteur s'ouvre en raison d'un défaut en aval		L'emplacement du défaut est identifié et une commutation manuelle est réalisée afin d'isoler le défaut et de réduire le plus possible le nombre de clients non alimentés.

A.3.4.2 Étapes

Scénario							
Nom du scénario:		FLISR pour Trouble Call (appel sur incident) et interruption d'AMI, commutation par l'équipe					
N° d'étape	**Événement**	**Nom du processus/de l'activité**	**Description du processus/de l'activité**	**Service**	**Producteur des informations (Acteur)**	**Destinataire des informations (Acteur)**	**Informations échangées**
1 alt a	Le client n'est plus alimenté	Entrée d'un appel sur incident	Le client appelle l'entreprise de distribution. Le représentant du service client crée une TroubleTicket et l'envoie à NO-FLT	created	Représentant du service client (CSR)	NO-FLT	**TroubleTickets**
1 alt b	Un défaut se produit et déclenche l'ouverture de la protection du système, et au moins un compteur AMI est mis hors tension.	AMI	Le compteur reçoit la dernière notification de mise hors tension de la part d'un compteur et crée des EndDeviceEvents.	created	MR-AMI	NO-FLT	**EndDeviceEvents**
2	L'OMS crée une interruption non planifiée	Analyse d'interruption	Une interruption non planifiée est créée.	created	NO-FLT	CS-TCM	**UnplannedOutages**
3	L'OMS dépêche une équipe sur l'interruption.	Équipe dépêchée	Les informations connues relatives à l'interruption non planifiée sont envoyées à une équipe sur le terrain	created	NO-FLT	MC-FRD	**TroubleOrders**
4	L'équipe sur le terrain trouve le défaut	Localisation manuelle du défaut	L'équipe sur le terrain reçoit les informations relatives à l'interruption non planifiée et contrôle la ligne d'alimentation pour déterminer l'emplacement du défaut.				
5	L'équipe sur le terrain signale l'emplacement du défaut à l'OMS	Signalisation de la localisation manuelle du défaut	L'équipe sur le terrain communique l'emplacement du défaut à l'OMS	changed	MC-FLD	NO-FLT	**TroubleOrders**

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Scénario							
Nom du scénario:		FLISR pour Trouble Call (appel sur incident) et interruption d'AMI, commutation par l'équipe					
N° d'étape	**Événement**	**Nom du processus/de l'activité**	**Description du processus/de l'activité**	**Service**	**Producteur des informations (Acteur)**	**Destinataire des informations (Acteur)**	**Informations échangées**
6	L'OMS détermine le plan de commutation optimal	Isolation du défaut et restauration	NO-FLT reçoit l'emplacement du défaut et un opérateur ou un processus automatisé détermine la meilleure combinaison de commutateurs à faire fonctionner pour isoler les zones en amont et en aval du défaut et rétablir l'alimentation des clients qui ne font pas partie de la zone concernée par le défaut.	created	NO-FLT	NO	**SwitchingPlans**
7	Un plan de commutation est créé et son impact doit être évalué.	Évaluation du plan de commutation	Le plan de commutation est évalué pour déterminer si une approbation externe est nécessaire, par exemple si un TSO doit approuver la commutation qui va être réalisée par un DSO et qui implique un transfert de charge supérieur à un certain seuil entre des postes.	Processus manuel			
8 alt a	Une approbation externe de la commutation est exigée et la demande de commutation est rejetée.	Rejet externe du plan de commutation	Informer l'opérateur que la commutation n'est pas autorisée et mettre fin au cas d'utilisation.	Processus manuel			
8 alt b	Une approbation externe du plan de commutation n'est pas exigée ou la demande de commutation est approuvée.	Programmer une ressource pour exécuter le plan de commutation	NO envoie une demande de planification d'équipe pour attribuer une équipe au SwitchingPlan.	created	NO	MC-SCHD	**SwitchingOrders**
9	La demande de planification est satisfaite	Fonction de planification	La fonction de planification a attribué une/des équipe(s) au travail réalisé dans le cadre du SwitchingPlan	reply	MC-SCHD	NO	**SwitchingOrders**

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Scénario							
Nom du scénario:		FLISR pour Trouble Call (appel sur incident) et interruption d'AMI, commutation par l'équipe					
N° d'étape	**Événement**	**Nom du processus/de l'activité**	**Description du processus/de l'activité**	**Service**	**Producteur des informations (Acteur)**	**Destinataire des informations (Acteur)**	**Informations échangées**
10	SwitchingPlan est communiqué à l'équipe sur le terrain	Exploitation du réseau	Le SwitchingPlan est envoyé à l'équipe sur le terrain de manière à ce qu'elle puisse commencer à l'exécuter.	created	NO	MC-FRD	**SwitchingPlans**
11	Le SwitchingPlan est exécuté						
11 alt 1a	Étape de commutation exécutée par l'équipe	Exécution manuelle de l'étape	La Planification de séquence de commutation demande à l'équipe sur le terrain d'exécuter une ou plusieurs étapes. Si plusieurs équipes sur le terrain sont attribuées au SwitchingPlan, l'action de commutation est uniquement envoyée à l'équipe attribuée à l'étape.	create	OP-SSC	MC-SCHD	**SwitchingActions**. Référence au SwitchingPlan, numéro de SwitchingStepGroup, numéro de SwitchingStep et action correspondante.
11 alt 1b		Exécution manuelle de l'étape	L'équipe sur le terrain répond qu'elle a reçu la demande	reply	MC-SCHD	OP-SSC	SwitchingActions
11 alt 1c		Exécution manuelle de l'étape	L'équipe sur le terrain confirme qu'elle a exécuté l'étape (ou qu'elle ne peut pas l'exécuter)	created	MC-SCHD	OP-SSC	SwitchingEvents
11 alt 1d		Notification d'étape	Le changement d'état du réseau est communiqué à NO-FLT	created	NO	NO-FLT	SwitchingEvents
11 alt 2a	Étape de commutation exécutée SCADA	Exécution automatique de l'étape	La Planification de séquence de commutation demande à SCADA d'exécuter une étape	create	OP-SSC	NO-CTL	PSRControls
11 alt 2b		Exécution automatique de l'étape	SCADA confirme que la demande de contrôle a été reçue et qu'elle est en cours	reply	NO-CTL	OP-SSC	PSRControls
11 alt 2c		Exécution automatique de l'étape	SCADA confirme que la valeur a changé	created	NO-CTL	OP-SSC	PSRMeasurements
11 alt 2d		Notification d'étape	Le changement d'état du réseau est communiqué à NO-FLT	created	NO	NO-FLT	PSRMeasurements

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Scénario							
Nom du scénario:		FLISR pour Trouble Call (appel sur incident) et interruption d'AMI, commutation par l'équipe					
N° d'étape	**Événement**	**Nom du processus/de l'activité**	**Description du processus/de l'activité**	**Service**	**Producteur des informations (Acteur)**	**Destinataire des informations (Acteur)**	**Informations échangées**
12 alt 1a	Le nombre de clients change et il y a AMI	Analyse d'interruption	La fonction Analyse d'interruption reçoit des SwitchingEvents et des PSRMeasurements, puis détermine que l'état de mise sous tension de certains points d'utilisation associés à l'interruption non planifiée a changé. Cela déclenche l'envoi d'un ping à la fonction Compteur pour confirmer la restauration.				
12 alt 1b	Envoi d'un ping aux compteurs	Analyse d'interruption	La fonction Analyse d'interruption envoie des pings aux compteurs dont elle pense qu'ils sont à présent sous tension.	get	NO-FLT	MR-AMI	MeterReadings
12 alt 1c	Les compteurs répondent	Analyse d'interruption	Les compteurs sous tension répondent	reply	MR-AMI	NO-FLT	MeterReadings
12 alt 1d	L'alimentation des clients est confirmée	Analyse d'interruption	L'état de mise sous tension du point d'utilisation et le nombre de clients pour l'UnplannedOutage sont mis à jour	changed	NO-FLT	CS-TCM	UnplannedOutages
12 alt 2	Le nombre de clients change et il n'y a pas d'AMI	Analyse d'interruption	La fonction Analyse d'interruption reçoit des SwitchingEvents et des PSRMeasurements, puis détermine que l'état de mise sous tension de certains points d'utilisation associés à l'interruption non planifiée a changé. La restauration de l'interruption est prise pour hypothèse pour le client dans la zone mise sous tension.	changed	NO-FLT	CS-TCM	UnplannedOutages

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A.3.5 Informations échangées

Informations échangées		
Nom des informations échangées	**Description des informations échangées**	**Exigences relatives aux données des informations** **R-ID**
MeterReadings	Demande/réponse pour déterminer le statut de mise sous tension d'un compteur	
PSRMeasurements	Variations des valeurs discrètes et analogiques par rapport au terrain.	
PSRControls	Commandes d'ouverture et de fermeture des commutateurs.	
SwitchingActions	Demande d'exécution d'une étape du plan de commutation. Inclut l'opération à exécuter et le composant du réseau sur lequel l'exécuter.	
SwitchingEvents	Notification d'un changement d'état du réseau. Inclut l'opération exécutée et le composant du réseau sur lequel elle l'a été.	
SwitchingOrders	Demande de planification des équipes sur un SwitchingPlan	
SwitchingPlans	Séquence d'ouverture et de fermeture des commandes pour isoler un défaut et restaurer l'alimentation pour un nombre maximal de clients.	
TroubleOrders	Demande de planification d'une équipe sur une UnplannedOutage. Localisation confirmée du défaut de l'UnplannedOutage	
TroubleTickets	Le client signale une interruption. Inclut l'identification du client et le point d'utilisation concerné.	
UnplannedOutages	Nombre de clients affectés et liste des points d'utilisation hors tension.	

A.3.6 Termes et définitions communs

Termes et définitions communs	
Terme	**Définition**

A.4 Interruption planifiée pour maintenance – Processus manuel

La séquence représentée à la Figure A.3 s'appuie sur le processus métier d'une grande entreprise européenne. Dans le processus en cours, l'interopérabilité entre les systèmes est très limitée, s'agissant plutôt d'interactions manuelles. De même, cette séquence part du principe que tous les commutateurs ne sont pas télémesurés et qu'ils exigent une opération manuelle.

Si le travail planifié exige d'isoler une zone pour les besoins de la maintenance, un directeur technique soumet en premier lieu une demande au système de gestion des travaux (SAP en l'occurrence). Ensuite, le directeur technique formule une demande séparée de plan de commutation en vue d'isoler la zone de travail, adressée par courriel à un opérateur de salle de commande. L'opérateur crée des "programmes de commutation", à savoir un bon de travail combiné à un plan de commutation (le concept le plus proche dans le CIM serait peut-être un SwitchingPlan). Un programme de commutation contient toute la procédure d'isolement, de restauration de l'alimentation et de retour à l'état normal. Après les nécessaires approbations, l'opérateur envoie un courriel contenant les programmes de commutation au directeur technique.

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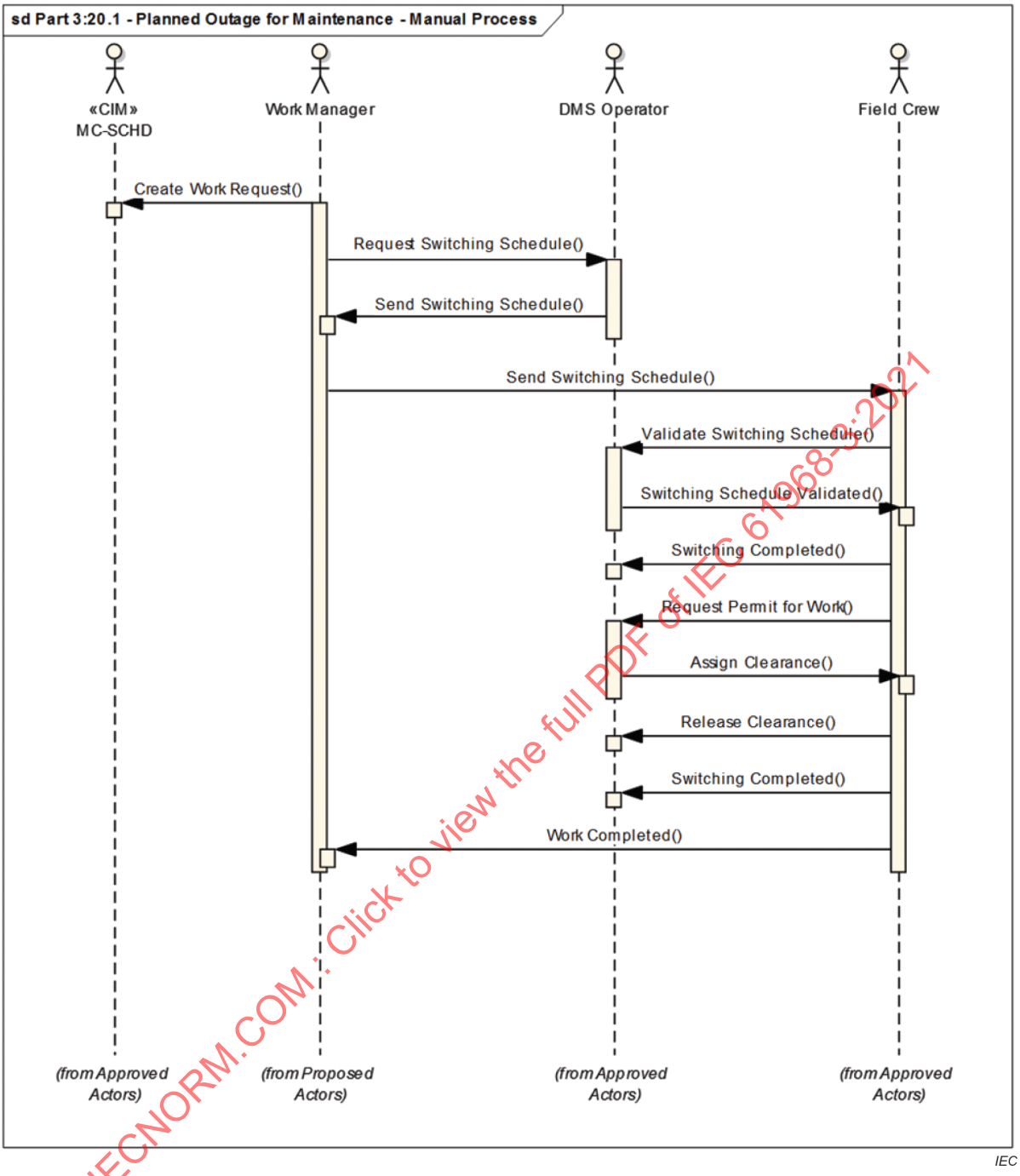
Le directeur technique attribue les programmes de commutation à une équipe sur le terrain, puis les étapes de commutation individuelles aux membres de l'équipe en fonction de leurs qualifications. Par exemple, seuls quelques membres de l'équipe peuvent être en mesure de procéder à la commutation et à la mise à la terre. Soit le directeur technique envoie par courriel les programmes de commutation au chef d'équipe, soit il les imprime et les lui remet en mains propres.

L'équipe sur le terrain se rend sur le lieu de travail. Dès son arrivée, le chef d'équipe contacte l'opérateur pour l'informer que tout le monde est prêt à travailler. L'opérateur valide le fait que le programme de commutation est toujours valable dans l'état actuel du réseau. Désormais, l'équipe est libre d'exécuter toute la procédure d'isolement et de restauration de l'alimentation prévue dans le programme de commutation, et informe l'opérateur que la commutation est terminée. L'opérateur met à jour le DMS pour indiquer les modifications.

L'alimentation dans la zone de travail est maintenant coupée. L'équipe de maintenance contacte l'opérateur pour demander un "permis de travail", également appelé "habilitation". Le chef d'équipe reçoit et conserve par-devers lui le permis de travail lors de la maintenance. Noter qu'une seule personne peut recevoir le permis de travail (en général le chef d'équipe). Cette personne ne peut pas réattribuer le permis de travail à un autre membre de l'équipe (seul l'opérateur peut le faire).

À l'issue du travail de maintenance, le chef d'équipe contacte l'opérateur pour renvoyer le permis de travail. Ensuite, l'équipe continue d'exécuter le programme de commutation afin de remettre le réseau à l'état normal, puis en informe l'opérateur.

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Anglais	Français
Planned Outage for Maintenance – Manual Process	Interruption planifiée pour maintenance – Processus manuel
Work Manager	Directeur technique
DMS Operator	Opérateur DMS
Field Crew	Équipe sur le terrain
Create Work Request()	Créer une demande de travaux()
Request Switching Schedule()	Demander un programme de commutation()
Send Switching Schedule()	Envoyer un programme de commutation()
Validate Switching Schedule()	Valider le programme de commutation()
Switching Schedule Validated()	Programme de commutation validé()
Switching Completed()	Commutation terminée()

Anglais	Français
Request Permit for Work()	Demander un permis de travail()
Assigne Clearance()	Attribuer l'habilitation()
Release Clearance()	Délivrer l'habilitation()
Work Completed()	Travail terminé()
(from Approved Actor)	(des Acteurs approuvés)

Figure A.1 – Interruption planifiée pour maintenance – Processus manuel

A.5 Interruption planifiée pour maintenance

A.5.1 Généralités

Ce cas d'utilisation décrit la manière de demander une interruption planifiée, de créer un plan de commutation et d'exécuter un plan de commutation. Il suit le processus manuel décrit à l'Article A.4, mais dans ce cas, la majorité des étapes sont automatisées. Il a été développé à l'aide du modèle de cas d'utilisation de l'IEC.

A.5.2 Description du cas d'utilisation

A.5.2.1 Nom du cas d'utilisation

Identification du cas d'utilisation		
ID	**Domaine(s)**	**Nom du cas d'utilisation**
	Assistance à la clientèle, Gestion d'interruption, Gestion des travaux	Demande, création et exécution d'une interruption planifiée.

A.5.2.2 Gestion de version

Changements de gestion de version / Version	Date (jj/mm/aaaa)	Nom Auteur(s) ou Comités	Domaine d'expertise / Domaine / Rôle	Titre	Statut d'approbation projet, pour commentaires, pour vote, final
1	24/04/2019	WG14 Part Teams Focus Community	Systèmes d'informations client, Gestion d'interruption et Gestion des travaux		Projet

A.5.2.3 Domaine d'application et objectifs du cas d'utilisation

Domaine d'application et objectifs du cas d'utilisation	
Cas métier connexe	
Domaine d'application	Ce cas d'utilisation porte sur la demande, la création et l'exécution d'une interruption planifiée.

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A.5.2.4 Récit du cas d'utilisation

Récit du cas d'utilisation
Brève description – 3 phrases au maximum
Un plan de commutation est demandé par la fonction Gestion des travaux, qui est ensuite écrit par le personnel d'exploitation. L'exécution du plan de commutation est ensuite programmée, et les clients qui vont être impactés en sont informés. Dès le début de l'exécution, le service client est informé du moment où l'alimentation des clients va être coupée, puis rétablie.
Description complète
La séquence commence par une SwitchingPlanRequest, qui permet d'acheminer une demande entre la fonction Gestion des travaux (ou une autre fonction métier) et la fonction Exploitation du réseau, selon laquelle une commutation doit être réalisée. Il peut s'agir d'une demande d'isolation d'une partie du réseau afin de procéder à des travaux de maintenance ou de construction. La charge utile inclut le type de travaux à réaliser et le moment auquel il convient de le commencer. Le résultat classique d'une SwitchingPlanRequest est la création d'un SwitchingPlan. Un SwitchingPlan est une suite d'étapes préalablement définies qui, en règle générale, exécutent des opérations de changement de l'état du réseau (une séquence d'opérations d'ouverture et de fermeture du commutateur, par exemple). La Programmation des actions de commutation (OP-SSC) accuse réception de la demande avec un message de réponse. Le SwitchingPlan est ensuite développé par la création manuelle ou automatique d'étapes. Le SwitchingPlan traverse différents processus d'examen et d'approbation dans la fonction Programmation des actions de commutation. À l'issue du développement d'un SwitchingPlan approuvé, la Programmation des actions de commutation formule une demande de création d'une SwitchingOrder à la Programmation et répartition du travail (MC-SCHD) à l'aide du message SwitchingOrders. Le SwitchingPlan n'est pas encore communiqué à l'extérieur de la fonction Programmation des actions de commutation. Le SwitchingOrder est planifié dans la Programmation et répartition du travail. Dès qu'il a été planifié, la Programmation et répartition du travail répond par un message SwitchingOrders afin d'indiquer que le SwitchingOrder a été planifié. Enfin, le service client est informé de l'interruption planifiée par l'intermédiaire d'un message PlannedOutageNotification, qui est utilisé pour informer les clients de l'interruption planifiée. Un bon de commutation peut être reprogrammé ou annulé. Cette demande est en général formulée par l'exploitation du réseau en raison d'une modification de la configuration du réseau ou d'un événement météorologique. La demande de reprogrammation est adressée à la maintenance et à la construction pour fournir des ressources pour la date/l'heure révisée. La nouvelle date/heure est ensuite communiquée à l'assistance à la clientèle par l'intermédiaire d'un message PlannedOutageNotification. Les étapes opérationnelles actuelles d'un SwitchingPlan sont définies à l'aide du profil SwitchingPlan. Les étapes opérationnelles peuvent contenir différentes SwitchingActions qui déterminent quelle opération doit être réalisée et sur quel composant du réseau. Au moment de l'exécution du SwitchingPlan, différents profils sont utilisés pour coordonner l'exécution entre la salle de commande, les équipes sur le terrain et SCADA. Un SwitchingPlan peut être uniquement composé d'étapes opérationnelles qui sont réalisées par une équipe sur le terrain et/ou uniquement par des étapes opérationnelles réalisées automatiquement avec SCADA. L'exécution du SwitchingPlan commence lorsque OP-SSC envoie un message SwitchingPlans à MC-FRD, qui détient la dernière version approuvée du SwitchingPlan à exécuter. Cela est représenté à la Figure A.4. Le diagramme de séquences représente donc la manière dont une étape de commutation est envoyée de la salle de commande à une équipe sur le terrain à l'aide d'un message SwitchingActions. Même si l'équipe sur le terrain peut déjà disposer d'un exemplaire complet du SwitchingPlan, ce message est utilisé pour lui demander d'exécuter l'étape spécifique indiquée dans le message. La réponse indique que l'équipe sur le terrain a reçu l'instruction d'exécuter une étape de commutation. Le message SwitchingEvents est une confirmation de l'exécution de l'étape de commutation. Le diagramme de séquences représente également la manière dont une étape ControlAction est coordonnée par une séquence de PSRControls, une réponse et des PSRMeasurements lorsque l'étape est exécutée à l'aide de commandes SCADA. Le diagramme de séquences représente également la manière dont l'assistance à la clientèle est informée de l'exécution d'une SwitchingStep ayant pour effet de couper l'alimentation des clients et des changements de nombre de clients. Ces notifications sont formulées dans le message PlannedOutages.

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A.5.2.5 Remarques générales

Remarques générales
Le suivi des bons de commutation est essentiel au fonctionnement en toute sécurité du réseau électrique. La coordination électronique de l'exécution des bons de commutation entre la salle de commande et les équipes sur le terrain peut réduire l'ambiguïté de la commutation et les erreurs de commutation.

A.5.3 Schémas de cas d'utilisation

Plusieurs diagrammes de séquences sont associés à ce cas d'utilisation. Les diagrammes de séquences sont présentés avec chaque étape dans le cas d'utilisation.

Schéma du cas d'utilisation
La Figure A.2 est un diagramme présentant la création d'un plan de commutation.
La Figure A.3 présente les modifications apportées à un plan de commutation
La Figure A.4 présente l'exécution d'un plan de commutation

A.5.4 Détails techniques

A.5.4.1 Acteurs: Personnes, systèmes, applications, bases de données, système d'alimentation et autres parties prenantes

Ce cas d'utilisation est écrit à l'aide des acteurs suivants

Acteurs			
Regroupement (Communauté)		**Description du groupe**	
Exploitation du réseau Service client (CS) Maintenance et Construction (MC)		IEC 61968-1 Fonction métier Modèle d'interface de référence (IRM)	
Nom de l'acteur **Voir Liste des acteurs**	**Type d'acteur** **Voir Liste des acteurs**	**Description de l'acteur** **Voir Liste des acteurs**	**Informations supplémentaires spécifiques à ce cas d'utilisation**
CS-CSRV	Système	L'acteur du service client donne des informations aux clients relatives à leur service électrique.	
MC-SCHD	Système	Programmation de la maintenance et de la construction	
OP-SSC	Système	Exploitation du réseau - Planification de séquence de commutation.	
NO-CTL	Système	Fonction métier dans SCADA qui envoie les commandes à distance aux dispositifs sur le terrain.	
MC-FRD	Système	Maintenance et Construction – distribution des ressources sur le terrain	

A.5.4.2 Conditions préalables, hypothèses, post-conditions, événements

Conditions de cas d'utilisation			
Acteur/Système/Informations/Contrat	**Événement déclencheur**	**Conditions préalables**	**Hypothèse**
	Une demande de commutation est créée		Toutes les interruptions planifiées exigent d'écrire et d'utiliser un plan de commutation pour suivre son exécution.

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A.5.4.3 Références/Questions

Références						
N°	**Type de référence**	**Référence**	**Status**	**Impact sur le cas d'utilisation**	**Auteur/Organisation**	**Lien**
	Normes	IEC 61968-3 IEC 61968-6 IEC-61968-8		Le cas d'utilisation est utilisé pour valider ces trois normes.		

A.5.4.4 Informations supplémentaires relatives au cas d'utilisation pour la Classification / le Mapping

Informations relatives à la classification
Relation avec d'autres cas d'utilisation
Niveau de profondeur
Cas d'utilisation au niveau du système qui présente et guide la mise en œuvre du système.
Hiérarchisation
Relation générique, régionale ou nationale
Vue
Autres mots clés pour la classification

A.5.5 Analyse étape par étape du cas d'utilisation

A.5.5.1 Conditions préalables

Conditions du scénario					
N°	**Nom du scénario**	**Acteur principal**	**Événement déclencheur**	**Condition préalable**	**Post-Condition**
A.5.5.2	Création d'un plan de commutation	MC-SCHD	Une demande de création d'un plan de commutation est formulée		Un plan de commutation est créé et les clients impactés sont informés.
A.5.5.3	Le bon de commutation est mis à jour	OP-SSC	La date/heure de début d'un bon de commutation doit être modifiée (en raison de mauvaises conditions météorologiques, par exemple).	Il existe un plan de commutation	Le bon de commutation est mis à jour et les clients impactés sont informés.
A.5.5.4	Exécution du plan de commutation	OP-SSC	L'heure/la date d'exigibilité d'un plan de commutation approche.	Il existe un plan de commutation et les ressources sont disponibles pour l'exécuter.	Le plan de commutation est exécuté.

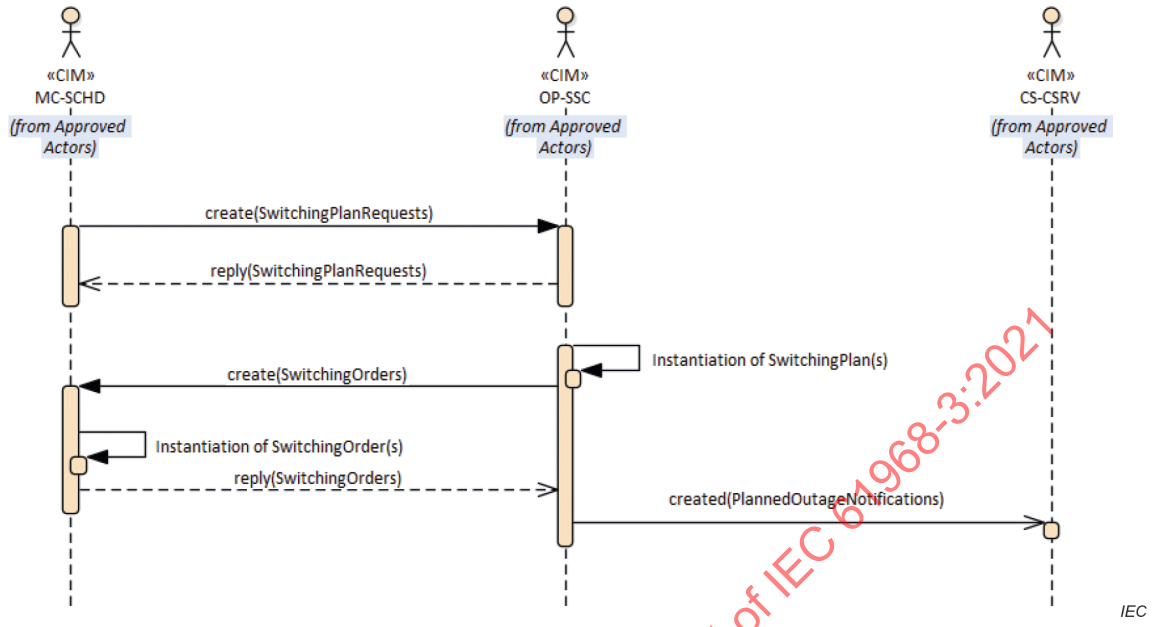
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A.5.5.2 Étapes – Le SwitchingPlan est créé

Scénario							
Nom du scénario:		Création d'un plan de commutation					
N° d'étape	**Événement**	**Nom du processus/de l'activité**	**Description du processus/de l'activité**	**Service**	**Producteur des informations (Acteur)**	**Destinataire des informations (Acteur)**	**Informations échangées**
1	La fonction Gestion des travaux planifie un nouveau projet de construction ou de maintenance qui exige d'isoler une partie du réseau.	Planification de la maintenance et de la construction	Une SwitchingPlanRequest est envoyée à la fonction Exploitation du réseau.	create	MC-SCHD	OP-SSC	**SwitchingPlanRequests**, qui inclut le moment où le travail est exigé, l'endroit où il est exigé et ce qui doit être réalisé.
2	OP-SSC répond en indiquant qu'il a reçu la demande.	Programmation de bon de commutation		reply	OP-SSC	MC-SCHD	**SwitchingPlanRequests**
3	Le plan de commutation est écrit et approuvé	Ecriture du bon de commutation	Une personne examine les informations de la demande et crée une séquence d'étapes de commutation, en les capturant dans le plan de commutation. Le plan de commutation suit un cycle d'examen et d'approbation. Dès qu'il a été approuvé, une demande est adressée à la maintenance et à la construction pour programmer les ressources qui vont procéder à la commutation.	create	OP-SSC	MC-SCHD	**SwitchingOrders**. Contient le lieu de travail, les compétences et la quantité exigées, et la date/l'heure.
4	Le travail de commutation est programmé.	Programmation de bon de commutation	La fonction Maintenance et construction détermine les équipes qui vont être affectées au travail sur le bon de commutation.	created	MC-SCHD	OP-SSC	**SwitchingOrders**. Contient les équipes qui ont été affectées.
5	Les clients sont informés de l'interruption planifiée	Communication client	La programmation de bon de commutation détermine les clients qui vont être concernés et envoie une notification au service client, qui va contacter les clients.	created	OP-SSC	CS-CSRV	**PlannedOutageNotifications**. Contient une liste de clients, la raison de l'interruption et la date/heure de début et de fin de l'interruption planifiée.

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La Figure A.2 présente la création d'un **SwitchingPlan**.



Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
Instantiation of SwitchingPlan(s)	Instanciation des SwitchingPlan(s)
Instantiation of SwitchingOrder(s)	Instanciation des SwitchingOrder(s)

Figure A.2 – Création d'un SwitchingPlan

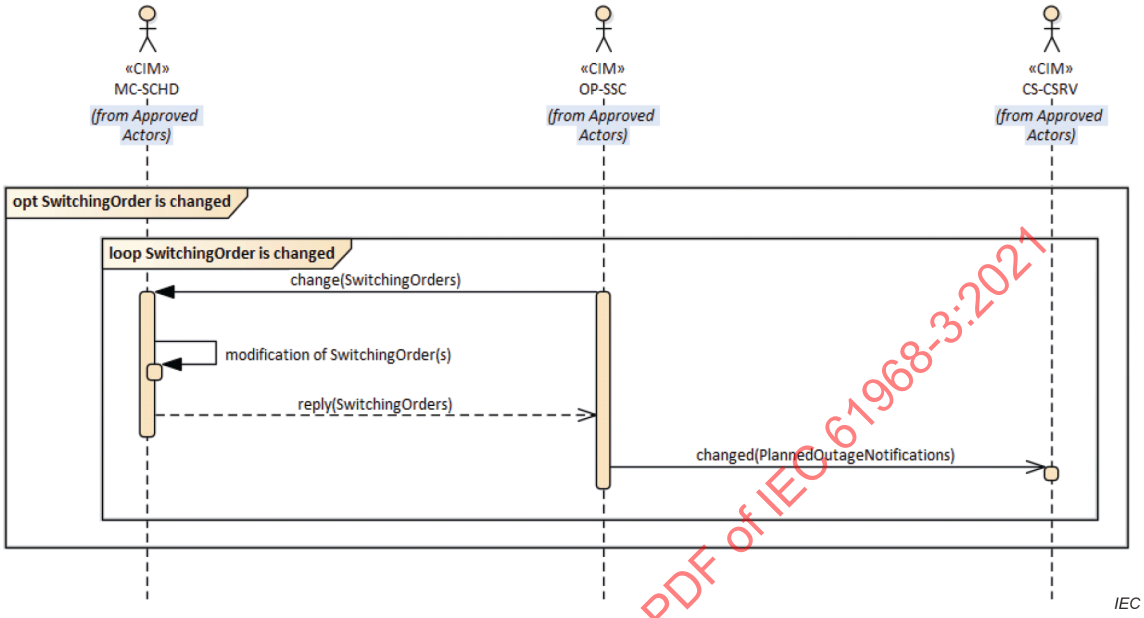
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A.5.5.3 Étapes – Modifications de SwitchingOrder

Scénario							
Nom du scénario:		Le bon de commutation est mis à jour					
N° d'étape	**Événement**	**Nom du processus/de l'activité**	**Description du processus/de l'activité**	**Service**	**Producteur des informations (Acteur)**	**Destinataire des informations (Acteur)**	**Informations échangées**
1	Les conditions du réseau ou les conditions météorologiques changent de sorte qu'un bon de commutation doit être modifié.	Événement externe	OP-SSC informe MC-SCHD que la date/heure d'un bon de commutation doit être modifiée.	change	OP-SSC	MC-SCHD	**SwitchingOrders**. Nouvelle date/heure de début/fin.
2	Le bon de commutation est reprogrammé	Programmation de l'équipe	Des ressources sont affectées pour la nouvelle date/heure				
3	La nouvelle date/heure est communiquée à l'exploitation du réseau	Programmation de l'équipe		reply	MC-SCHD	OP-SSC	**SwitchingOrders** avec nouvelle date/heure de début/fin
4	Le service client est informé de la modification	Communication client		changed	OP-SSC	CS-CSRV	**PlannedOutageNotifications** avec nouvelle date/heure de début/fin

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La Figure A.3 présente les mises à jour réalisées lors du cycle de vie d'un SwitchingOrder. Le même processus peut être répété si plusieurs modifications sont exigées dans le temps. Le SwitchingOrder peut également être intégralement annulé.



Anglais	Français
(from Approved Actors)	(des Acteurs approuvés)
SwitchingOrder is changed	SwitchingOrder est modifiée
modification of SwitchingOrder(s)	Instanciation des SwitchingOrder(s)

Figure A.3 – Modifications apportées au SwitchingOrder

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