BS ISO 14827-2:2022

BSI Standards Publication

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

Part 2: AP-DATEX

Documents
Document Sharing Hub

Full document details: BS ISO 14827-2:2022

National foreword

This British Standard is the UK implementation of ISO 14827-2:2022. It supersedes BS ISO 14827-2:2005, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/278, Intelligent transport systems.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 539 16002 4

ICS 03.220.01; 35.240.60

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2023.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: BS ISO 14827-2:2022

INTERNATIONAL STANDARD

ISO 14827-2

Second edition
2022-12-20

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

Part 2: AP-DATEX

Reference number
ISO 14827-2:2022(E)

Documents
Document Sharing Hub

© ISO 2022

Full document details: BS ISO 14827-2:2022

COPYRIGHT PROTECTED DOCUMENT

© ISO 2022, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub

Full document details: BS ISO 14827-2:2022

Contents

Page

Foreword ... **v**
Introduction ... **vi**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Symbols and abbreviated terms ... **2**
5 Conformance ... **3**
6 Exchange framework ... **3**
6.1 General ... 3
6.2 Basic pull with TCP/UDP datagrams exchange PSM ... 5
6.2.1 Overview ... 5
6.2.2 Exchange pattern messages definition ... 6
6.2.3 State diagrams ... 7
6.2.4 Features implementation description ... 7
6.3 Basic push TCP/UDP datagrams exchange PSM ... 8
6.3.1 Overview ... 8
6.3.2 Exchange pattern messages definition ... 9
6.3.3 State diagrams ... 9
6.3.4 Features implementation description ... 10
7 Data exchange procedures ... **11**
7.1 General ... 11
7.2 General datagrams procedures ... 11
7.2.1 General ... 11
7.2.2 Sessions ... 11
7.2.3 Transport requirements ... 12
7.2.4 Response time-outs ... 12
7.2.5 Retransmission ... 12
7.2.6 Duplicate datagrams ... 12
7.3 General file procedures ... 12
7.4 Sessions ... 12
7.4.1 General ... 12
7.4.2 Establishing a session ... 13
7.4.3 Maintaining a session ... 14
7.4.4 Terminating a session ... 15
7.5 Requesting information ... 16
7.5.1 General ... 16
7.5.2 Offline subscriptions ... 16
7.5.3 Online subscriptions ... 16
7.6 Publication of information ... 17
7.6.1 General ... 17
7.6.2 General procedures ... 17
7.6.3 Single subscriptions ... 19
7.6.4 Registered subscriptions ... 19
Annex A (normative) **Message definition requirements** ... **21**
Annex B (normative) **Datagram structures** ... **25**
Annex C (normative) **Data dictionary** ... **33**
Annex D (normative) **Value domains** ... **66**
Annex E (normative) **TCP/UDP datagrams exchange implementation considerations** ... **80**
Annex F (normative) **TCP/UDP datagrams exchange over internet protocols** ... **81**

AVA Documents
Document Sharing Hub

© ISO 2022 – All rights reserved

Full document details: BS ISO 14827-2:2022

Annex G (normative) **Protocol requirements list** **82**
Bibliography **86**

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

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*.

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.

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

Introduction

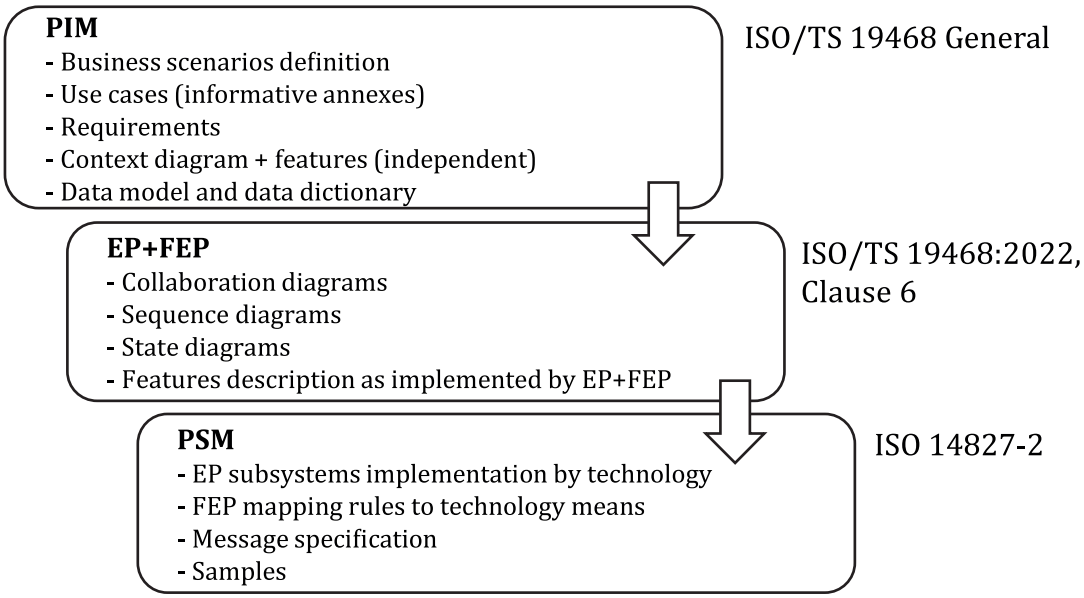
Data exchange among centres is a baseline service for implementing intelligent transport system (ITS) services. For interoperability purposes, data delivery and collaborative ITS services need to be implemented according to certain specifications based on fully-described interfaces.

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

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

INTERNATIONAL STANDARD **ISO 14827-2:2022**

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).

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

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

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

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

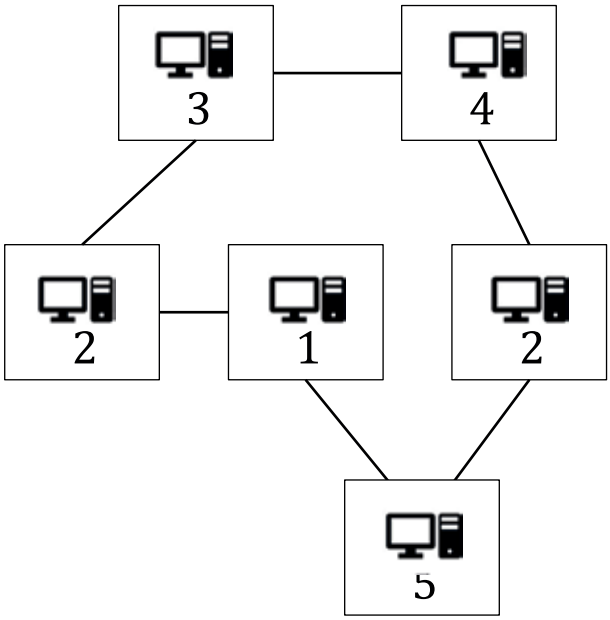
6.1 General

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.

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

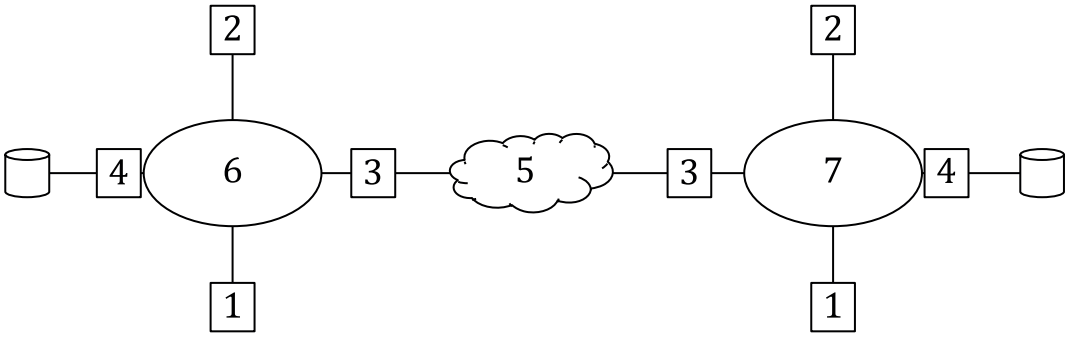


Key

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.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

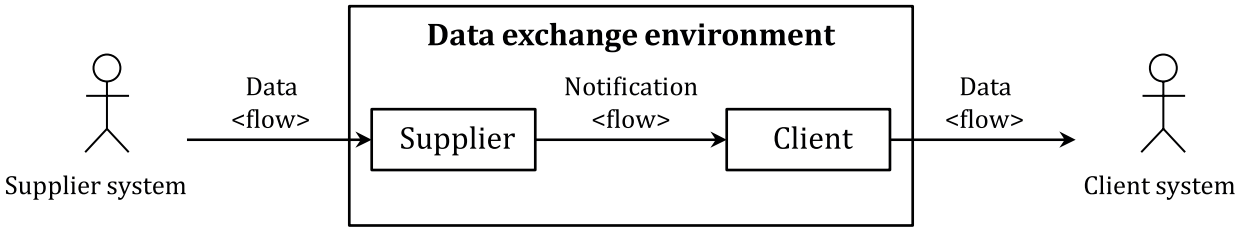


Figure 4 — Communication interfaces

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.

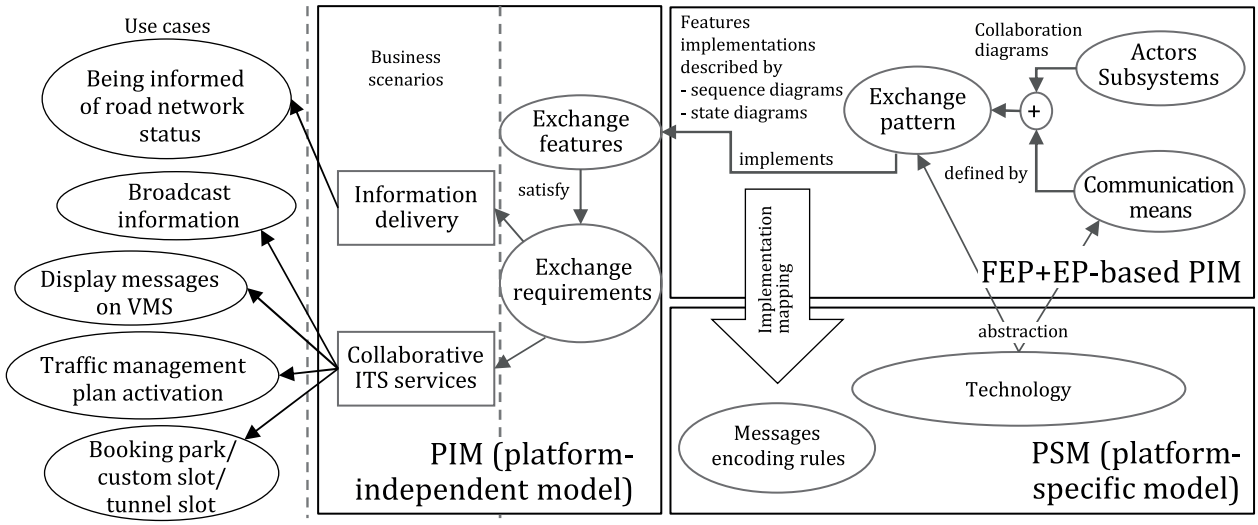


Figure 5 — Business scenario and functional exchange profile (FEP)

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

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

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.

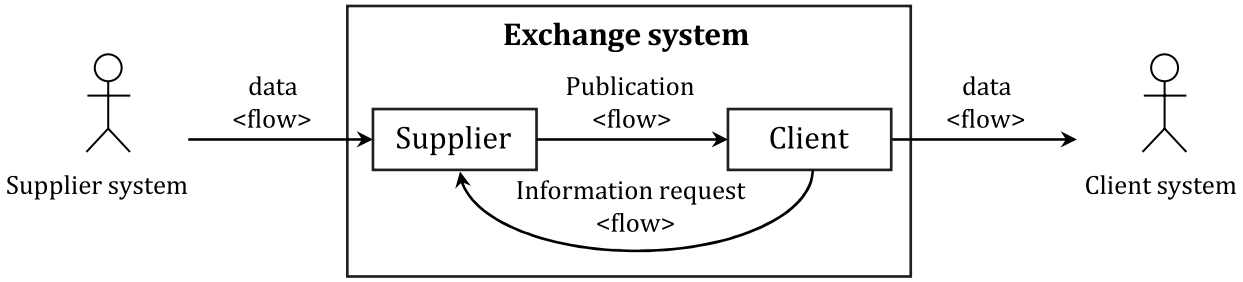


Figure 6 — Basic pull exchange actors

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.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

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.

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

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

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

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.

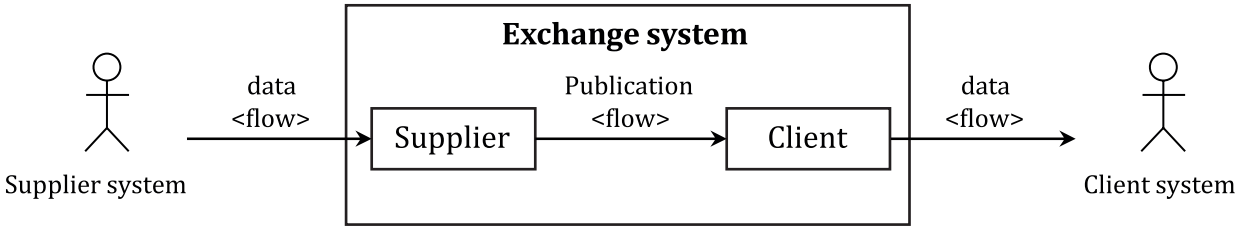


Figure 7 — Basic push exchange actors

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.

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

6.3.4 Features implementation description

6.3.4.1 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.

6.3.4.2 Subscription contract

6.3.4.2.1 Contract

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

6.3.4.2.2 Catalogue

Catalogue is not managed.

6.3.4.3 Session

6.3.4.3.1 Session life cycle

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

6.3.4.3.2 Link monitoring

Link monitoring is not provided.

6.3.4.4 Information management

6.3.4.4.1 Operating modes

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

6.3.4.4.2 Update methods

The update method is not provided.

6.3.4.4.3 Life cycle management

The life cycle is not managed.

6.3.4.5 Data delivery

6.3.4.5.1 Data delivery scheme

The data delivery scheme is described in 7.6.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

6.3.4.5.2 Data request scheme

Not implemented in this pattern.

6.3.4.5.3 Large datasets handling

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

6.3.4.5.4 Synchronization

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

6.3.4.6 Self-description

Handshake is not available.

6.3.4.7 Communication

The communication feature may be implemented at other internet protocol level.

6.3.4.8 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.

7 Data exchange procedures

7.1 General

This document defines an application layer protocol by which data elements are exchanged between a client and supplier. Communication between client and supplier shall be accomplished by the exchange of datagrams and files as defined in this clause.

7.2 General datagrams procedures

7.2.1 General

TCP/UDP datagrams shall be constructed according to the formally defined ASN.1 data structure as DatexDataPacket, defined in Annex B.

The data dictionary for each field of DatexDataPacket is accordance with Annex C. The value domain specified in the data dictionary is accordance with Annex D.

7.2.2 Sessions

This document requires all datagrams to be transmitted in an application session. Within each session, one system shall act as a client and the other shall act as the supplier. Multiple sessions may exist simultaneously.

NOTE A pair of systems will have two concurrent sessions, one where System A acts as the client and System B acts as the supplier and the other where System A acts as the supplier and System B acts as the client. These sessions would be distinguished by lower layer protocols (e.g. TCP or UDP port numbers).

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

7.2.3 Transport requirements

Data may be exchanged over connectionless or connection-oriented transport profiles, but a single transport profile shall be used for all datagrams exchanged within a session.

EXAMPLE If the first datagram in establishing a session is transmitted using UDP, then all datagrams within that session will use UDP. Likewise, if the initial transmission is TCP, then all datagrams will be TCP.

7.2.4 Response time-outs

The client and supplier shall negotiate the response time-out period for each session. The response time-out period should be long enough to accommodate the network propagation delays for both datagrams as well as the turn-around time required to handle the message on the receiving end. In theory, this should be measured from when the last byte is transmitted to when the last response byte is received. However, it is expected that most implementations will measure the time from the return from the system write call to the return from the system read call.

NOTE A typical implementation is to set the time-out to be an integral multiple of the turn-around time and the multiplier is typically set to three. When some communications media and networks experience significant delays, the system will allow this multiplier to be set at run-time.

7.2.5 Retransmission

If a specific datagram requires a response and an appropriate response is not received within the response time-out period, the identical datagram (e.g. same datagram number, same time stamp, etc.) shall be retransmitted one time only. If no response is received to the second datagram, prior to a subsequent response time-out period, the datagram transmission shall be considered unsuccessful. If a response is received after the time-out period, it may be ignored.

7.2.6 Duplicate datagrams

Any time a client or supplier receives a datagram that requires a response, a new response datagram shall be prepared and transmitted as soon as possible, even if the received datagram was a duplicate datagram.

7.3 General file procedures

The client may request the publication (reply) data to be sent within the publication datagram, or the client may request the publication data to be stored in a file on the supplier with the publication datagram indicating the filename of the publication file. The file can then be retrieved by the client within the constraints set by the supplier. Such a publication file shall only contain the "TICS information" as defined by the publication datagram structure as defined in B.2.9.

7.4 Sessions

7.4.1 General

Within each session, one system is a client and the other is a supplier. A supplier with a given domain name shall not accept more than one session with any client domain name with a given transport profile. However, as a single system may have multiple domain names, multiple sessions can potentially exist between a given client system and supplier system pair. Multiple sessions may exist on a single physical link simultaneously.

NOTE 1 For an example of multiple sessions, system A can act as a supplier in one session with system B while also acting as a client in a second session.

NOTE 2 When a single client has sessions with multiple suppliers simultaneously, the complete session number over any given transport profile is defined by the supplier domain name followed by the client domain name.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

NOTE 3 When some implementations have a need to frequently publish relatively large datagrams, there are various ways to achieve this, including: (1) increasing the UDP/IP datagram size to support the required size; or (2) maintaining a prolonged TCP connection over which the large datagrams are periodically sent. The preferred solution will depend on a number of implementation-specific issues such as media quality and required reliability of transmission.

NOTE 4 The usage of different transport profiles (e.g. one UDP and one TCP) will allow simultaneous sessions between a single client and supplier pair.

7.4.2 Establishing a session

The supplier may wish to establish a session. For example, this may be in order to publish information for a registered subscription (request) or allow a receipt of a subscription if the supplier is protected by a firewall. In this case, the supplier shall transmit an "Initiate" datagram, as defined in B.2.3, with the datex-Destination-txt and datex-Sender-txt fields set to the proper name.

A supplier should not terminate a session it initiated for a period of one heartbeat duration after final publication.

If the client receives an "Initiate" datagram or if the client wishes to establish a session, the client shall transmit a "Login" datagram, as defined in B.2.4.

Upon receiving a "Login" datagram, a supplier shall determine if the domain names, username, password, maximum heartbeat duration, response time-out period, allowed encoding rules, datagram size and login reason are valid for the request. The supplier shall also ensure that a session with the given domain name and transport profile does not already exist. If the request is found to be invalid, the supplier shall either:

— respond with a "reject" datagram, as defined in B.2.12, with the "error-code" set to the most appropriate code number which applies to the denial, or

— not respond if the supplier determines this is appropriate due to security reasons.

If the request is valid, the supplier shall respond with an "accept" datagram, as defined in B.2.11, and shall identify the selected encoding rules from the list of options in the login request. This completes the procedures to establish a session.

The procedure to establish a session is summarized in Figure 8. All datagrams exchanged during this procedure shall use the encoding rules that were agreed upon offline. All datagrams exchanged after the successful completion of this procedure shall use the encoding rules, as negotiated within the "Login" and "Accept" datagrams.

EXAMPLE As per Annex F, if the session is established over TCP/IP on Port 355, datagrams exchanged during this procedure will use BER encoding; datagrams exchanged after the successful completion of the login process would then use the encoding rules negotiated by the "Login" and "Accept" datagrams.

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

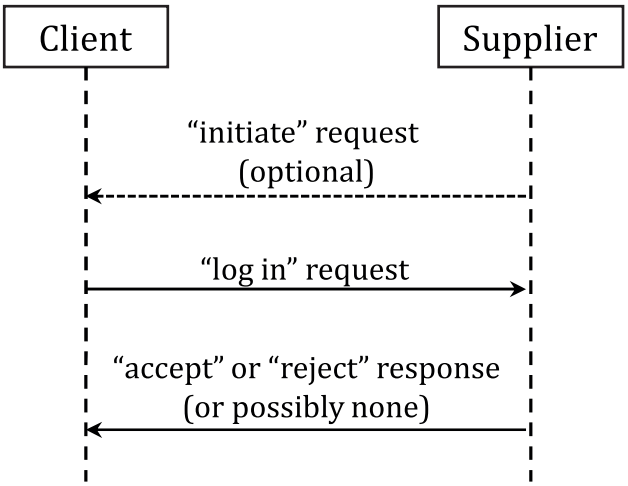


Figure 8 — Establishing a session

7.4.3 Maintaining a session

Sessions are maintained by the client and supplier exchanging "FrED" datagrams. If, at any point during a session, no datagrams are received from the other system for a period exceeding the maximum heartbeat duration, as specified in the login request, the session shall be immediately terminated by both the client and the supplier without exchanging any data. This type of termination is generally only encountered due to unusual circumstances, e.g. a system crash.

NOTE 1 FrED stands for a "Friendly Exchange of Data". The datagram is generally used as an acknowledgement datagram, but it is also used as a system heartbeat when there has been a prolonged period of silence. Thus, the term "ack" does not truly apply to this datagram and the term "FrED" has been considered more appropriate.

NOTE 2 A session can be kept open permanently by meeting the requirements of this subclause.

The client shall maintain the session until the termination procedures are initiated as indicated in 7.4.4. The client shall keep track of the elapsed time since it received a datagram from the supplier and shall ensure that this time does not exceed the maximum heartbeat duration by generating "FrED" datagrams, as defined in B.2.5, as needed. The DATEX.FrED_ConfirmPacket_number-ulong shall be zero (0) for such FrED datagrams, hereinafter referred to as "FrED heartbeat datagrams". It is recommended that the client transmit FrED heartbeat datagrams roughly three times more often than the time specified by the maximum heartbeat duration.

The supplier shall acknowledge a "FrED" heartbeat datagram by transmitting a "FrED" datagram with the DATEX.FrED_ConfirmPacket_number-ulong set to the packet number of the "FrED" heartbeat datagram which is being acknowledged. This shall complete the session maintenance procedure.

When desired, the session shall be terminated according to the procedure described in 7.4.4.

The procedure to maintain a session is summarized in Figure 9.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

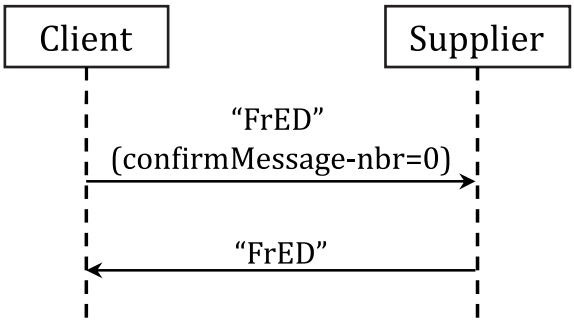


Figure 9 — Maintaining a session

7.4.4 Terminating a session

A session may be actively terminated by either the client or the supplier. If the supplier wishes to terminate a session, it shall transmit a "Terminate" datagram, as defined in B.2.6. If the supplier does not receive any response after two tries, the supplier shall terminate the session on its end.

If the client receives a valid "Terminate" datagram, or if the client wishes to terminate a session, it shall transmit zero or more subscription cancellations, as defined in 7.5 and B.2.8, if it wishes to cancel any persistent subscriptions, followed by a "Logout" datagram, as defined in B.2.7.

NOTE 1 Registered subscriptions do not expire with the termination of a session if the "Persistent" flag was set in the subscription. This allows systems to keep subscriptions active when the session is not active. For example, this can be useful for dial-up connections or to minimize the impact of system crashes.

NOTE 2 A supplier does not need to wait for a FrED for a guaranteed publication to a non-persistent subscription.

Upon receipt of a valid "Logout" datagram, the supplier shall terminate the associated session and issue a FrED, as defined in B.2.5. The client shall terminate the associated session upon receipt of the FrED. This shall complete the session termination procedure.

NOTE If the client does not receive the FrED, despite following the retransmission rules, it will terminate the session according to the provisions of 7.4.3.

The procedure to terminate a session is summarized in Figure 10.

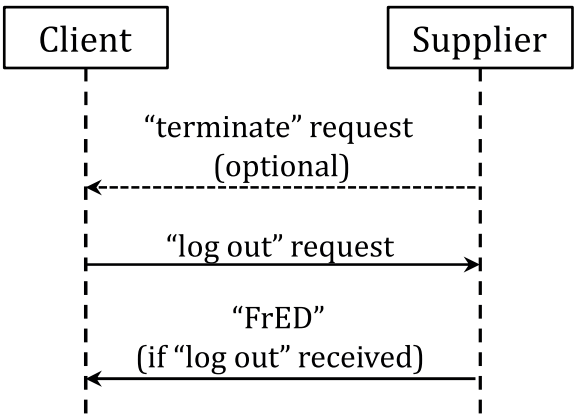


Figure 10 — Terminating a session

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

7.5 Requesting information

7.5.1 General

Clients and suppliers shall provide for offline subscriptions (requests) as defined in 7.5.2, online subscriptions as defined in 7.5.3, or both.

NOTE The subscription process will take place offline or online. This allows a supplier to transmit publications (replies) (e.g. accident publications) without having to support the associated subscription datagram. This can potentially be desirable in order to bring legacy systems into conformance or for security purposes.

7.5.2 Offline subscriptions

Suppliers may provide local mechanisms to register any and all subscriptions to which the supplier claims compliance. This feature shall be supported for all clients known to the supplier.

Clients may provide local configuration mechanisms to accept publications from a remote supplier so that the client may accept publications related to an offline subscription.

7.5.3 Online subscriptions

A client may support the ability to transmit “subscription” datagrams, as defined in B.2.8. If the client claims conformance for online subscriptions, it shall support this service for all subscriptions to which it claims conformance.

A supplier may accept “subscription” datagrams in order to allow for online requests to be processed. If the supplier claims conformance for online subscriptions, it shall support “subscription” datagrams for all subscriptions to which it claims conformance.

Upon receipt of a subscription datagram, the supplier shall respond with either an "accept" or "reject" datagram, as defined in B.2.11 and B.2.12. An "accept" datagram shall only indicate that the data was properly received and understood by the system; it does not guarantee that the end-application will accept the subscription. For example, if a valid subscription is received, but the owner of the given session is not authorized to receive the requested data, an “accept” datagram would be transmitted, but the end-application would immediately transmit a “publication”, as defined in 7.6, indicating that the subscription has been terminated with a reason of accessDenied.

This shall complete the subscription procedure.

If the subscription was accepted, the supplier shall publish data according to 7.6. A subscription can be cancelled by setting the datexSubscribe-CancelReason-cd field to one of the cancel reasons. The procedure to request information is summarized in Figure 11.

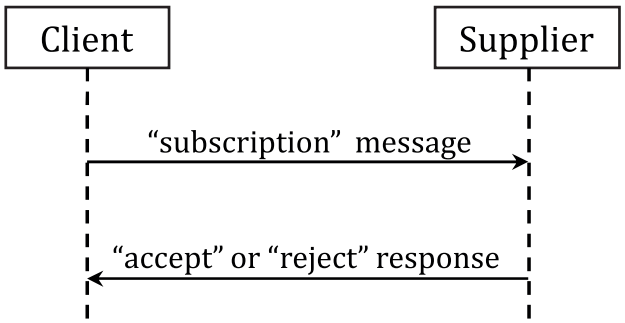


Figure 11 — Subscribing a session

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

7.6 Publication of information

7.6.1 General

Publication of information is partially dependent upon the type of request. The general procedure is described in 7.6.2; the specific procedures for the different types of requests are described in:

— 7.6.3 for single subscriptions, and

— 7.6.4 for registered subscriptions.

For each subscription to which a system claims conformance, the associated publication shall be supported. Support of the publication datagram is mandatory for all datagrams less than the maximum datagram size. If the system claims conformance to publications that exceed the maximum datagram size, the system shall support the "publication-notice" (see 7.6.2.4) and the file transfer mechanism (see 7.6.2.6); otherwise, support for the "publication-notice" and file transfer mechanism are optional. If a system claims conformance to the "publication-notice" and file transfer mechanism, the system shall support these features for all subscriptions to which it claims conformance. Support for multiple publications within a single datagram or single file is mandatory for clients to receive and optional for suppliers to send.

7.6.2 General procedures

7.6.2.1 General

The supplier shall generate a "publication" datagram, as defined in B.2.9, at the times specified in 7.6.3 and 7.6.4.

7.6.2.2 Guaranteed flag

The datexPublish-Guaranteed-bool shall be set to "true" if the associated subscription datagram requested guaranteed delivery. Otherwise, it shall be set to "false".

7.6.2.3 Datagram publications

If the client subscribed for datagram publications, the publication datagram shall contain the publication data if the resulting datagram is smaller than the maximum datagram size defined in the Interchange agreement.

NOTE A memory table would most typically be transmitted as a datagram, although it could also be transferred as a file by creating a virtual disk in memory.

7.6.2.4 Publication-notice datagram

If the client subscribed for file publications, or if the resulting datagram is larger than the maximum datagram size, the data shall be stored in a file and the publication datagram shall indicate the path and filename of the publication data.

NOTE The file transfer uses standard file transfer protocols; thus, the file is exchanged in a separate session from the one used for the TCP/UDP datagrams exchange datagrams described in this document.

7.6.2.5 Client response

If the client determines that the publication is improperly encoded, except for any PublicationData structure that may be present, it shall issue a "reject" datagram, as defined in B.2.12. Otherwise, if datexPublish-Guaranteed-bool is set to true, the client shall issue an "accept" datagram, and if datexPublish-Guaranteed-bool is set to false, no response shall be sent.

NOTE 1 Any errors within the PublicationData structure are handled by the procedures in 7.6.2.7.

AVA Documents
Document Sharing Hub

© ISO 2022 – All rights reserved

Full document details: BS ISO 14827-2:2022

This shall complete the publication procedures if the “publication” datagram was invalid or if the “publication” datagram indicated a filename and that file was previously downloaded and not yet acknowledged with a transfer done datagram. If the “publication” datagram indicated a file that has not been previously downloaded, the procedures of 7.6.2.6 and 7.6.2.7 shall follow in order. If the “publication” datagram contained the publication data, the procedures of 7.6.2.7 shall follow.

NOTE 2 A duplicate filename can be received due to a duplicate message being sent because of a communications error or due to a recycling of message names. Suppliers can wish to name files with large sequential numbers to avoid duplicate filenames and prevent any loss of data. If the client has already been notified of the publication, there is no reason to start another file transfer process.

7.6.2.6 File transfer mechanism

If the “publication” datagram indicated a new filename (i.e. it was not a duplicate message), the client shall immediately retrieve the indicated file after sending the accept datagram, if required. The file transfer shall be via one of the supported file transfer mechanisms, as negotiated in the “subscription” and “publication” datagrams. Once the file has been transferred (or the client has exceeded its maximum number of tries to download the file), the client shall transmit a “transfer-done” datagram, as defined in B.2.10, to verify the receipt (or notify the supplier of failure). The supplier shall acknowledge the “transfer-done” datagram with a “FrED” datagram, as defined in B.2.5. The supplier shall attempt to keep the file available for downloading until the "transfer-done" notice is received.

7.6.2.7 Reject invalid publication data

For each invalid PublicationData structure contained within the publication (due to invalid encoding), the client shall send a reject datagram. This shall complete these procedures.

The procedure to publish information is summarized in Figure 12. A supplier may cancel any subscription at any time by sending a publication datagram with the publicationType field of the PublicationData structure set to one of the terminate codes.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

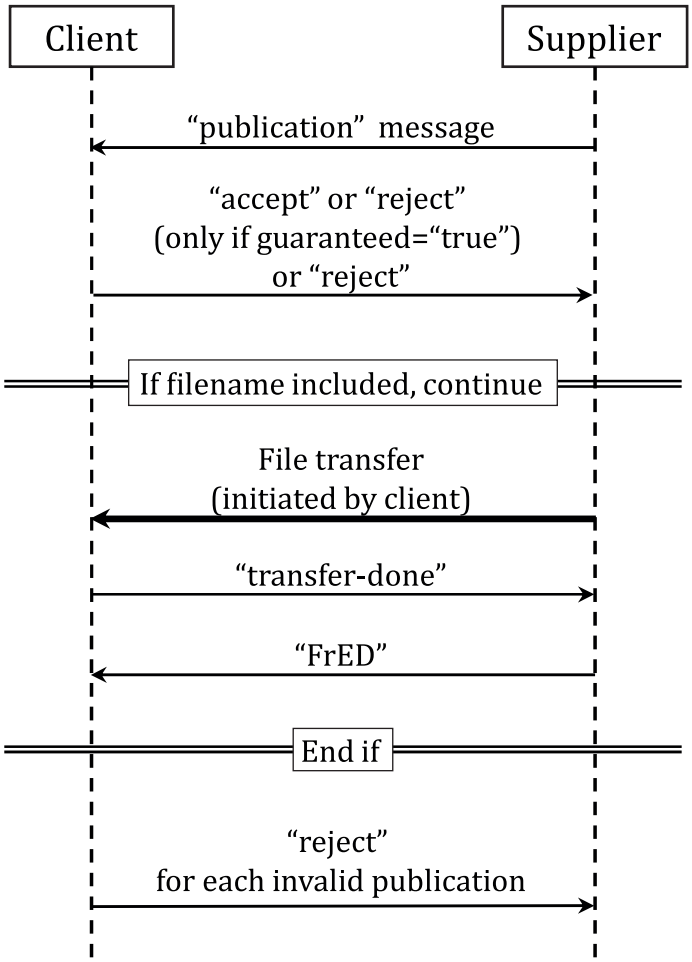


Figure 12 — Publishing information

NOTE The file transfer in the above exchange is a complex procedure, as defined by the associated file transfer standard. The file transfer is requested by the client but is shown as an arrow from the supplier to indicate that the file is on the supplier and is being sent to the client.

7.6.3 Single subscriptions

For one-time, or "single" requests, the supplier shall publish the requested data as soon as possible after completion of the "subscription" process. The publication shall contain all data fulfilling the subscription request.

NOTE Historical data are considered to be separate data elements; thus, historical data can be retrieved as any other information.

7.6.4 Registered subscriptions

Subscriptions may also be "registered" in order to request information as it becomes available or on a periodic basis.

a) Registered subscriptions shall either be continuous or daily (i.e. activated on specific days of the week).

   1) If the subscription is continuous, the subscription shall activate at the datexRegistered-StartTime and remain activated 24 hours a day, seven days a week, until the subscription expires (i.e. reaches the datexRegistered-EndTime) or is explicitly cancelled by a subsequent

© ISO 2022 – All rights reserved

Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

subscription. If the datexRegistered-EndTime is less than or equal to the datexRegistered-StartTime, then no publication shall be made.

2) If the subscription is "daily", the subscription shall become active within the supplier at the start time (datexRegistered-StartTime) on each valid day of week (datexRegistered-DaysOfWeek-cd) occurring on or after the specified start date (datexRegistered-StartDate) and before or on the specified end date (datexRegistered-EndDate). It shall be immediately activated if the current time is valid when the subscription is registered. The subscription shall deactivate at the end of the period defined by the start time (datexRegistered-StartTimeOfDay) plus the duration (datexRegistered-Duration). The end date shall not be earlier than the start date. A daily subscription may also be deactivated by a request that cancels or modifies the subscription. If the datexRegistered-EndDate is less than the datexRegistered-StartDate, then no publication shall be made.

b) Upon subscription activation (or re-activation), the supplier shall publish an initial publication message. If the supplier is unable to provide information at the indicated start time, it shall provide information as soon as possible.

c) Registered subscriptions shall also be classified as either: a) event-driven (i.e. provides information when a specific event occurs); or b) periodic (i.e. provides information at a defined frequency).

d) After the initial publication is produced, the supplier shall attempt to produce a subsequent publication message as follows.

1) If the mode is "periodic", the supplier shall attempt to produce a new publication periodically at a frequency as defined by datexRegistered-UpdateDelay-qty. If the subscription is sent after the start time, the cycle shall be synchronized with the datexRegistered-StartTime.

NOTE 1 In this case, the initial publication will be at a random point in the cycle, and the second publication can follow at any fraction of the cycle later, but will occur on a cycle point as measured from the datexRegistered-StartTime.

In the periodic mode, a supplier should publish information at every cycle point. If the supplier is unable to publish the information within a period of 60 % of a cycle beyond the cycle point, the publication should not be transmitted. Both the supplier and the client should terminate less important subscriptions (e.g. as reflected in the datexSubscription-Priority field) to minimize the probability of this occurring.

NOTE 2 For example, it is assumed that there is a periodic subscription for data every second. The supplier responds originally at the start time, the next publication (containing information about conditions at 1,0 s) is sent at 1,25 s, the next publication (indicating conditions at 2,0 s) is sent at 2,5 s, and the next publication (containing data valid for 3,0 s) is not ready until 3,75 s. This last publication will be ignored (i.e. it is more than 0,6 s late) and the supplier and client are recommended to consider cancelling less important subscriptions. The intent is to not send old data and have the systems build up an infinite backlog of messages to send while the system is clearly at maximum capacity. Depending on message content and system design, this can sometimes be practical problem. Thus, this clause is provisional and it is intended that the implementation will take whatever appropriate actions are necessary to solve these problems.

2) If the mode is "event-driven", the supplier shall produce a publication within a period of datexRegistered-UpdateDelay-qty after the supplier is notified of an event. Thus, in this case, the datexRegistered-UpdateDelay-qty parameter serves as a maximum latency value for event reporting. The subscription message shall define the term "event" in the definition and/or message body. If the maximum latency is exceeded, the data shall be published as soon as possible and the datexPublish-LatePublicationFlag shall be set. Suppliers should terminate less important subscriptions (as reflected in the datexSubscription-Priority field) to minimize the probability of this occurring.

© ISO 2022 – All rights reserved
Documents
Document Sharing Hub
Full document details: BS ISO 14827-2:2022

Annex A
(normative)

Message definition requirements

A.1 General

Exchange information is defined in ISO/TS 19468. This annex provides messages definition requirements for an end application message conforming to this document.

An end application message conforming to this document shall be formally defined with the attributes defined in the following clauses.

A.2 provides an explanation of the message elements for TCP/UDP datagrams exchange. A.3 provides the Message Container class diagram based on ISO/TS 19468. A.4 provides formal ASN.1 information object specification used to document these attributes.

A.2 Message elements

A.2.1 Name

Each message shall be assigned a unique, descriptive name. This name may be used by some protocols for identification purposes.

A.2.2 Definition

Each message shall be assigned a formal, textual definition. The textual definition may reference figures and other information as appropriate. The definition shall provide a meaningful description of the message and clearly indicate the functionality required by the end system.

If the message can be used in an event-driven mode, the definition will define what constitutes an event.

A.2.3 Remarks

The message specification may also include additional remarks. Such remarks shall be considered to be informative only, with the intention of providing a better understanding of the message or of providing supplemental information for the reader.

A.2.4 Message body

The message body shall be completely defined within this field as an ASN.1 type using the notation as defined in ISO/IEC 8824-1.

This allows a consistent methodology for documenting the data; it does not imply the use of ASN.1 encoding rules. A protocol may select any of the ASN.1 encoding rules or use other rules and procedures (e.g. as defined for EDIFACT and CORBA).

NOTE This element corresponds to PayloadPublication of "MessageContainer" package (see ISO/TS 19468:2022, Annex C).

A.2.5 Message type

The message type shall indicate if the message defines a subscription or publication message structure. Subscription message specifications shall include the “subscription-type”, “initial publication”,

© ISO 2022 – All rights reserved

AVA Documents Document Sharing Hub
Full document details: BS ISO 14827-2:2022