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

Part 2: **AP-DATEX**

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Foreword

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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).

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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*.

This second edition cancels and replaces the first edition (ISO 14827-2:2005), which has been technically revised.

The main changes are as follows:

— the title has been modified;

— the concept of a platform-independent model (PIM) as defined in ISO/TS 19468 has been integrated;

— the message format previously defined in ISO 14827-1:2005 (to be withdrawn) has been included.

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

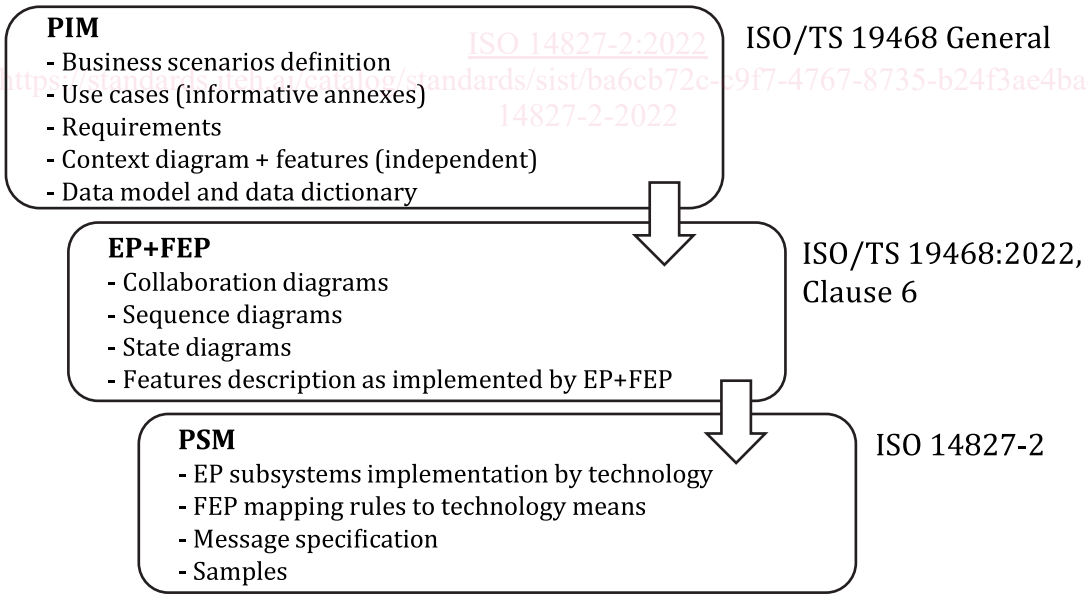
Data exchange among centres is a baseline service for implementing intelligent transport system (ITS) services. For interoperability purposes, data delivery and collaborative ITS services need to be implemented according to certain specifications based on fully-described interfaces.

This document has been revised based on the concept of a platform-independent model (PIM) as defined in ISO/TS 19468, maintaining backward compatibility with ISO 14827-2:2005 and taking into consideration the future withdrawal of ISO 14827-1:2005.

The development of the first editions of ISO 14827-1 and ISO 14827-2 began in the 1990s. These documents were published in 2005 based on European DATEX. Since then, the exchange environment of traffic information and traffic data has made a great deal of progress and DATEX II has been developed, enabling the distribution of traffic information and traffic management information in a way that is not dependent on language and presentation format. DATEX II is closely related to ISO/TS 19468. ISO/TS 19468 aims to describe the general exchange specification technology and to describe interaction through a high-level model which is not dependent on a specific technology in a model-driven approach; it defines functional exchange profiles by several possible exchange patterns.

According to this concept, ISO 14827-2 (this document) was revised as a platform-specific model for AP-DATEX (application profile-data exchange) and other Internet protocol (IP) networks. The relationship between ISO/TS 19468 and the ISO 14827 series (including this document) is shown in Figure 1. This document aims to define and describe the data exchange requirements using TCP/UDP (transmission control protocol/user datagram protocol) datagrams (defined as "DATEX-ASN") and the basics of ASN.1 messages, as defined in ISO 14827-1.

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



Key

PIM platform-independent model

EP exchange pattern

FEP functional exchange profile

PSM platform-specific model

Figure 1 — Relationship between exchange-related documents

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

Part 2: AP-DATEX

1 Scope

This document defines a platform-specific model (PSM) for data exchange, which specifically uses ASN.1 and TCP/UDP (transmission control protocol/user datagram protocol) datagrams which were defined as "DATEX-ASN" in the first edition of this document for AP-DATEX (application profile-data exchange) and other Internet protocol (IP) networks. A PSM is an actual implementation of a platform-independent model (PIM) for exchange. This document specifies the message rules and procedures for communication between different systems for ITS using TCP/UDP datagrams.

This document deals mainly with the communication interfaces. It has been designed to meet the unique requirements of intelligent transport systems (ITS). However, it has also been designed in a generic fashion and thus can be used for other data exchanges as well.

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.

ISO/TS 19468, *Intelligent transport systems — Data interfaces between centres for transport information and control systems — Platform-independent model specifications for data exchange protocols for transport information and control systems*

ISO/IEC 8824-1, *Information technology — Abstract Syntax Notation One (ASN.1) — Part 1: Specification of basic notation*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TS 19468 and the following apply.

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

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

— IEC Electropedia: available at https://www.electropedia.org/

3.1
DATEX-ASN
data exchange protocol in abstract syntax notation as TCP/UDP (transmission control protocol/user datagram protocol) datagrams exchange

Note 1 to entry: This was initially defined in ISO 14827-2:2005 (first edition of this document).

3.2
DatexDatapacket
TCP/UDP (transmission control protocol/user datagram protocol) datagrams which are defined in ASN.1 as application layer data packets and can be exchanged using any compatible lower-layer combination

Note 1 to entry: See Annex B.

3.3
guaranteed delivery
TCP/UDP (transmission control protocol/user datagram protocol) datagrams exchange mechanism in which the client acknowledges the receipt of a publication (reply)

3.4
heartbeat
data packet sent to indicate that the sending system is still alive and communicating

3.5
publication
information (usually contained in payload) exchange from a supplier

Note 1 to entry: "Payload publication" is defined in ISO/TS 19468.

3.6
subscription
request to a supplier from a client for information exchange

3.7
transport profile
set of services which are responsible for providing a virtually error-free, point-to-point connection so that host A can send data packets to host B and they will arrive uncorrupted

4 Symbols and abbreviated terms

AP-DATEX	application profile-data
BER	basic encoding rule
CORBA	common object request broker architecture
DATEX-ASN	data exchange in abstract syntax notation
DTLS	datagram transport layer security
EDIFACT	electronic data interchange for administration, commerce and transport
EP	exchange pattern
FDDI	fibre distributed data interface
FEP	functional exchange profile
FrED	friendly exchange of data
FTP	file transfer protocol
IP	Internet protocol
ISDN	integrated services digital network

NTCIP	National Transportation Communications for ITS (intelligent transport systems)
OID	object identifier
PIM	platform-independent model
PN	port number
PPP	point-to-point protocol
PRL	protocol requirements list
PSM	platform-specific model
SNMP	simple network management protocol
TCP	transmission control protocol
TCIP	transit communications interface profiles
TFTP	trivial file transfer protocol
TICS	transport information and control systems
TLS	transport layer security
UDP	user datagram protocol
VMS	variable message sign

5 Conformance

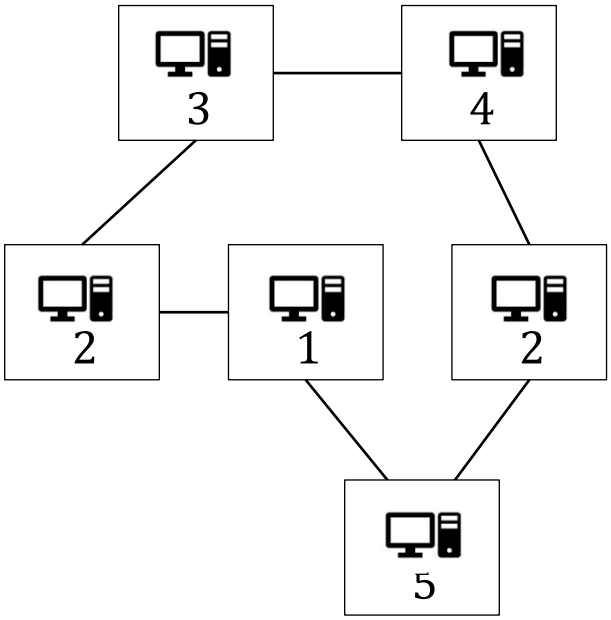
There is no explicit conformance test in this document. Conformance is achieved if the exchange data conform to the messaging rules of this document.

6 Exchange framework

6.1 General

TCP/UDP datagrams exchange allows different systems to exchange relevant data. The data are contained in end-application messages. Each end-application message shall be defined according to message definition requirements laid out in Annex A. TCP/UDP datagrams exchange defines how these end-application messages are packaged to form complete datagrams and also defines the rules and procedures for exchanging these datagrams. Systems using TCP/UDP datagrams exchange may implement additional end-application functionalities according to the user requirements.

A TCP/UDP datagrams exchange network comprises a certain number of systems, an example of which is provided in Figure 2. It is typically exchanged using well-known IPs, such as UDP/IP or TCP/IP, then may use IPsec, DTLS, TLS, etc. for security.

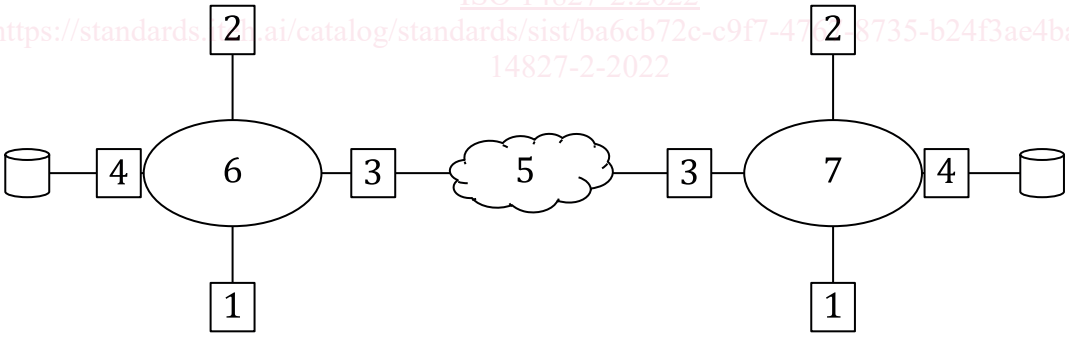


Key

1 weather system
2 traffic management system
3 transit management system
4 emergency management system
5 information service provider

Figure 2 — An example of TCP/UDP datagrams exchange network

Each system can be viewed as consisting of the interfaces, as shown in Figure 3.



Key

1 application interface
2 operator interface
3 communication interface
4 database interface
5 communications cloud
6 client system
7 supplier system

Figure 3 — System interfaces

The data exchange environment and actors can be viewed as shown in Figure 4.

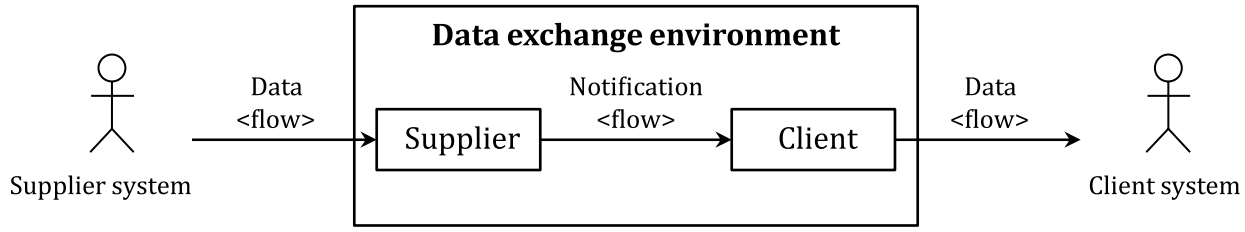


Figure 4 — Communication interfaces

Systems implementing this document sometimes operate simultaneously as a client and supplier, using multiple sessions. The communications cloud between the two systems can be complex or simple.

When implementing a specific PSM, a functional exchange profile (FEP), which is a selection of data exchange features, is identified.

The model driven approach defined in ISO/TS 19468 is summarized in Figure 5.

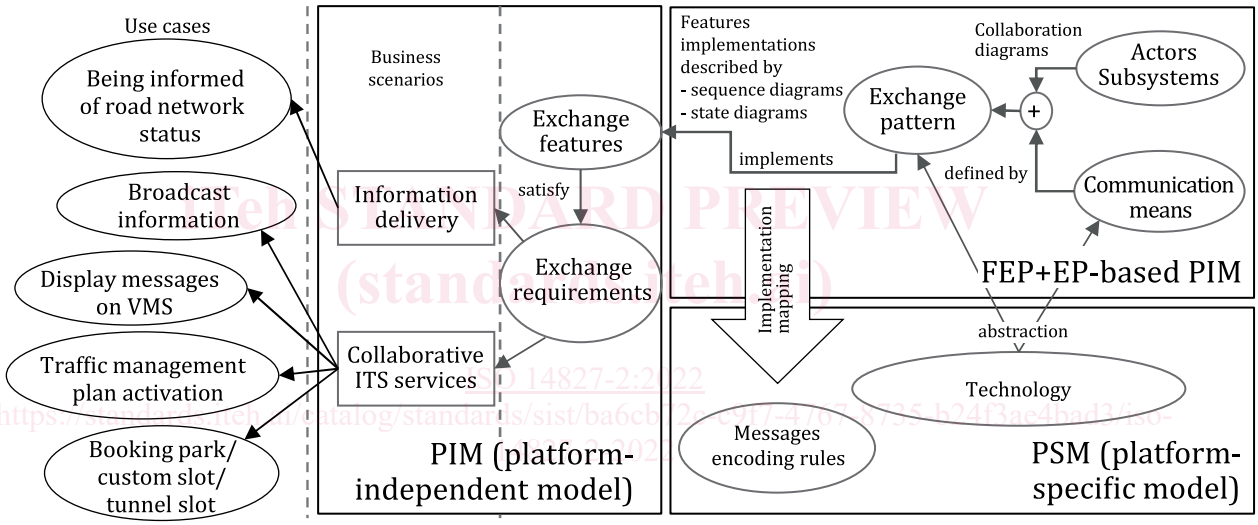


Figure 5 — Business scenario and functional exchange profile (FEP)

This document describes the mapping rules in order to implement specific platform push and pull and FEP+EP based PIM in TCP/UDP datagrams exchange which is based on ASN.1 message PSM. A PIM-level description of FEP+EP is detailed in ISO/TS 19468 and is referenced in this document.

6.2 Basic pull with TCP/UDP datagrams exchange PSM

6.2.1 Overview

The basic pull EP+FEP is based on an information request by a client from a supplier which delivers requested information to the client. It can be implemented in IPs. A selection of features for basic pull is shown in Table 1.

Table 1 — Selection of features for basic pull

Features area	Feature	Basic pull implemented
Subscription contract	Contract	Log in/Log out See 7.4.2, 7.4.4
	Catalogue	N

Table 1 *(continued)*

Features area	Feature	Basic pull implemented
Session	Session life cycle	Log in/Log out/Maintain See 7.4.2, 7.4.4, 7.4.3
	Link monitoring	N
Information management	Operating modes	Periodic or on occurrence (i.e. triggered by client conditions)
	Update methods	N
	Life cycle management	N
Data delivery	Data delivery	Y
	Data request	Y
	Large datasets handling	Y
	Synchronization	Y (periodic mode)
Self-description	Handshake	N
Communication	Security	N
	Compression	N
	Communication	N

6.2.2 Exchange pattern messages definition

6.2.2.1 Overall presentation

Exchange systems are used which provide tools enabling message generation and their transfer between supplier and client. A data flow between the supplier system and client system is shown in Figure 6.

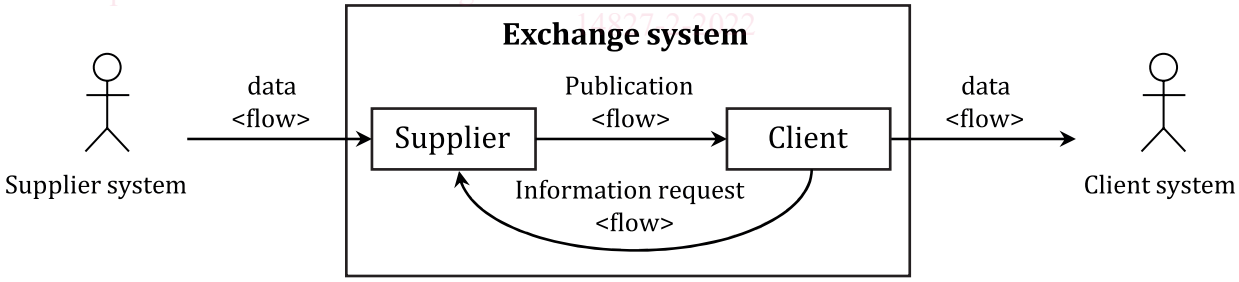


Figure 6 — Basic pull exchange actors

6.2.2.2 Exchange pattern definition

The basic pull client and supplier shall establish, maintain, or terminate a session according to the procedure described in 7.4 of this document.

The basic pull client shall request information according to the procedure described in 7.5 of this document.

The basic pull supplier shall provide information according to the procedure described in 7.6 of this document.

6.2.2.3 Relevant exchange information in exchange data model

No exchange information is needed in this pattern to implement data delivery features.

6.2.2.4 Exchange messages

Exchange messages are included in the payload and defined in Annex B.

6.2.3 State diagrams

State diagrams are not needed, and relevant procedures are described in Clause 7.

6.2.4 Features implementation description

6.2.4.1 Overview

This subclause provides a description and the corresponding specification for each feature identified in the context diagram according to the basic pull exchange architecture. The following features are specified:

— subscription contract;

— subscription (also known as session);

— information management;

— data delivery;

— communication/protocol.

6.2.4.2 Subscription contract

6.2.4.2.1 Contract

The session is established or terminated according to the procedure described in 7.4.

6.2.4.2.2 Catalogue

Catalogue is not managed.

6.2.4.3 Session

6.2.4.3.1 Session life cycle

The session is managed according to the procedure described in 7.4.

6.2.4.3.2 Link monitoring

Link monitoring is not provided.

6.2.4.4 Information management

6.2.4.4.1 Operating modes

The available operating mode for client pull is periodic, or on occurrence as described in 7.6.

6.2.4.4.2 Update methods

The update method is not provided.

6.2.4.4.3 Life cycle management

The life cycle is not managed.

6.2.4.5 Data delivery

6.2.4.5.1 Data delivery scheme

The data delivery scheme is described in 7.6.

6.2.4.5.2 Data request scheme

The data request scheme is described in 7.5.

6.2.4.5.3 Large datasets handling

The large datasets are handled as a data file. The data file scheme is described in 7.6.

6.2.4.5.4 Synchronization

Under periodic mode, publication cycle synchronization is available, and its scheme is described in 7.6.4.

6.2.4.6 Self-description

Handshake is not available.

6.2.4.7 Communication

Communication feature may be implemented at IP level.

6.2.4.8 General optimization issues

Implementation considerations and IP usages for TCP/UDP datagrams exchange shall be as shown in Annex E and Annex F. Requirements of protocol shall be as shown in Annex D.

6.3 Basic push TCP/UDP datagrams exchange PSM

6.3.1 Overview

The basic push EP+FEP is performed from a supplier which delivers information to a client without request by the client. It can be implemented in internet protocols. A selection of features for basic push is shown in Table 2.

Table 2 — Selection of features for basic push

Features area	Feature	Basic push implemented
Subscription contract	Contract	Log in/Log out See 7.4.2, 7.4.4
	Catalogue	N
Session	Session life cycle	Log in /Log out/Maintain See 7.4.2, 7.4.4, 7.4.3
	Link monitoring	N
Information management	Operating modes	Periodic or on occurrence (i.e. triggered by supplier conditions)
	Update methods	N

Table 2 *(continued)*

Features area	Feature	Basic push implemented
	Life cycle management	N
Data delivery	Data delivery	Y
	Data request	N
	Large datasets handling	Y
	Synchronization	Y (periodic mode)
Self-description	Handshake	N
Communication	Security	N
	Compression	N
	Communication	N

6.3.2 Exchange pattern messages definition

6.3.2.1 Overall presentation

Exchange systems are used which provide tools enabling message generation and their transfer between supplier and client. A data flow between supplier and client is shown in Figure 7.

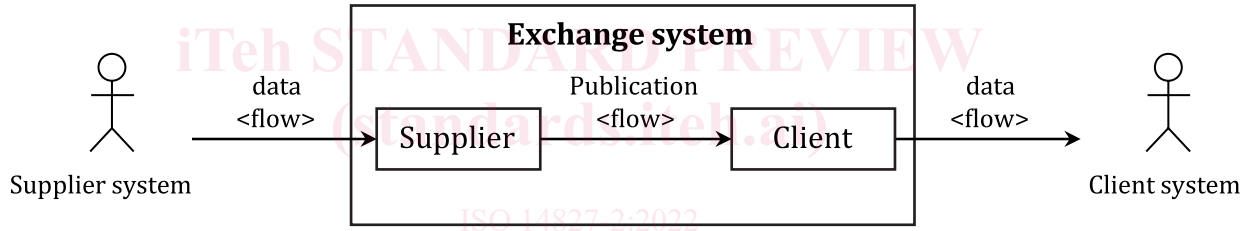


Figure 7 — Basic push exchange actors

6.3.2.2 Exchange pattern definition

The basic push client and supplier shall establish, maintain, or terminate a session according to the procedure described in 7.4 of this document.

The basic push supplier may request receiving information to client and shall provide information according to the procedure described in 7.6 of this document.

6.3.2.3 Relevant exchange information in exchange data model

No exchange information is needed in this pattern to implement data delivery features.

6.3.2.4 Exchange messages

Exchange messages are included in payload and defined in Annex B.

6.3.3 State diagrams

State diagrams are not needed, and procedures are described in Clause 7.