INTERNATIONAL STANDARD

**ISO
14827-3**

First edition
2019-01

Transport information and control systems — Data interfaces between centres for transport information and control systems —

Part 3:
Data interfaces between centres for intelligent transport sytems (ITS) using XML (Profile A)

Systèmes de commande et d'information des transports — Interfaces de données entre les centres pour systèmes de commande et d'information des transports —

Partie 3: Interfaces de données entre centres pour systèmes intelligents de transport (ITS) utilisant XML

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

A list of all parts in the ISO 14827 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The relationship between this document and other standards in the ISO 14827 series is as follows.

ISO 14827-1 defines fundamental requirements of messages exchanged among centres. ISO 14827-2 defines ASN.1 formats to implement messages over ASN.1 platform. This document conforms to the fundamental requirements defined in ISO 14827-1 and defines requirements on XML messages to implement messages using XML. There is no compatibility between ASN.1 messages defined by ISO 14827-2 and XML messages defined by this document.

This document is not intended to conflict with existing standards on interfaces of data exchange among ITS centres.

Transport information and control systems — Data interfaces between centres for transport information and control systems —

Part 3:
Data interfaces between centres for intelligent transport sytems (ITS) using XML (Profile A)

1   Scope

This document is applicable to data exchange between different systems. This document defines the message rules and procedures for communication between transport information and control systems using XML. This document clarifies how to package end-application messages and relevant data. This document defines the mechanism to request end-application data from the client and to deliver the requested data from the supplier. Several profiles are defined, however only Profile A is defined in this document. Other profiles will be defined in future parts of the ISO 14827 series of standards. A system can be both a client and a supplier of another system simultaneously, using multiple sessions.
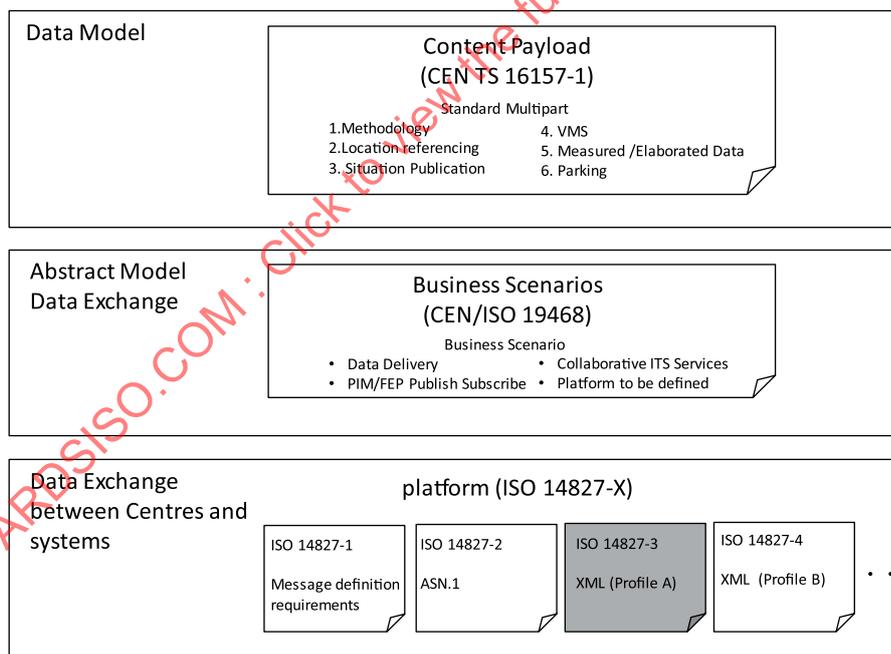
Figure 1 — Relationship between related documents

Rules and procedures for exchanging data-packets in lower layers are out of scope of this document. These functionalities can be implemented using generic protocols defined in the industrial standards. However this document defines how to use these protocols.

Data definition used in specific end-applications is out of scope in this document.

A network following this document comprises multiple kinds of systems. Each system can be viewed as an element including databases and interfaces, as shown in Figure 2:
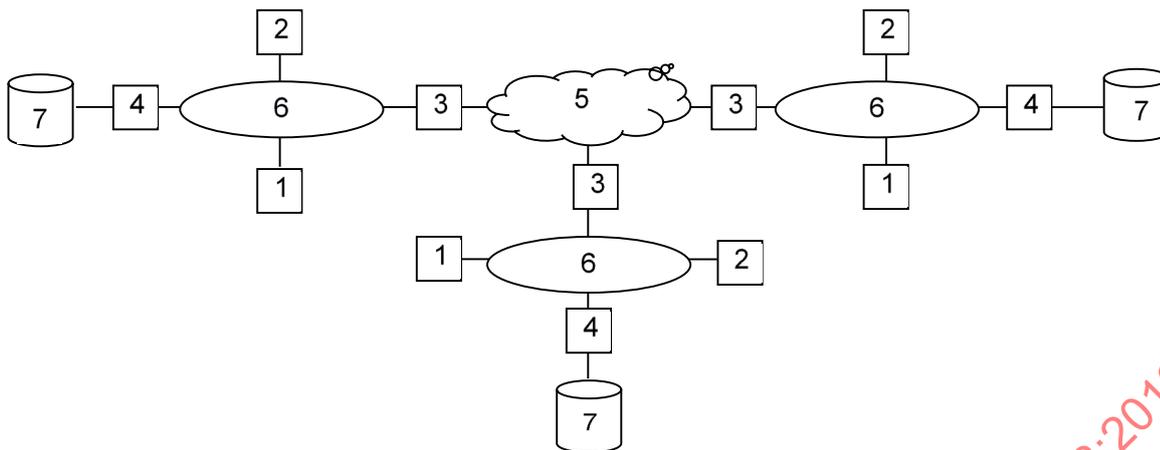
Key

1   application interface
2   operator interface
3   communication interface
4   database interface
5   communications cloud
6   system that makes a "subscription" or a "publication"
7   database

Figure 2 — System interfaces

This document is applicable to "communication interface" only. It is specified to meet the requirements of communication between ITS centres. However, it is designed in a generic fashion and thus can be used for data exchanges in other parts of the ITS field as well.

The framework for communication between centres using XML and the area that is prescribed by this document is shown in Figure 3. This document defines message rules and procedures for communication utilizing XML. In addition, this document explains how to use these protocols.

Figure 3 — Framework for transmissions between centres using XML and the standardization area
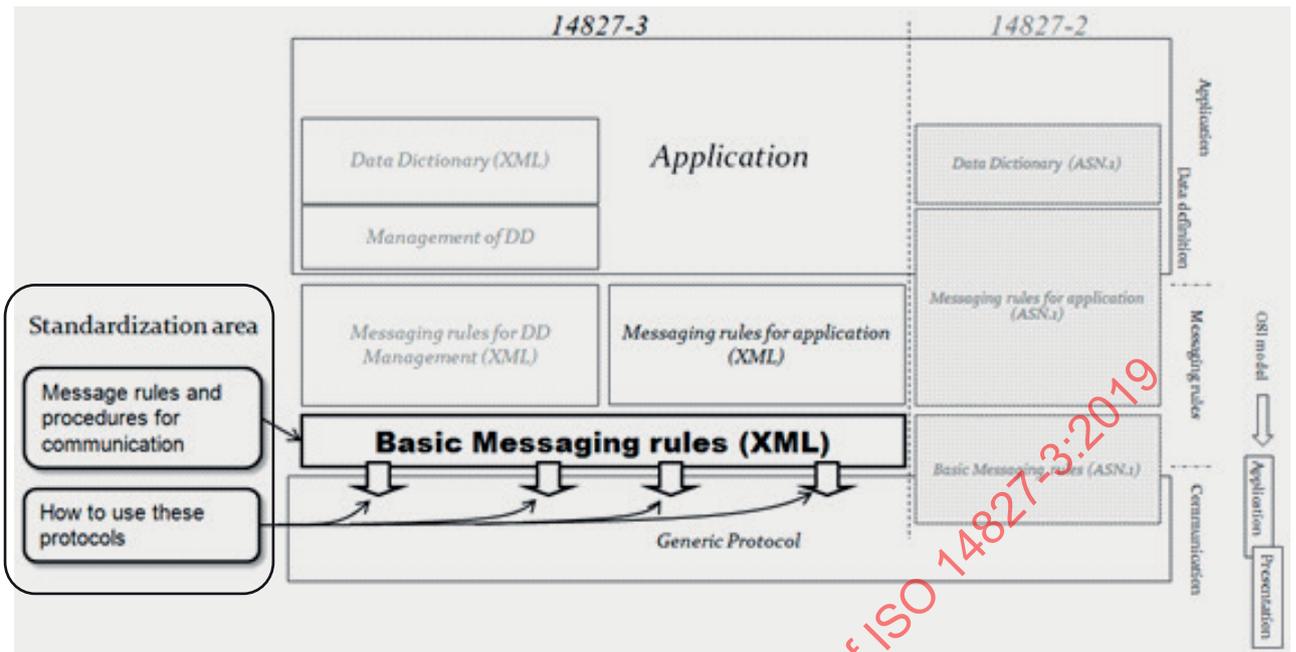
This document defines a Platform Specific Model (PSM) for exchange, which specifically uses XML. A PSM is an actual implementation of a Platform Independent Model (PIM) for exchange. A PIM is defined in another standard. When implementing a specific PSM, a Functional Exchange Profile (FEP), which is a selection of data exchange features, is identified. This document provides a FEP in <u>Annex A</u>.

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.

NTCIP 2306, *National Transportation Communications for ITS Protocol, Application Profile for XML Message Encoding and Transport in ITS Center-to-Center Communications, v01.69r, December 2008*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

— ISO Online browsing platform: available at <u>https://www.iso.org/obp</u>

— IEC Electropedia: available at <u>http://www.electropedia.org/</u>

3.1
centre
computer or network that meets the requirements of a standardized communications interface over a fixed-point communications network, regardless of whether the centre is the only system within the building or just one of many, or even if the centre is in a remote location

Note 1 to entry: "Centres" include both government and private sector publishers and users of data.

**3.2
client**

computer or application that requests and accepts data from a supplier computer or application using a protocol

**3.3
message**

data structure that is associated with a specific meaning and, when properly sent, an instance which can convey information between systems

Note 1 to entry: For example, a data structure might include a list of speeds from detector stations. This single data structure could be used to specify the content of several messages (e.g. the list of speeds currently being detected, the list of stored speeds that will trigger a congestion warning if current values fall below the indicated level, or a request for a list of locations where the current speed is less than the indicated speed). An instance of the message would then contain the actual values.

**3.4
publication**

data which has been prepared by a supplier, and made available

**3.5
receipt**

data which is prepared by the receiver of the subscription or publication in order to acknowledge the order

**3.6
subscription**

data which is prepared by a client in order to request current or future publication(s)

**3.7
supplier**

computer or application that receives and responds to requests for data from client computers or applications using a protocol

4   Symbols and abbreviated terms

FEP   Functional Exchange Profile

GNU   GNU is Not UNIX

GZIP   GNU Zip

HTTP   Hyper Text Transfer Protocol

ITS   Intelligent Transport Systems

PIM   Platform Independent Model

PSM   Platform Specific Model

SOAP   Simple Object Access Protocol

UCS   Universal Multi-octet Coded Character Set

UTF   UCS Transformation Format

XML   Extensible Markup Language

5 Conformance

There are no explicit conformance tests in this document. Conformance is achieved if the exchange data conform to the messaging rules of this document.

6 Messaging rules

6.1 General

This document provides requirements for creating XML messages exchanged between centres. These XML messages do not apply to a specific application, but can be used by various applications. This document deals with two methods for exchanging XML messages: "Push" and "Pull".

Using SOAP is mandatory when exchanging information with Push. The formats of XML messages for exchanging information by Push are described in 6.2. Using SOAP is optional when exchanging information with Pull. The formats of XML messages for exchanging information by Pull with SOAP are described in 6.3. The formats of XML messages for exchanging information by Pull without SOAP are described in 6.4.

In creating XML messages, one XML tag profile shall be selected. Profile A supposes interconnection to a centre conforming to NTCIP 2306. Details of Profile A are described in normative Annex B.

XML messages described in this clause are supposed to be transmitted over generic protocols for communication (see normative Annex C).

6.2 Push

6.2.1 General

This subclause describes XML messages for exchanging information by Push. When centres exchange information, a client subscribes for a supplier beforehand, and the supplier publishes messages to the client periodically or on occurrence according to the subscription. A sequence diagram of subscription is shown in Figure 4, a sequence diagram of publication on occurrence is shown in Figure 5, and a sequence diagram of periodic publication is shown in Figure 6.

Subclause 6.2.2 describes common requirements for XML messages used for subscription, publication, and receipt. Following that, 6.2.3 describes specific requirements for subscription messages, 6.2.4 for publication messages, and 6.2.5 for receipt messages as well.
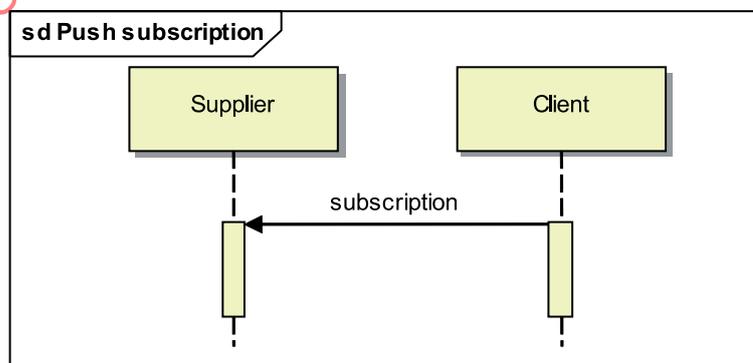
Figure 4 — Sequence diagram of Push subscription
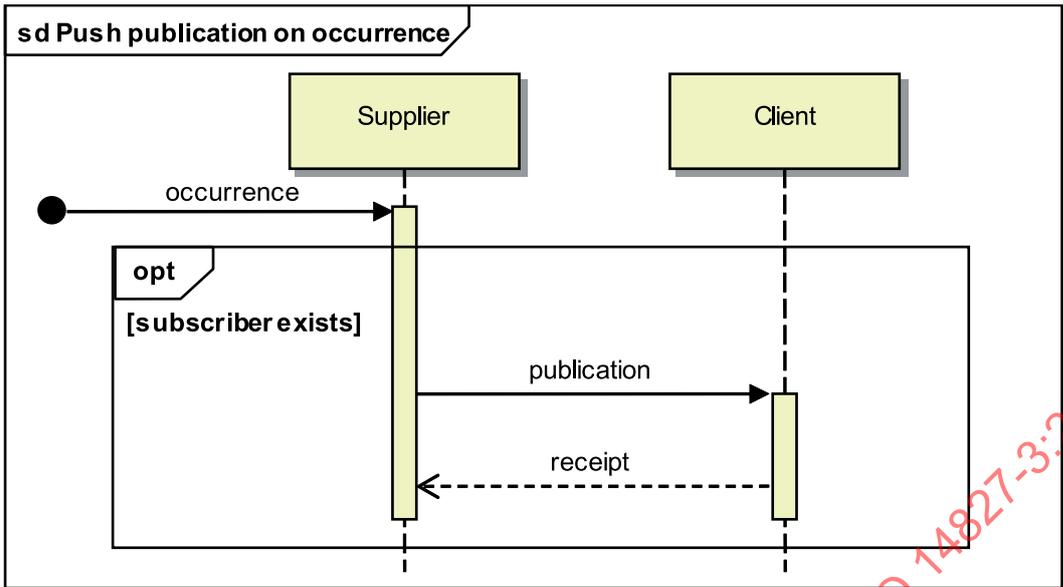
Figure 5 — Sequence diagram of Push publication on occurrence
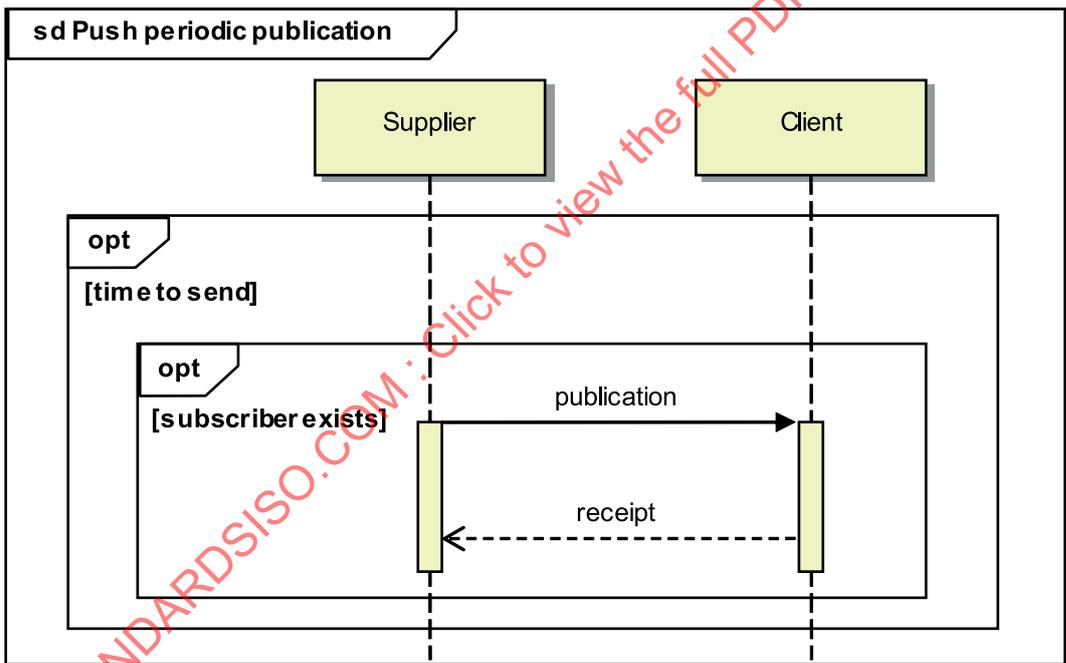
Figure 6 — Sequence diagram of Push periodic publication

6.2.2   General message structure

6.2.2.1   Introduction

This subclause describes common requirements for XML messages used for subscription, publication, and receipt.

6.2.2.2   XML version and character encoding scheme

An XML message shall begin with a header specifying XML version and character encoding scheme.

6.2.2.3   SOAP envelope

An XML message shall contain a SOAP envelope.

6.2.2.4   SOAP header

A SOAP envelope shall contain a SOAP header.

6.2.2.5   SOAP body

A SOAP envelope shall contain a SOAP body.

6.2.3   Subscription message structure

6.2.3.1   Introduction

This subclause describes structures of XML messages used when clients subscribe for suppliers.

6.2.3.2   Profile A

A SOAP body shall contain a subscription header. The subscription header shall contain following:

— reference information (optional);

— subscription ID (mandatory);

— subscription name (optional);

— client address (mandatory);

— subscription type (mandatory);

— subscription operating code (mandatory);

— broadcast alert (optional);

— subscription time frame (optional);

— subscription frequency (optional).

The subscription time frame further contains two data elements: subscription start time and subscription stop time.

6.2.4   Publication message structure

6.2.4.1   Introduction

This subclause describes structures of XML messages used when suppliers make publication to clients after subscription.

6.2.4.2   Profile A

A SOAP body shall contain a publication header and a publication payload. The publication header shall contain following:

— reference information (optional);

— subscription ID (mandatory);

— subscription name (optional);

— subscription count (mandatory).

6.2.5 Receipt message structure

6.2.5.1 Introduction

This subclause describes structures of XML messages used in receipts for subscriptions and publications.

6.2.5.2 Profile A

A SOAP body shall contain a receipt header. The receipt header shall contain following:

— reference information (optional).

6.3 Pull with SOAP

6.3.1 General

This subclause describes XML messages for exchanging information by Pull with SOAP. When centres exchange information, a client makes a request for a supplier, and the supplier makes a response to the client. A sequence diagram of Pull with SOAP is shown in Figure 7. Subclause 6.3.2 describes common requirements for XML messages used for request and response. Following that, 6.3.3 describes specific requirements for request messages and 6.3.4 for response messages as well.

Figure 7 — Sequence diagram of Pull with SOAP

6.3.2 General message structure

6.3.2.1 Introduction

This subclause describes common requirements for XML messages used for request and response.

6.3.2.2 XML version and character encoding scheme

An XML message shall begin with a header specifying XML version and character encoding scheme.

6.3.2.3 SOAP envelope

An XML message shall contain a SOAP envelope.

6.3.2.4 SOAP header

A SOAP envelope shall contain a SOAP header.

6.3.2.5 SOAP body

A SOAP envelope shall contain a SOAP body.

6.3.3 Request message structure

6.3.3.1 Introduction

This subclause describes structures of XML messages used when clients make a request for suppliers.

6.3.3.2 Profile A

A SOAP body shall contain a request payload.

6.3.4 Response message structure

6.3.4.1 Introduction

This subclause describes structures of XML messages used when suppliers make response to clients.

6.3.4.2 Profile A

A SOAP body shall contain a response payload.

6.4 Pull without SOAP

6.4.1 General

This subclause describes XML messages for exchanging information by Pull without SOAP. When centres exchange information, a client makes a request for a supplier, and the supplier makes a response to the client. A sequence diagram of Pull with SOAP is shown in Figure 8. Subclause 6.4.2 describes common requirements for XML messages used for request and response. Following that, 6.4.3 describes specific requirements for request messages and 6.4.4 for response messages as well.
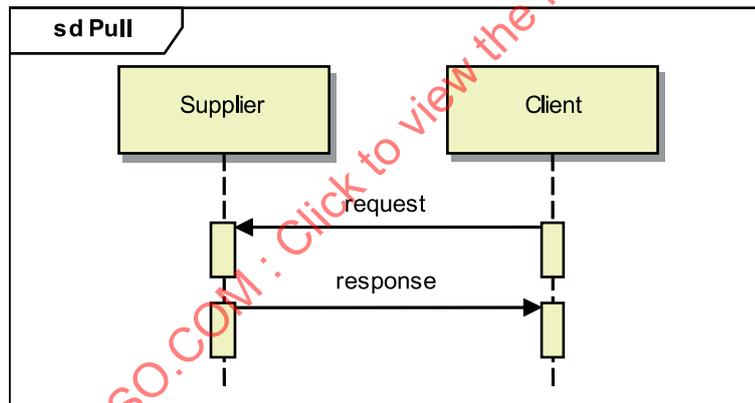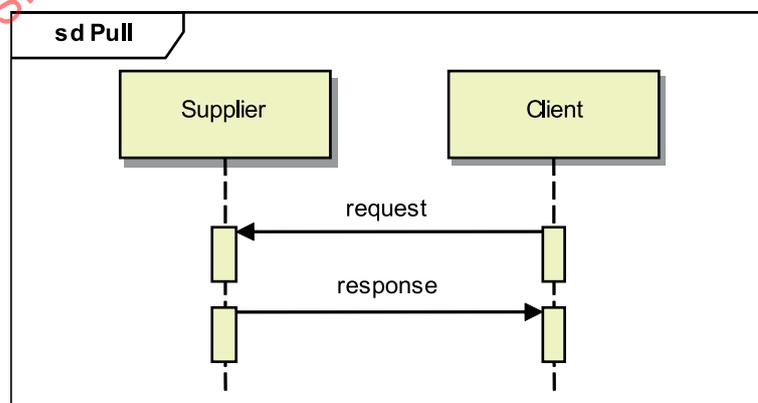

Figure 8 — Sequence diagram of Pull without SOAP

6.4.2   General message structure

This subclause describes common requirements for XML messages used for request and response.

An XML message for request and response shall begin with a header specifying XML version and character encoding scheme.

6.4.3   Request message structure

6.4.3.1   Introduction

This subclause describes a structure of XML messages used when clients make a request for suppliers.

6.4.3.2   Profile A

An XML message shall contain a request payload.

6.4.4   Response message structure

6.4.4.1   Introduction

This subclause describes a structure of XML messages used when suppliers make a response to clients.

6.4.4.2   Profile A

An XML message shall contain a response payload.

Annex A
(normative)

Functional Exchange Profile (FEP)

A.1   List of requirements for the FEP

The FEP has the following list of requirements for each objective.

Contract: Allow the establishment of an agreement or a contract on-line or off-line, between the supplier and client, in order to describe the information and features that are available on the exchange.

Table A.1 — Contract requirements

Designation	Definition	Push	Pull with SOAP	Pull without SOAP
Feature negotiation	The ability to set or update the details and parameters that manage and control the data exchange in real time operation.	N	N	N
Subscription	The ability in an exchange system to define that a client is interested to retrieve data from one supplier so that it can be subscribed to that supplier.	Y	N	N
Filtering	The ability in an exchange system to select the appropriate subset of information to be delivered to a client based on a previous client request.	N	N	N
Catalogue	The ability in a supplier system to give information to clients about the various kinds and characteristics of the information that the supplier is capable to provide.	N	N	N

Session: Be able to establish a session between the supplier and client and deal with errors and failures of communications.

Table A.2 — Session requirements

Designation	Definition	Push	Pull with SOAP	Pull without SOAP
Error detection	The ability of a system to understand and be aware when an error occur during the exchange of information.	N	N	N
Error recovery	The ability of a system to recover from a detected error and recover the missed / erroneous information.	N	N	N
Link monitoring	The ability of an exchange system to monitor the state of the link in order to be aware of any link disruption such as: network failures, node not working properly and all situation that leads to potential loosing of data or errors.	N	N	N

Information management: Control the lifecycle information management, and allow that both suppliers and clients understand the status of the information been exchanged.

Table A.3 — Information management requirements

Designation	Definition	Push	Pull with SOAP	Pull without SOAP
Lifecycle management	The ability to describe the full lifecycle of information elements (e.g. start, update and end and cancellation) when applicable.	Y	N	N
Publish multiple related publications in a single message	The need to receive all information related to a specific situation at a specific timestamp, where it should also be possible to link all information from other publications such as Measured Data, VMS Settings, Elaborated Data, etc.	N	N	N

Data delivery: Ensure the exchange of all information between supplier and client, in an efficient, robust and consistent way.

Table A.4 — Data delivery requirements

Designation	Definition	Push	Pull with SOAP	Pull without SOAP
Information exchange	Support all functions to exchange information between supplier and client.	Y	Y	Y
Partial updates	The capability of a system to exchange only the updated information (the parts of the information that have been changed).	N	N	N
Exchange large data sets	The capability of systems to exchange large amount of data sets.	N	N	N
Synchronisation	The ability of a receiver system to be aware when the information received by the client are the same available at the supplier system and to provide the client with what is needed to achieve that state in case that information is currently different.	N	N	N

Security: Provide high levels of security

Table A.5 — Security requirements

Designation	Definition	Push	Pull with SOAP	Pull without SOAP
Security	The ability in an exchange system to protect information from unauthorised access, use, disclosure, disruption, modification, perusal, inspection, recording or destruction.	N	N	N
Authentication	The ability in an exchange system to assure the truth of an attribute of a datum or entity being exchanged.	N	N	N
Authorisation	The ability in an exchange system to recognise the right to access specific data to a particular client.	N	N	N
Non-repudiation	The ability in an exchange system to grant the integrity and origin of data.	N	N	N

Communication: Use efficient and optimized mechanisms of communication

Table A.6 — Communication requirements

Designation	Definition	Push	Pull with SOAP	Pull without SOAP
Low Bandwidth cost	The ability in an exchange system to reduce the size of data to be exchanged.	N	N	N
Minimum Latency	The ability in an exchange system to reduce the time delay experienced in a system.	N	N	N

A.2 Selection of exchange features

These FEP requirements are granted via the PIM feature selection, which is described in the following table. It identifies a list of features that a PSM should support.

Table A.7 — Exchange specification features

Exchange specification features	Features	Push	Pull with SOAP	Pull without SOAP
Subscription contract	Contract	Y	N	N
	Catalogue	N	N	N
Session	Subscription life cycle	Y	N	N
	Link monitoring	N	N	N
Information management	Update methods	Y	N	N
	Lifecycle management	Y	N	N
	Operating modes	Y	N	N
Data delivery	Data request	N	Y	Y
	Data delivery	Y	Y	Y
	Large datasets handling	N	N	N
	Synchronisation	N	N	N
Communication	Security	N	N	N
	Compression	N	N	N
	Communication	N	N	N

Annex B
(normative)

Tag scripts for composing XML messages

B.1 Push

B.1.1 Introduction

This clause describes XML tags in XML messages for exchanging information by Push.

B.1.2 General message structure

B.1.2.1 Introduction

This subclause describes XML tags in XML messages used for subscription, publication, and receipt.

B.1.2.2 XML version and character encoding scheme

A header specifying XML version and character encoding scheme shall use the following XML tag.

```
<?xml version="1.0" encoding="UTF-8"?>
```

B.1.2.3 SOAP envelope

A SOAP envelope shall use the following XML tag.

```
<soap:Envelope xmlns:soap="http://www.w3.org/2003/05/soap-envelope/">
    SOAP header content
    SOAP body content
</soap:Envelope>
```

B.1.2.4 SOAP header

A SOAP header shall use the following XML tag.

```
<soap:Header>
</soap:Header>
```

B.1.2.5   SOAP body

A SOAP body shall use the following XML tag.

```
<soap:Body>
        subscription header

    or
        publication header and publication payload
    or
        receipt header
</soap:Body>
```

B.1.3   Subscription message structure

B.1.3.1   Introduction

This subclause describes XML tags in XML messages used for subscription.

B.1.3.2   Profile A

B.1.3.2.1   General

A general structure of subscription messages is shown in Figure B.1.
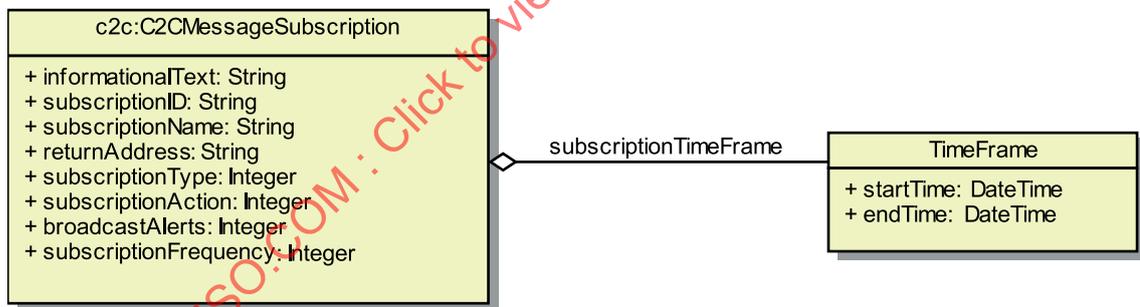

Figure B.1 — Structure of subscription messages depicted using UML

B.1.3.2.2   Subscription header

B.1.3.2.2.1   Introduction

This subclause describes XML tags used for a subscription header and its internal elements.

B.1.3.2.2.2 Subscription header

A subscription header shall use the following XML tag.

```
<c2c:c2cMessageSubscription xmlns:c2c='http://www.ntcip-c2c-address'>
    reference information
    subscription ID
    subscription name
    client address
    subscription type
    subscription operating code
    broadcast alert
    subscription start/stop time
    subscription frequency
</c2cMessageSubscription>
```

B.1.3.2.2.3 Reference information

A reference information shall use the following XML tag. Its content shall be 1~255 length character string.

```
<informationalText>
    reference information (character string)
</informationalText>
```

B.1.3.2.2.4 Subscription ID

A subscription ID shall use the following XML tag. Its content shall be information identifying the client (1~32 length character string).

```
<subscriptionID>
    subscription ID (character string)
</subscriptionID>
```

B.1.3.2.2.5 Subscription name

A subscription name shall use the following XML tag. Its content shall be 1~128 length character string.

```
<subscriptionName>
    subscription name (character string)
</subscriptionName>
```

B.1.3.2.2.6 Client address

A client address shall use the following XML tag. Its content shall be client URL (1~128 length character string).

```
<returnAddress>
    client address (character string)
</returnAddress>
```

B.1.3.2.2.7 Subscription type

A subscription type shall use following XML tag. Its content shall be a number (1~3 integer) that indicates the subscription type; 1 for subscription on occurrence; 2 for periodic subscription; and 3 for subscription on change.

```
<subscriptionType>
    subscription type (integer)
</subscriptionType>
```

B.1.3.2.2.8 Subscription operating code

A subscription operating code shall use the following XML tag. Its content shall be a number (1~4 integer) that indicates operation to the subscription; 1 for new subscription; 2 for restarting subscription; 3 for cancelling subscription; and 4 for cancelling all subscriptions.

```
<subscriptionAction>
    subscription operating code (integer)
</subscriptionAction>
```

B.1.3.2.2.9 Broadcast alert

A broadcast alert shall use the following XML tag. Its content shall be a number (1~2 integer) that indicates whether broadcast alerts are allowed or not; 1 to allow and 2 to disallow.

```
<broadcastAlerts>
    broadcast alert (integer)
</broadcastAlerts>
```

B.1.3.2.2.10 Subscription start time/Subscription stop time

A subscription start time and subscription stop time shall use the following XML tag. Its content shall be date and time (dateTime type). In Profile A, dateTime type is the same as DateTimePair defined in SAE J2354, which is used in NTCIP 2306.

```
<subscriptionTimeFrame>
<start>
   subscription start time (dateTime type)
</start>
<end>
   subscription stop time (dateTime type)
</end>
<subscriptionTimeFrame>
```

B.1.3.2.2.11 Subscription frequency

A subscription frequency shall use the following XML tag. Its content shall be a number, in seconds (1~4294967295 integer), describing the subscription updates.

```
<subscriptionFrequency>
   subscription frequency (integer)
</subscriptionFrequency>
```

B.1.4   Publication message structure

B.1.4.1   Introduction

This subclause describes XML tags in XML messages used for publication.

B.1.4.2   Profile A

B.1.4.2.1   General

A general structure of publication messages is shown in Figure B.2.
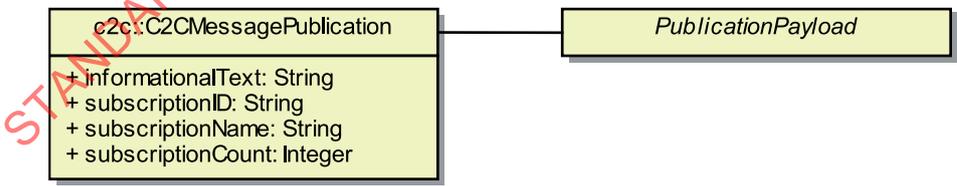

Figure B.2 — Structure of publication messages depicted using UML

B.1.4.2.1.1   Introduction

This subclause describes XML tags used for a publication header and its internal elements.

B.1.4.2.1.2   Publication header

A publication header shall use the following XML tag.

```
<c2c:c2cMessagePublication xmlns:c2c='http://www.ntcip-c2c-address'>
    reference information
    subscription ID
    subscription name
    subscription count
</c2cMessagePublication>
```

B.1.4.2.1.3   Reference information

A reference information shall use the following XML tag. Its content shall be 1~255 length character string.

```
<informationalText>
    reference information (character string)
</informationalText>
```

B.1.4.2.1.4   Subscription ID

A subscription ID shall use the following XML tag. Its content shall be information identifying the client (1~32 length character string).

```
<subscriptionID>
    subscription ID (character string)
</subscriptionID>
```

B.1.4.2.1.5   Subscription name

A subscription name shall use the following XML tag. Its content shall be 1~128 length character string.

```
<subscriptionName>
    subscription name (character string)
</subscriptionName>
```

B.1.4.2.1.6   Subscription count

A subscription count of client shall use the following XML tag. Its content shall be 1~4294967295 integer.

```
<subscriptionCount>
    subscription count (integer)
</subscriptionCount>
```

B.1.4.2.2   Publication payload

A publication payload shall use the following XML tag. Elements' name and data structure of the publication payload depends on used XML Schema (the following is an example of tmdd).

```
<tmdd:dMSInventory xmlns:tmdd="http://www.tmdd-address">
   payload content
</tmdd:dMSInventory>
```

B.1.5   Receipt message structure

B.1.5.1   Introduction

This subclause describes XML tags in XML messages used for receipts for subscriptions and publications.

B.1.5.1.1   Profile A

B.1.5.1.2   General

A general structure of receipt messages is shown in Figure B.3.
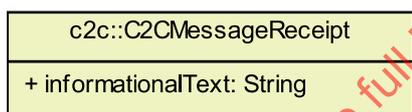

Figure B.3 — Structure of receipt messages depicted using UML

B.1.5.1.3   Receipt header

This subclause describes XML tags used for a receipt header and its internal elements selected.

B.1.5.1.3.1   Receipt header

A receipt header shall use following XML tag.

```
<c2c:c2cMessageReceipt xmlns:c2c='http://www.ntcip-c2c-address'>
   reference information
</c2cMessageReceipt>
```

B.1.5.1.3.2   Reference information

A reference information shall use following XML tag. Its content shall be character string.

```
<informationalText>
   reference information (character string)
</informationalText>
```

B.2   Pull with SOAP

B.2.1   General

This clause describes XML tags in XML messages for exchanging information by Pull with SOAP.

B.2.2 General message structure

B.2.2.1 Introduction

This subclause describes XML tags in XML messages used for request and response.

B.2.2.2 XML version and character encoding scheme

A header specifying XML version and character encoding scheme shall use the following XML tag.

```
<?xml version="1.0" encoding="UTF-8"?>
```

B.2.2.3 SOAP envelope

A SOAP envelope shall use the following XML tag.

```
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope">
    SOAP header content
    SOAP body content
</soap:Envelope>
```

B.2.2.4 SOAP header

A SOAP header shall use the following XML tag.

```
<soap:Header>
</soap:Header>
```

B.2.2.5 SOAP body

A SOAP body shall use the following XML tag.

```
<soap:Body>
      request payload
   or
      response payload
</soap:Body>
```

B.2.3 Request message structure

This subclause describes XML tags in XML messages used for request.

B.2.3.1 Profile A

B.2.3.1.1 General

A structure of request messages consists of RequestPayload