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Intelligent transport systems — Fast service announcement protocol (FSAP) for general purposes in ITS

Systèmes de transport intelligents — Protocole d'annonce de service rapide (FSAP)

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CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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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).

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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*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 278, *Intelligent transport systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 22418:2018), which has been technically revised. The main changes compared to the previous edition are as follows:

— this document has been editorially aligned with draft ETSI EN 302 890-1 in order to make these two standards complement each other such that both can be published as European standards;

— one minor technical detail of the ASN.1 code related to a specific extension element was harmonized with ETSI.

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.

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Introduction

Provisioning of ITS services at specific locations on the road network requires awareness of the availability and the purpose of such services in order to allow a road network user to make decisions on the potential consumption of such a service. Awareness of services can be achieved by pull and push mechanisms. Whilst pull mechanisms are well understood and deployed for non-time-critical usage, several use cases depend on a push mechanism. Whilst pull mechanisms require a-priori knowledge of an intended service, push mechanisms support also "mandatory services" that may be locally and dynamically applicable and defined by local policies rather than global regulations.

This document illustrates and specifies the features of the cooperative push mechanism "service announcement" based on the internationally harmonized message formats specified in ISO/TS 16460, and builds on any localized ITS-S communications protocol stack (ITS-SCPS), one of which is FNTP, specified in ISO 29281-1, which builds on the ITS-M5 access technology specified in ISO 21215. It is to be noted that the terms "service announcement" and "service advertisement" are used synonymously.

This document complements service announcement specifications at IEEE ("WAVE Service Advertisement" [WSA] specified in IEEE 1609.3[TM]) and at ETSI ("Service Announcement Essential Message" [SAEM] specified in draft ETSI EN 302 890-1):

— The WSA requires normatively only a subset of the functionality specified in ISO/TS 16460. WAVE is designed for the IEEE 802.11(TM) OCB localized communications access technology operated in the 5,9 GHz frequency bands allocated in the United States of America, also referred to as "US-DSRC".

— The SAEM, also using the message formats specified in ISO/TS 16460, is tailored in support of a limited ITS service domain identified in ETSI as "Basic Set of Applications", using only a small subset of functionality specified in ISO/TS 16460 and in this document. So far, ETSI requires usage of the ITS-S communication protocol stack constituted by ITS-G5, GeoNetworking, the Basic Transport Protocol and the common ETSI message header.

Using the same ITS-SCPS for transmission of the service announcement message (SAM) and the same limited subset of service announcement functionality, FSAP, WSA, and SAEM are binary compatible with respect to the shared service announcement features.

Understanding service advertisement and the related protocol specified in this document requires understanding of ISO/TS 16460.

Requirements are specified in the following clauses of this document.

— Clause 5 specifies general requirements.

— Clause 6 presents a tutorial on architectural issues related to FSAP.

— Clause 7 specifies protocol elements of FSAP.

— Clause 8 specifies protocol procedures of FSAP.

— Clause 10 specifies conformance declaration.

— Clause 11 specifies test methods.

— Annex A specifies the ASN.1 module for FSAP.

— Annex B specifies details of the optional support of presenting communication requirements of FSAP to the ITS station management in conformance with ISO 17423.

— Annex C specifies details of the optional support of path and flow management for FSAP in conformance with ISO 24102-6.

— Annex D presents the implementation conformance statement proforma.

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Intelligent transport systems — Fast service announcement protocol (FSAP) for general purposes in ITS

1 Scope

This document specifies the fast service announcement protocol (FSAP) for general purposes in ITS. It references and supports all features of ISO/TS 16460, especially supporting the service response message (SRM) and related features in addition to the service announcement message (SAM), which enables only very basic features.

FSAP supports locally advertised ITS services uniquely identified by an ITS application identifier (ITS-AID).

This document specifies message formats and related basic protocol procedures by reference to ISO/TS 16460, and further related protocol requirements for operation of FSAP in the context of an ITS station specified in ISO 21217.

This document illustrates its relations to service announcement protocols specified by ETSI TC ITS and IEEE.

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/IEC 8825-2, *Information technology — ASN.1 encoding rules: Specification of Packed Encoding Rules (PER) — Part 2*

ISO/IEC 8825-7, *Information technology — ASN.1 encoding rules — Part 7: Specification of Octet Encoding Rules (OER)*

ISO/TS 16460, *Intelligent transport systems — Communications access for land mobiles (CALM) — Communication protocol messages for global usage*

ISO 17419, *Intelligent transport systems — Cooperative systems — Globally unique identification*

ISO 17423, *Intelligent transport systems — Cooperative systems — Application requirements and objectives*

ISO 21217, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

ISO 29281-1, *Intelligent transport systems — Localized communications — Part 1: Fast networking & transport layer protocol (FNTP)*

ISO 24102-3, *Intelligent transport systems — ITS station management — Part 3: Service access points*

ISO 24102-4, *Intelligent transport systems — ITS station management — Part 4: Station-internal management communications*

ISO 24102-6, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 6: Path and flow management*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21217 apply.

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

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

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

4 Abbreviated terms

APDU	application protocol data unit
FSAM	fast service advertisement message
FSAP	fast service announcement protocol
FSRM	fast service response message
ITS-AID	ITS application identifier
ITS-SAPID	ITS-S application process identifier
ITS-SCPS	ITS station communication protocol stack
REQN	request message PDU, no response message PDU expected
REQW	request message PDU, response message PDU expected
RES	response message PDU, acknowledging a REQW
SAEM	service announcement essential message
SAM	service announcement message
SRM	service response message
S-FSAM	secured FSAM
S-FSRM	secured FSRM
SrvIniP	service initialization phase
SrvOpP	service operation phase

5 General requirements

The normative part of the specification of the service advertisement messages in ISO/TS 16460 is a normative part of this document.

The FSAP specified in this document shall be identified in FSAP APDUs by the version number three.

APDUs specified in this document are the FSAM and the FSRM.

The messages for FSAM and FSRM shall be encapsulated by a security frame, resulting in a S-FSAM and a S-FSRM.

Fragmented transmission of FSRMs and FSAMs is prohibited. Thus, the maximum size of S-FSAMs and S-FSRMs is limited by the capabilities of the protocol stack used for transmission.

FSAP is identified at the ITS-S networking and transport layer by:

— the well-known registered ITS port number (ITS-PN) PORT_SAM = 1 = 0x00.01, identifying the FSAP port that is receiving groupcasted S-FSAMs, and

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— dynamically assigned ITS-PNs:

  — PORT_DYN_FSAM identifying the FSAP port that is receiving unicast S-FSAMs. The dynamic assignment is done in the ITS-SU that is transmitting S-FSRMs;

  — PORT_DYN_FSRM identifying the FSAP port that is receiving unicast S-FSRMs. The dynamic assignment is done in the ITS-SU that is transmitting S-FSAMs;

as illustrated in Table 1; see also 7.3 on ITS port numbers.

Table 1 — FSAP ITS port numbers

Direction	Source ITS-PN	Destination ITS-PN	MAC mode
From service advertiser to service user	PORT_DYN_FSRM	PORT_SAM	Groupcast (broadcast or multicast)
		PORT_DYN_FSAM	Unicast
From service user to service advertiser	PORT_SAM	PORT_DYN_FSRM	
	PORT_DYN_FSAM		

NOTE Procedures on how to perform multicast transmission of S-FSAMs are not specified in this document.

Unicast transmissions of S-FSRMs and S-FSAMs may be repeated, e.g. after timeout for a respective acknowledgement, as defined by implementation.

Further on the FSAP is identified by:

— the ITS-AID 2.113.664; see also 7.4. The p-encoded (ASN.1 unaligned packed encoding rules) presentation of this number of ASN.1 type `ITSaid` specified in ISO 17419 is 0pE0.00.00.00, i.e. fits into a four octet field.

An implementation supporting path and flow management shall conform to ISO 24102-6.

An implementation for a distributed ITS-SU, i.e. an ITS-SU consisting of several ITS-SCUs interconnected with an ITS station-internal network, shall conform to ISO 24102-4.

As

— identical message formats for service advertisement are used in IEEE 1609.3(TM) (WAVE SAM) and ETSI TS 102 890 (SAEM), and

— the features specifications in IEEE 1609.3(TM) and ETSI TS 102 890 are sub-sets of the specification in this document,

an implementation of FSAP optionally may support the service advertisement from IEEE WAVE devices and the service announcement from ETSI ITS stations by considering the following:

— WSM support

  1) The only supported access technology is IEEE 802.11(TM) OCB mode specified in IEEE 802.11(TM) (ISO 21215 with US frequency allocation and WAVE-specific details).

  2) The only networking & transport layer protocol supported is the WAVE Short Message protocol (WSMP) specified in IEEE 1609.3(TM), which uses the same message format as FNTP with TPID-FS zero (ISO 29281-1).

  3) Port numbers are not used. Instead, the service advertisement message SAM is identified by the value 135 of ITS-AID, used as a transport layer destination address in WSMP (i.e. in FNTP with TPID-FS zero [ISO 29281-1]).

  4) The WAVE SAM is identical to FSAM.

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5) S-FSAM (Security encapsulated FSAM) uses the same format and encoding as WAVE does. WAVE security is specified in IEEE 1609.2(TM).

6) FSRM and other features, e.g. mandatory applications and private service channels, are not supported.

— SAEM support

1) The only supported access technology is IEEE 802.11(TM) OCB mode (ISO 21215 with EU frequency allocation and ETSI-specific details), referred to as ITS-G5.

2) The only networking & transport layer protocol currently supported is ETSI GeoNetworking/ ETSI Basic Transport Protocol.

3) The SAEM is identified by the BTP port number for SAM specified in ETSI TS 103 248.

4) The SAEM is SAEM preceded by the ETSI common message header.

5) Security encapsulation is not specified.

6) FSRM and other features, e.g. mandatory applications and private service channels, are not supported.

Details of support of application requirements for communications, if supported in an implementation, shall be as specified in Annex B. Details of path and flow management, if supported in an implementation, shall be as specified in Annex C.

6 Architecture

6.1 ITS communications architecture

The FSAP is designed as a functionality of the ITS station and communication architecture specified in ISO 21217.

6.2 Implementation architecture

The FSAP specified in this document supports the implementation architectures introduced in ISO 21217.

6.3 Communication roles and entities

The FSAP distinguishes the following roles identified in ISO/TS 16460:

a) Service advertiser:

— management of advertisement requests from service providers;

— transmission of FSAMs and reception of FSRMs.

b) Service provider:

— provision of ITS services.

c) Service user:

— reception of FSAMs and transmission of FSRMs;

— consumption of ITS services.

An ITS-SU may simultaneously or sequentially act as a service advertiser, service provider, and service user.

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This document does not explicitly consider the distinction of service advertiser ITS-SUs and service provider ITS-SUs; for the purpose here, the two roles are assumed to be located in the same ITS-SU.

An instance of any kind of ITS station identified in ISO 21217 (roadside, vehicle, portable, centre) may implement the FSAP.

6.4 Communication phases

6.4.1 Overview

In order to allow an ITS-SU to offer an ITS service to another ITS-SU by means of an application session, a service initialization phase (SrvIniP) is performed by the FSAP, where the SrvIniP is based on localized communication, e.g. applying the FNTP networking & transport layer protocol specified in ISO 29281-1.

After initialization, the application session is performed during the service operation phase (SrvOpP), where the SrvOpP may be based on either localized communication or networking, e.g. IPv6 communication, over any kind of access technology.

During SrvIniP, handover to another protocol stack, e.g. another access technology and IPv6, may be demanded.

The real-time SrvIniP procedures are preferably implemented in an ITS-S router.

NOTE The specification of SrvOpP is outside the scope of this document.

6.4.2 Service initialization phase

The purpose of SrvIniP is to invite a peer ITS-SU by means of a fast service announcement message (FSAM) to use an ITS service which is uniquely identified by an ITS-AID specified in ISO 17419; ITS-AID points to an ITS application object.

NOTE 1 Usage of some allocated ITS-AID values are not always meaningful in FSAM.

Acceptance of such an invitation typically results in a session where the two peer ITS-S applications exchange data. However, a session is not necessarily needed, i.e. the service may be provided completely by the FSAM. Thus, FSAM provides also the means to periodically broadcast information from ITS broadcast services.

Three operational options of SrvIniP are specified. The distinction was originally motivated by the two ITS application objects:

a) ITS application class (ISO 15628), and

b) ITS application,

and was extended to allocate private communication channels to individual ITS station units (ITS-SUs).

Option a), originally designed for ITS application classes (DSRC-like SrvIniP, see ISO 15628), is illustrated in Figure 1. FSAM is sent by a service advertiser ITS station to invite for a service initialization phase. FSRM is sent by a service user ITS station to acknowledge FSAM. Successful SrvIniP is given by the first successful REQW or REQN of the service provider.

NOTE 2 In ISO 15628, BST corresponds functionally to FSAM, and VST corresponds functionally to FSRM.

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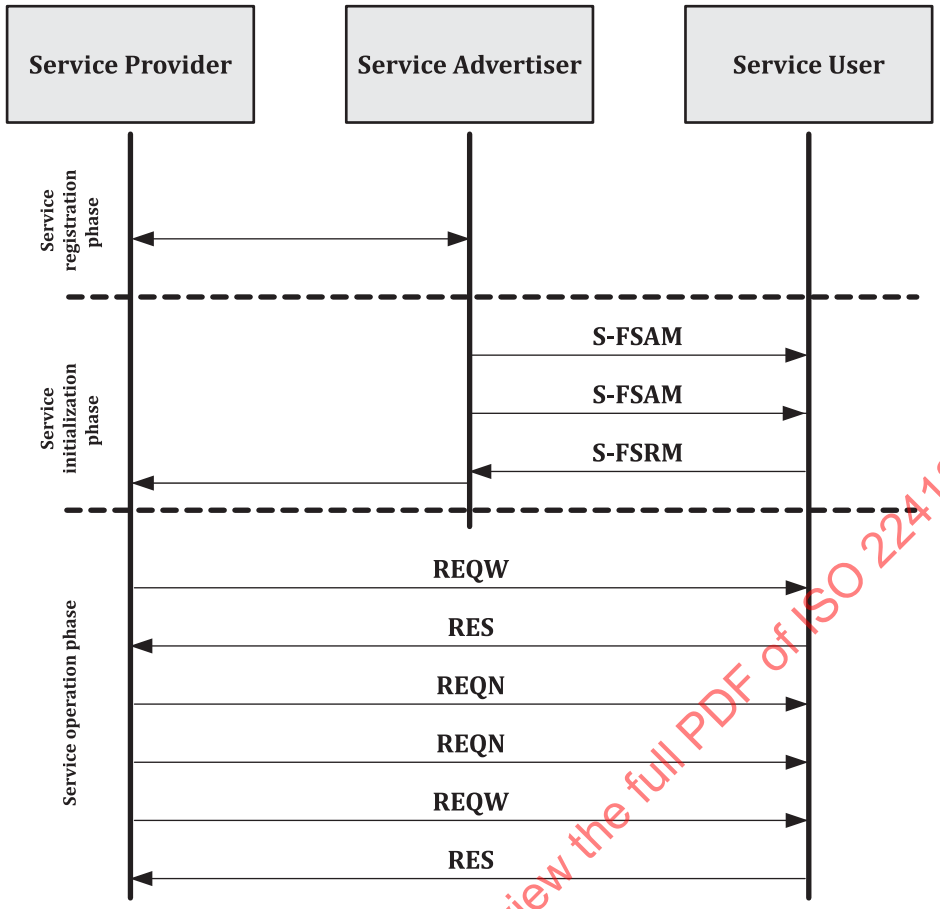

Figure 1 — ITS application session with FSRM

NOTE 3 The concept of application classes was introduced in ISO 15628. Distinction of classes was performed with an identifier of ASN.1 type `DSRCapplicationEntityID`. The difference between an ITS application class and an ITS application is that for an ITS application class several contexts exist. Each context itself can be referred to as an ITS application.

During a SrvOpP:

— requests, either with or without an expected response, are typically sent by the service provider, but may also be sent by the service user, and

— responses are typically sent by the service user, but may also be sent by the service provider,

dependent on the specification of the ITS application.

NOTE 4 Rules on which data are sent by a service provider or by a service user apply strictly for ISO 15628. In general, for ITS there are no such rules.

NOTE 5 As specified in ISO 21217, the service user and service client instances of an ITS application are referred to as ITS-S application processes; ITS-S application processes residing in the "Applications" entity are referred to as ITS-S applications.

Option b), originally designed for ITS applications (WAVE-like SrvIniP)[3], is illustrated in Figure 2. FSAM is sent by a service advertiser to perform service initialization. Successful SrvIniP is given by the first successful REQW or REQN of the service user.

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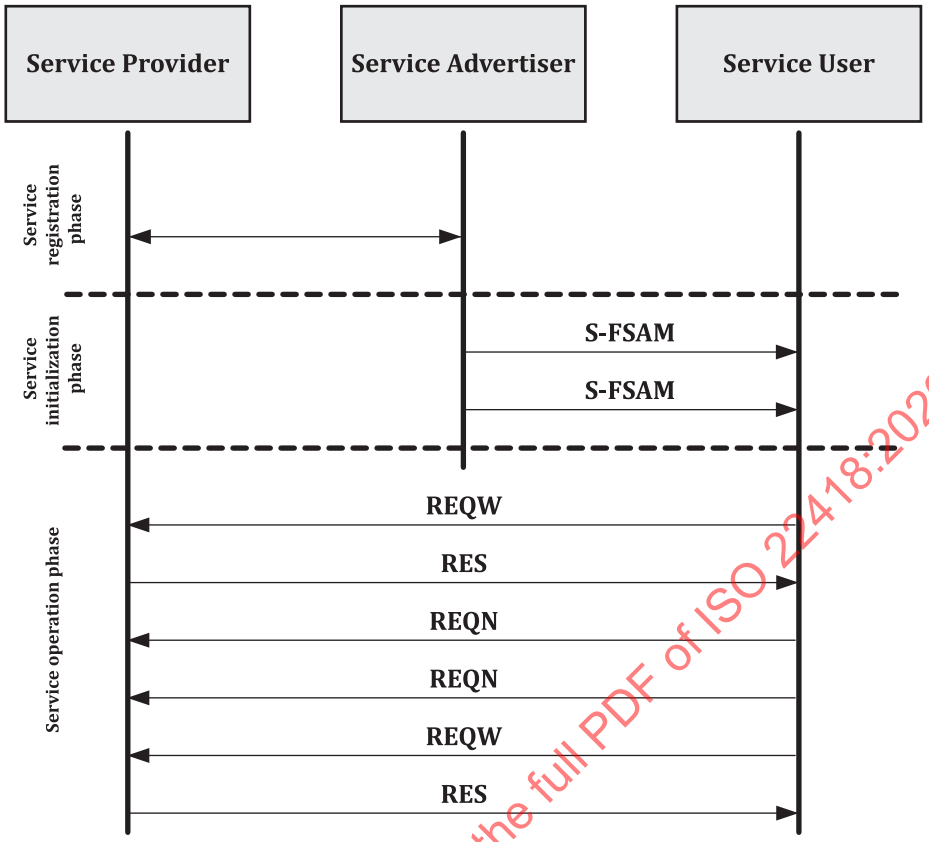

Figure 2 — ITS application session without FSRM

During a SrvOpP:

— requests, either with or without an expected response, are typically sent by the service user, but may also be sent by the service provider, and

— responses are typically sent by the service provider, but may also be sent by the service user,

dependent on the specification of the ITS application.

NOTE 6 In general for ITS there is no such strict rule regarding which station type is sending which type of message.

Option c) presents the situation when a service advertiser wants to allocate private communication channels to service users. In this option, an additional handshake between the service advertiser and the service user is needed prior to start of the SrvOpP. Option c) is applicable for ITS applications and ITS application classes.

NOTE 7 "Private communication channel" does not necessarily mean that only a single service user station operates on it. It is up to the service advertiser station to allocate a private communication channel to one or several service user stations.

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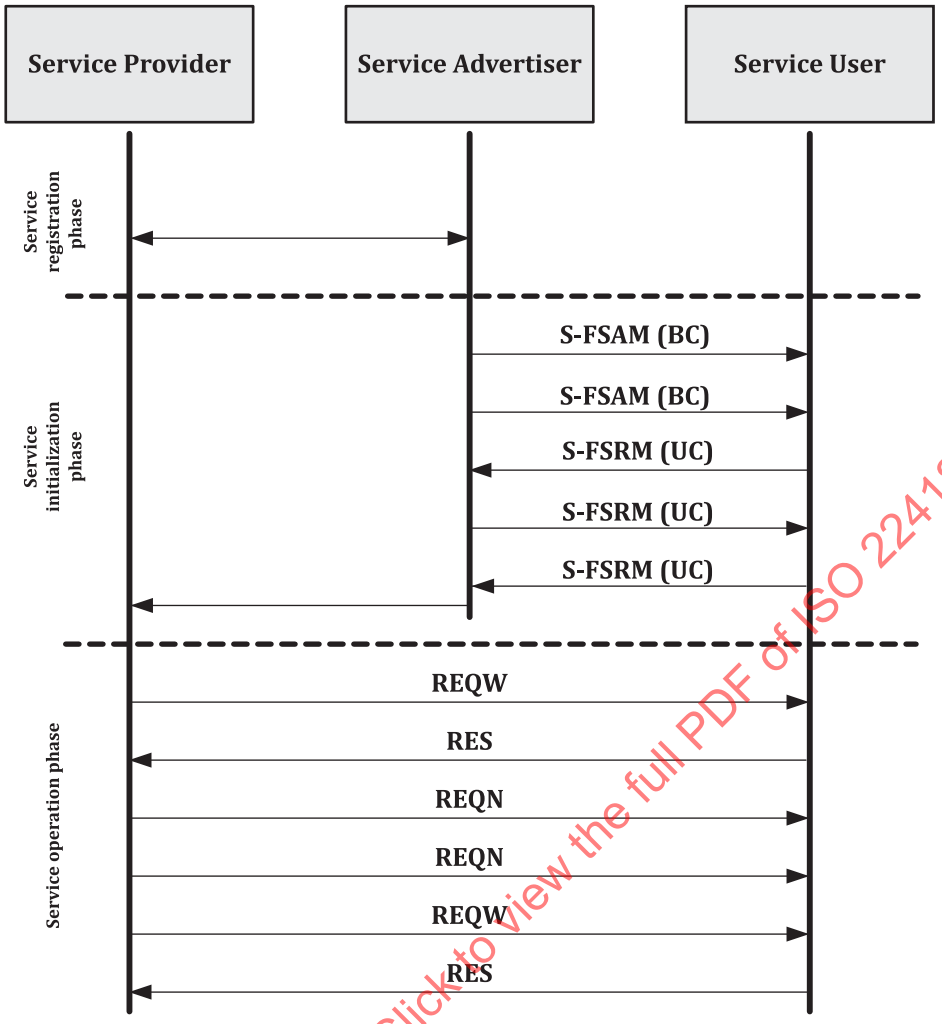

Figure 3 — ITS application session with privately allocated communication channel

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6.4.3 Service operation phase

Management of reception and transmission of session messages, e.g.

— "Request with No response expected" (REQN),

— "Request With response expected" (REQW), and

— "Response to a request" (RES),

as illustrated in Figures 1, 2, and 3, is outside the scope of this document.

6.5 Advertised services

ITS services being advertised with FSAP are provided by ITS applications which are typically specified with two complementary ITS-S application processes, e.g. one implementing the provider part, the other implementing the user part; see ISO 21217.

An ITS application is uniquely identified by an ITS-AID specified in ISO 17419. The one or several ITS-S application processes of such a single ITS application are distinguished by means of the ITS-S application process identifier (ITS-SAPID) specified in ISO 17419. Thus, a specific ITS-S application process is uniquely identified by the tuple {ITS-AID, ITS-SAPID}.

ITS-SAPIDs can also be used to distinguish different versions of the ITS-S application process.

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In order to identify and execute the proper ITS-S application processes during the SrvOpP, two approaches are identified:

a) management by FSAP;

b) management by the ITS application not using specific features of FSAP.

Approach a) defines an ITS application in general as an ITS application class, i.e. an ITS application with different contexts (see ISO 17419). Thus, upon reception of an FSAM advertizing such an ITS application class, the service user station first will reply with an FSRM presenting the supported ITS-SAPID values. Based on this information, the service provider will select a suited ITS-S application process identified by the ITS-SAPID, if possible, or will not be able to provide the service.

A possible procedure b) would be to use version numbers in the APDUs of the ITS-S application processes, allowing a receiving entity to select the appropriate protocol.

6.6 FSAP reference architecture

The FSAP reference architecture is illustrated in Figure 4.

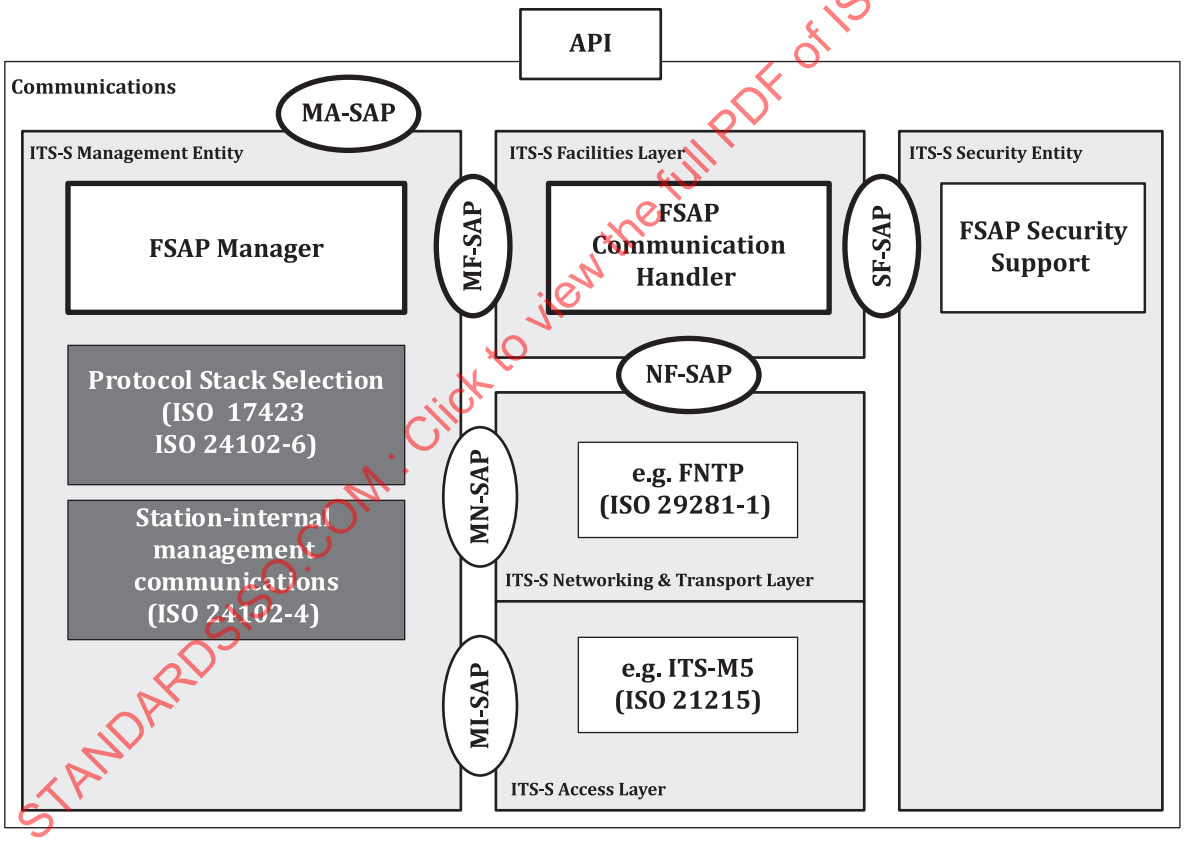

Figure 4 — FSAP reference architecture

The FSAP is specified by means of two functional entities located in the ITS station, see ISO 21217, i.e.

— "FSAP communication handler" located in the ITS-S facilities layer;

— "FSAP manager" located in the ITS-S management entity.

Security services in support of FSAP are located in the ITS-S security entity shown in Figure 4. Related specifications, except very general ones in 7.2.4, are out of scope of this document.

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Further support functionalities are:

— protocol stack selection, e.g. as specified in ISO 17423 and ISO 24102-6;

— station-internal management communications, e.g. as specified in ISO 24102-4.

NOTE Initial investigations are underway in ISO/TC 204 to provide the functionality of the FSAP Communication Handler as part of an ITS station capability as defined in ISO/TS 17429.

7 Protocol elements

7.1 Management service access points

SAPs are functional descriptions which in many cases are not implemented as observable interfaces. Thus, in general, SAPs are not testable. The requirements set up in this document with respect to SAPs thus just mean the functional behaviour rather than a specific implementation. As far as related ASN.1 definitions are given, these become mandatory as soon as the defined elements become observable, e.g. within PDUs for ITS station-internal management communications as specified in ISO 24102-4.

FSAP uses functionality of the MA-SAP, MF-SAP, and SF-SAP. This functionality is provided by means of procedures with parameters presented in tables. Appropriate ASN.1 type definitions implementing this functionality are specified.

7.2 Protocol data units

7.2.1 General

The format of FSAM shall be identical to the format of SAM as specified in ISO/TS 16460; it is presented in Figure 5.

FSAM							
Header					Body		
4 bits	*4 bits*	*4 bits*	*4 bits*	*Optional Variable*	*Optional Variable*	*Optional Variable*	*Optional Variable*
Version	Option Selector	FSAM-ID	FSAM-Count	FSAM Extensions	Service Info Segment	Channel Info Segment	IPv6 Routing Advertisement

Figure 5 — General format of FSAM

The format of FSRM shall be identical to the format of SRM as specified in ISO/TS 16460; it is presented in Figure 6.

FSRM					
Header			Body		
4 bits	*4 bits*	*Optional Variable*	*Optional Variable*	*Optional Variable*	*Optional Variable*
Version	Option Selector	FSRM Extensions	Private Channel Allocation Request	Context Information	Private Channel Allocation Confirm

Figure 6 — General format of FSRM

None of the features specified in ISO/TS 16460 are prohibited for FSAM or FSRM.

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7.2.2 Fast service advertisement message (FSAM)

FSAM is of ASN.1 type `Fsam` as specified in A.2. It is identical to the service advertisement message SAM of ASN.1 type `Sam` as specified in ISO/TS 16460.

7.2.3 Fast service response message (FSRM)

FSRM is of ASN.1 type `Fsrm` as specified in A.2. It is identical to the service response message `SRM` of ASN.1 type `Srm` as specified in ISO/TS 16460.

7.2.4 Secured messages

The messages FSAM and FSRM shall be encapsulated by a security frame, resulting in a Secured FSAM (S-FSAM) and a Secured FSRM (S-FSRM) as presented in Figure 7.

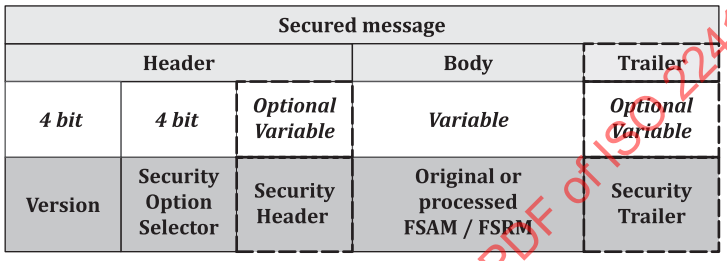

Figure 7 — Encapsulated FSAM and FSRM

Basic requirements are specified in ISO/TS 16460.

The "Secured message" in Figure 7 is specified with the following ASN.1 code, applying octet encoding rules (OER) as specified in ISO/IEC 8825-7:

```
Smessage ::= SEQUENCE {
   protocolVersion    INTEGER (0..255), -- actual version value is three
   content            SmessageContent
   }

SmessageContent ::=  CHOICE  {
   unsecuredData      OCTET STRING, -- contains unmodified FSAM or FSRM
   signedData         SignedData,
   encryptedData      EncryptedData,
   ...
   }
```

Currently identified values of the "Security Option Selector" are:

— 0x80: Unsecured message.

  The optional security header and security trailer are not present. The body contains the unmodified FSAM or FSRM preceded by a length field indicating the number of octets contained in FSAM and FSRM, respectively.

— 0x81: Signed message.

  The optional security header and trailer are present. The body contains the unmodified FSAM or FSRM preceded by a length field indicating the number of octets contained in FSAM and FSRM, respectively.

— 0x82: Encrypted message.

  The optional security header and trailer are present. The body contains encrypted data.

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Different methods to sign or encrypt messages are possible. One approach is specified in IEEE 1609.2(TM) with `Smessage ::= Ieee1609Dot2Data`.

FSAP uses the services of the ITS-S Security Entity for signing and encrypting messages.

Further security details are out of scope of this document.

7.2.5 Request and response messages

Request and response messages may be exchanged between peer ITS-S units within SrvOpP.

NOTE Details are outside the scope of this document.

7.3 Port numbers

FSAP uses an ITS-S network & transport layer protocol, where ITS port numbers (ITS-PNs) are used to identify source and destination endpoints in an ITS station. ITS-PNs are of ASN.1 type `PortNumber` as specified in ISO 17419 for FNTP.

Source and destination endpoints of ITS-S applications, i.e. peer instances of ITS applications, advertised with FSAP are accessible either with static (well-known) port numbers, or with dynamically assigned port numbers according to the rules of the ITS-S networking & transport layer protocol and the protocol procedures specified in this document. The number range of dynamically assigned port numbers PORT_DYN, and assigned values of static port numbers PORT_REG are identified in ISO 17419.

7.4 ITS application object identifier (ITS-AID)

ITS application objects are identified by means of an ITS application object identifier (ITS-AID), as specified in ISO 17419. ITS-AID is of ASN.1 type `ITSaid`.

8 Protocol procedures

8.1 General

8.1.1 FSAP communication handler procedures

The FSAP communication handler located in the ITS-S facilities layer shown in Figure 4 performs the following tasks:

— Cooperate with the FSAP manager located in the ITS-S management entity via the MF-SAP as illustrated in Figure 1, using MF-Commands and MF-Requests as specified in ISO 24102-3 with details specified in this document. The purposes are:

  — Receive registering, updating and deregistering requests from the FSAP manager for FSAM real-time groupcasting.

  — Receive requests from the FSAP manager for sending FSAMs and FSRMs in unicast mode to identified peer stations.

  — Forward received FSAMs and FSRMs from peer stations to the FSAP manager and perform appropriate procedures.

— Prepare necessary ITS-S networking & transport layer protocols for communication.

— Assemble and maintain FSAM PDUs and FSRM PDUs.

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— Involve the FSAP security support located in the ITS-S security entity via the SF-SAP illustrated in Figure 1, using SF-Commands and SF-Requests as specified in ISO 24102-3 with details specified in other standards or specification documents, for:

  — converting FSAM PDUs into S-FSAM PDUs, and FSRM PDUs into S-FSRM PDUs;

  — converting S-FSAM PDUs into FSAM PDUs, and S-FSRM PDUs into FSRM PDUs.

— Request transmission of S-FSAM PDUs and S-FSRM PDUs via the proper lower communications protocol stack accessible via the NF-SAP.

— Receive S-FSAM PDUs and S-FSRM PDUs from the proper lower communications protocol stack via the NF-SAP.

Details are given by dedicated procedures specified in this document.

8.1.2 FSAP manager procedures

The FSAP manager located in the ITS-S management entity shown in Figure 4 performs the following tasks:

— Cooperate with ITS-S application objects via the MA-SAP as illustrated in Figure 1, using MA-Commands and MA-Requests as specified in ISO 24102-3.

  — Register and deregister ITS-S application processes as service providers or service users and maintain such registrations.

  — Notify registered ITS-S application processes about events of the FSAP. Details depend on the role as service provider or service user.

— Cooperate with the FSAP communication handler, see 8.1.1.

— Manage forwarding of FSAP related information between ITS-SCUs of the same ITS station applying ITS station-internal management communications specified in ISO 24102-4, if applicable.

— Contribute to the management of selecting communication protocol stacks for ITS-S applications, e.g. specified in ISO 24102-1, ISO 17423, ISO 24102-6.

Details are given by dedicated procedures specified in this document.

8.1.3 Extension elements

Processing of extension elements contained in FSAMs and FSRMs, if applicable, shall be as specified in ISO/TS 16460 and in this document. Details of management of some extension elements specified in ISO/TS 16460 may depend on implementations.

Applicable extension elements identified so far are:

a) SAM extensions listed in ISO/TS 16460:2016, Table 5;

  — The extended channel info segment extension shall be supported by FSAP for implementations (ITS-SUs) supporting hybrid communications.

    NOTE 1 The extended channel info segment extension is not supported in IEEE 1609.3(TM).

b) Service info extensions listed in ISO/TS 16460:2016, Table 7;

  — The SAM application data extension shall be supported by FSAP.

  — The SrvOpP Protocol Stack extension of ASN.1 type `SrvOpP-ProtocolStack` specified in A.4 shall be supported by FSAP for implementations (ITS-SUs) supporting hybrid communications. The SrvOpP Protocol Stack extension, if present in the service info segment contained in a SAM of an

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announced ITS service, indicates a communication protocol stack different to the one used for transmission of the SAM that shall be used for the service session.

EXAMPLE If FSAM is sent out with ITS-M5 / GeoNetworking / Basic Transport Protocol / ETSI common message header, SrvOpP Protocol Stack indicating one protocol stack, e.g. US-DSRC / WSMP, then the respective service is offered via a communication link ITS-M5 / WSMP. Only GeoNetworking / Basic Transport Protocol / ETSI common message header are replaced by WSMP; all other communication protocols of the stack remain unchanged.

NOTE 2 The change of communication protocol stack requested with the SrvOpP Protocol Stack extension can be combined with a change of physical channel parameters, e.g. channel number, using the Channel Info Segment and Channel Index in the Service Info Segment.

NOTE 3 The SAM application data extension is not supported in IEEE 1609.3(TM).

c) Channel info extensions listed in ISO/TS 16460:2016, Table 8;

d) IPv6 routing extensions listed in ISO/TS 16460:2016, Table 9.

8.2 Service provider

8.2.1 FSAP registration

For the purpose of registering its offered service at the FSAP manager, a service provider ITS-S application process shall use the services of the FSAP manager. The registration data are presented in Table 2. The appropriate MA-REQUEST.request service primitive function is of ASN.1 type `FsapProviderRegistration` as specified in A.2. The appropriate MA-REQUEST.confirm service primitive function is of ASN.1 type `FsapProviderRegistrationConf` as specified in A.2.

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Table 2 — Registration at FSAP service provider

Direction	Parameter / ASN.1 type	Purpose
From service provider ITS-S application process to FSAP manager	Application identifier / `ITSsapiid`	Identifier uniquely identifying the ITS-S application process providing the service to be announced in an FSAM. The essential part of this application identifier is the ITS-AID that may be accompanied on purpose by the unique identifier of the instance of this ITS-S application process, and by the unique identifier of the ITS-SCU in which this ITS-S application process resides.
	ITS-S FlowID / `FlowID`	ITS-S FlowID of the flow registered for the service provider and to be used in a subsequent SrvOpP. If path and flow management specified in ISO 24102-6 is not supported, this parameter is not relevant and may be set to the value 65535.
	Priority / `UserPriority`	The priority of the ITS-S application process. The maximum value is limited by the priority value (CSP_MaxPrio) presented by the ITS-S application process at the time of registration at the ITS-S management entity specified in ISO 17423. Note that the FSAP manager may use other registration information specified in ISO 17423, e.g. CSP_LogicalChannelType.
	Dissemination information / `FsamDissemination`	Provides information on required or preferred communication protocol stacks, scheduling requirements, and directivity of antennae (only applicable in case an access technology supports software controlled antenna patterns).
	Service data / `FsapServiceDataRegistration`	Application specific service data for inclusion in FSAMs, i.e extensions, system service, provider ITS-PN, IPv6 routing.
From FSAP manager to service provider ITS-S application process	Application identifier / `ITSsapiid`	As reported by ITS-S application process.
	Advertised ITS-AID / `ITSaid`	The content of the ITS-AID field in the service info segment of the FSAM shall be reported. In case of a successful registration, the value in this parameter is identical to the ITS-AID parameter value contained in the parameter "application identifier".
	FSAM-ID / `SrvAdvID`	The content of the SAM-ID field of the FSAM shall be reported.
	FSAM-Count / `SrvAdvContentCount`	The content of the SAM-Count field of the FSAM shall be reported.
	Response code	Result of a request indicated by the ASN.1 type `ErrStatus` specified in ISO 24102-3.

If establishment of a session is intended, the registration shall include the optional ITS-PN assigned to the service provider ITS-S application process.

NOTE The procedure to assign a port number to the service provider ITS-S application can depend on the ITS-S networking & transport layer protocol, thus it is outside the scope of this document.

Requirements on when to register a service provider ITS-S application process are not specified in this document.

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If an ITS-S application process presents a registration request, but it is already registered, then the FSAP manager shall acknowledge this request with:

— ErrStatus "*sequenceError*" as specified in ISO 24102-3;

— the "Advertised ITS-AID" parameter set to the value 270.549.119 = 0pef.ff.ff.ff with the meaning "unknown / invalid ITS-S application object"; and

— FSAM-ID and FSAM-Count as currently used for the existing registration.

8.2.2 FSAP registration update

For the purpose of updating an offered service already registered at the FSAP manager, a service provider ITS-S application process shall use the services of the FSAP manager. The update data are presented in Table 3. The appropriate MA-REQUEST.request service primitive function is of ASN.1 type `FsapProviderUpdate as` specified in A.2. The appropriate MA-REQUEST.confirm service primitive function is of ASN.1 type `FsapProviderUpdateConf` as specified in A.2.

Table 3 — Update of registration at FSAP service provider

Direction	Parameter / ASN.1 type	Purpose
From service provider ITS-S application process to FSAP manager	Application identifier / `ITSsapiid`	Identifier uniquely identifying the ITS-S application process providing the service to be announced in an FSAM. The essential part of this application identifier is the ITS-AID that may be accompanied on purpose by the unique identifier of the instance of this ITS-S application process, and by the unique identifier of the ITS-SCU in which this ITS-S application process resides.
	ITS-S FlowID / `FlowID`	ITS-S FlowID of the flow registered for the service provider and to be used in a subsequent SrvOpP. If path and flow management specified in ISO 24102-6 is not supported, this parameter is not relevant and may be set to the value 65535.
	FSAM-ID / `SrvAdvID`	The content of the SAM-ID field of the used FSAM as reported in the initial registration or in the previous update.
	FSAM-Count / `SrvAdvContentCount`	The content of the SAM-Count field of the previously used FSAM as reported in the initial registration or in the previous update.
	Dissemination information / `FsamDissemination`	Provides information on required or preferred access technologies, scheduling requirements, and directivity of antennae (only applicable in case an access technology supports software controlled antenna patterns).
	Service data / `FsapServiceDataRegistration`	Application specific service data for inclusion in FSAMs, i.e extensions, system service, provider ITS-PN, IPv6 routing.

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Table 3 *(continued)*

Direction	Parameter / ASN.1 type	Purpose
From FSAP manager to service provider ITS-S application process	Application identifier / `ITSsapiid`	As reported by the ITS-S application process.
	Advertised ITS-AID / `ITSaid`	The content of the ITS-AID field in the service info segment of the FSAM shall be reported. In case of a successful registration update, the value in this parameter is identical to the ITS-AID parameter value contained in the parameter "Application identifier".
	FSAM-ID	The content of the SAM-ID field of the new FSAM shall be reported.
	FSAM-Count	The content of the SAM-Count field of the new FSAM shall be reported.
	Response code	Result of a request indicated by the ASN.1 type `ErrStatus` specified in ISO 24102-3.

Requirements on when to update a service provider ITS-S application are not specified in this document.

If an ITS-S application presents a registration update request, but it is not yet registered, then the FSAP manager shall acknowledge this request with:

— ErrStatus "*sequenceError*" as specified in ISO 24102-3;

— the "Advertised ITS-AID" parameter set to the value 270.549.119 = 0pef.ff.ff.ff with the meaning "unknown / invalid ITS-S application object"; and

— FSAM-ID and FSAM-Count set to zero each.

8.2.3 FSAP deregistration

For the purpose of deregistering an offered service already registered at the FSAP manager, a service provider ITS-S application process shall use the services of the FSAP manager. The deregister data are presented in Table 4. The appropriate MA-REQUEST.request service primitive function is of ASN.1 type `FsapProviderDeregistration` as specified in A.3. The appropriate MA-REQUEST.confirm service primitive function is of ASN.1 type `FsapProviderDeregistrationConf` as specified in A.2.

Table 4 — Deregistration at FSAP service provider

Direction	Parameter / ASN.1 type	Purpose
From service provider ITS-S application process to FSAP manager	Application identifier / `ITSsapiid`	Identifier uniquely identifying the ITS-S application process providing the service to be announced in an FSAM. The essential part of this application identifier is the ITS-AID that may be accompanied on purpose by the unique identifier of the instance of this ITS-S application process, and by the unique identifier of the ITS-SCU in which this ITS-S application process resides.
	ITS-S FlowID / `FlowID`	ITS-S FlowID of the flow registered for the service provider and to be used in a subsequent SrvOpP. If path and flow management specified in ISO 24102-6 is not supported, this parameter is not relevant and may be set to the value 65535.
	FSAM-ID / `SrvAdvID`	The content of the SAM-ID field of the used FSAM as reported in the initial registration or in the previous update.
	FSAM-Count / `SrvAdvContentCount`	The content of the SAM-Count field of the previously used FSAM as reported in the initial registration or in the previous update.

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Table 4 *(continued)*

Direction	Parameter / ASN.1 type	Purpose
From FSAP manager to service provider ITS-S application process	Application identifier / `ITSsapiid`	As reported by ITS-S application process.
	Advertised ITS-AID / `ITSaid`	The content of the ITS-AID field in the service info segment of the FSAM shall be reported. In case of a successful deregistration, the value in this parameter is identical to the ITS-AID parameter value contained in the parameter "application identifier".
	Response code	Result of a request indicated by the ASN.1 type `ErrStatus` specified in ISO 24102-3.

Upon reception of a deregistration request from the service provider ITS-S application, dynamically assigned port numbers of this ITS-S application process may be released, if not needed for purposes out of scope of this document.

NOTE Deletion of port numbers will result in deletion of related entries in forwarding tables of ITS-S networking & transport layer protocols.

Requirements on when to deregister a service provider ITS-S application are not specified in this document.

If an ITS-S application presents a deregistration request, but it is not yet registered, then the FSAP manager shall acknowledge this request with:

— ErrStatus "*sequenceError*" as specified in ISO 24102-3; and

— the "Advertised ITS-AID" parameter set to the value 270.549.119 = 0pef.ff.ff.ff with the meaning "unknown / invalid ITS-S application object".

8.2.4 FSAP communication management

The FSAP manager shall evaluate the dissemination information sets of ASN.1 type `FsamDisseminationSet` contained in the data element of ASN.1 type `FsamDissemination` for every registration/registration update request in order to select the proper communications protocol stack in the ITS-station for communication.

In case the "medium" component in an `FsamDisseminationSet` indicates a specific access technology, this one shall be selected for transmission of FSAMs, if it is available. If none of the requested access technologies presented in `FsamDissemination` is available, the registration request shall be acknowledged using the corresponding MF-Request.confirm service primitive `FsapProviderRegistrationConf` or `FsapProviderUpdateConf`, respectively, as specified in A.2 with:

— ErrStatus "*nonavailValue*";

— the "Advertised ITS-AID" parameter set to the value 270.549.119 = 0pef.ff.ff.ff with the meaning "unknown / invalid ITS-S application object"; and

— FSAM-ID and FSAM-Count set to zero each.

In case no specific access technology is requested, the default access technology shall be used, e.g. as identified by the CI selection management specified, e.g. in ISO 24102-1, ISO 17423 and ISO 24102-6.

In case the `"protocols"` component in an `FsamDisseminationSet` indicates a specific communications protocol stack or a part of it, this one shall be selected for transmission of FSAMs, if it is available. If none of the requested protocols presented in `FsamDissemination` is available, the registration request shall be acknowledged using the corresponding MF-Request.confirm service primitive `FsapProviderRegistrationConf` or `FsapProviderUpdateConf`, respectively, as specified in A.3 with:

— ErrStatus "*nonavailValue*";

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— the "Advertised ITS-AID" parameter set to the value 270.549.119 = 0pef.ff.ff.ff with the meaning "unknown / invalid ITS-S application object"; and

— FSAM-ID and FSAM-Count set to zero each.

In case no specific communications protocols for transmission of FSAMs are requested, the default networking & transport layer protocol shall be used, i.e. the FNTP specified in ISO 29281-1.

NOTE There is a potential conflicting overlap between the components `"medium"` and `"protocols"` in case protocols of the ITS-S access layer are presented. Assuming `"medium"` selects the ITS-M5 access technology (this is IEEE 802.11(TM) OCB), then `"protocols"` can provide complimentary information such as "applying IEEE 1609.4(TM)" or "applying ETSI ITS-G5 rules".

The component `"directivity"` in an `FsamDisseminationSet` is not necessarily applicable. In case it is not to be used, "fixed, pre-defined direction" is selected. In case a requested directivity cannot be applied, the request is ignored without notification.

The component `"gcInterval"` in an `FsamDisseminationSet` provides optional information on the most appropriate repetition interval for FSAM transmission. The value zero indicates that no specific interval is recommended. The FSAP manager may use predetermined quantized values of the interval between subsequent transmissions of the service advertisement message that best match the recommended interval.

For the purpose of registering a service at the FSAP communication handler for periodic announcement in an FSAM, the FSAP manager shall present the registration or update data listed in Table 5. The appropriate MF-REQUEST.request service primitive function is of ASN.1 type `FsamRequest` specified in A.3. The appropriate MF-REQUEST.confirm service primitive function is of ASN.1 type `FsamRequestConf` as specified in A.3.

Table 5 — Registration for FSAM transmission at FSAP communication handler

Direction	Parameter / ASN.1 type	Purpose
From FSAP manager to FSAP communications handler	Application identifier / `ITSsapiid`	Identifier uniquely identifying the ITS-S application process providing the service to be announced in an FSAM. The essential part of this application identifier is the ITS-AID that may be accompanied on purpose by the unique identifier of the instance of this ITS-S application process, and by the unique identifier of the ITS-SCU in which this ITS-S application process resides.
	Dissemination details / `GcStacks`	Information on one or several protocol stacks to be used for transmission of FSAMs, each with the recommended repetition interval.
	Priority / `UserPriority`	The priority of the ITS-S application process. This value cannot be updated.
	Service data / `FsapServiceDataRegistration`	Application specific service data for inclusion in FSAMs, i.e extensions, system service, provider ITS-PN, IPv6 routing.

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Table 5 *(continued)*

Direction	Parameter / ASN.1 type	Purpose
From FSAP communications handler to FSAP manager	Application identifier / `ITSsapiid`	As reported by ITS-S application process.
	Advertised ITS-AID / `ITSaid`	The content of the ITS-AID field in the service info segment of the FSAM shall be reported. In case of a successful registration, the value in this parameter is identical to the ITS-AID parameter value contained in the parameter "Application identifier".
	FSAM-ID / `SrvAdvID`	The content of the SAM-ID field of the FSAM shall be reported.
	FSAM-Count / `SrvAdvContentCount`	The content of the SAM-Count field of the FSAM shall be reported.
	Response code	Result of a request indicated by the ASN.1 type `ErrStatus` specified in ISO 24102-3.

If the FSAP manager presents a registration request for an ITS-S application that is already registered, then the FSAP communication handler shall acknowledge this request with:

— ErrStatus "*sequenceError*" as specified in ISO 24102-3;

— the "Advertised ITS-AID" parameter set to the value 270.549.119 = 0pef.ff.ff.ff with the meaning "unknown / invalid ITS-S application object"; and

— FSAM-ID and FSAM-Count as currently used for the existing registration.

For the purpose of updating a service at the FSAP communication handler for periodic announcement in an FSAM, the FSAP manager shall present the registration or update data listed in Table 6. The appropriate MF-REQUEST.request service primitive function is of ASN.1 type `FsamUpdate` as specified in A.3. The appropriate MF-REQUEST.confirm service primitive function is of ASN.1 type `FsamUpdateConf` as specified in A.3.

Table 6 — Registration update for FSAM transmission at FSAP communication handler

Direction	Parameter / ASN.1 type	Purpose
From FSAP manager to FSAP communications handler	Application identifier / `ITSsapiid`	Identifier uniquely identifying the ITS-S application process providing the service to be announced in an FSAM. The essential part of this application identifier is the ITS-AID that may be accompanied on purpose by the unique identifier of the instance of this ITS-S application process, and by the unique identifier of the ITS-SCU in which this ITS-S application process resides.
	FSAM-ID / `SrvAdvID`	The content of the SAM-ID field of the used FSAM as reported in the initial registration or in the previous update.
	FSAM-Count / `SrvAdvContentCount`	The content of the SAM-Count field of the previously used FSAM as reported in the initial registration or in the previous update.
	Dissemination details / `GcStacks`	Information on one or several protocol stacks to be used for transmission of FSAM, each with the required repetition interval.
	Service data / `FsapServiceDataRegistration`	Application specific service data for inclusion in FSAMs, i.e extensions, system service, provider ITS-PN, IPv6 routing.

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Table 6 *(continued)*

Direction	Parameter / ASN.1 type	Purpose
From FSAP communications handler to FSAP manager	Application identifier / `ITSsapiid`	As reported by ITS-S application process.
	Advertised ITS-AID / `ITSaid`	The content of the ITS-AID field in the service info segment of the FSAM shall be reported. In case of a successful registration update, the value in this parameter is identical to the ITS-AID parameter value contained in the parameter "Application identifier".
	FSAM-ID / `SrvAdvID`	The content of the SAM-ID field of the FSAM shall be reported.
	FSAM-Count / `SrvAdvContentCount`	The content of the SAM-Count field of the FSAM shall be reported.
	Response code	Result of a request indicated by the ASN.1 type `ErrStatus` as specified in ISO 24102-3.

If the FSAP manager presents a registration update for an ITS-S application that is not yet registered, then the FSAP communication handler shall acknowledge this request with:

— ErrStatus "*sequenceError*" as specified in ISO 24102-3;

— the "Advertised ITS-AID" parameter set to the value 270.549.119 = 0pef.ff.ff.ff with the meaning "unknown / invalid ITS-S application object"; and

— FSAM-ID and FSAM-Count set to zero each.

For the purpose of deregistering a service at the FSAP communication handler from periodic announcement in an FSAM, the FSAP manager shall present the registration or update data listed in Table 7. The appropriate MF-REQUEST.request service primitive function is of ASN.1 type `FsamDelete` as specified in A.3. The appropriate MF-REQUEST.confirm service primitive function is of ASN.1 type `FsamDeleteConf` as specified in A.3.

Table 7 — Deregistration from FSAM transmission at FSAP communication handler

Direction	Parameter / ASN.1 type	Purpose
From FSAP manager to FSAP communications handler	Application identifier / `ITSsapiid`	Identifier uniquely identifying the ITS-S application process of which the related service is no longer to be announced in an FSAM. The essential part of this application identifier is the ITS-AID that may be accompanied on purpose by the unique identifier of the instance of this ITS-S application process, and by the unique identifier of the ITS-SCU in which this ITS-S application process resides.
	FSAM-ID / `SrvAdvID`	The content of the SAM-ID field of the used FSAM as reported in the initial registration or in the previous update.
	FSAM-Count / `SrvAdvContentCount`	The content of the SAM-Count field of the previously used FSAM as reported in the initial registration or in the previous update.
From FSAP communications handler to FSAP manager	Application identifier / `ITSsapiid`	As reported by ITS-S application process.
	Advertised ITS-AID / `ITSaid`	The content of the ITS-AID field in the service info segment of the FSAM shall be reported. In case of a successful deregistration, the value in this parameter is identical to the ITS-AID parameter value contained in the parameter "Application identifier".
	Response code	Result of a request indicated by the ASN.1 type `ErrStatus` as specified in ISO 24102-3.

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If the FSAP manager presents a deregistration for an ITS-S application that is not yet registered, then the FSAP communication handler shall acknowledge this request with:

— ErrStatus "*sequenceError*" as specified in ISO 24102-3; and

— the "Advertised ITS-AID" parameter set to the value 270.549.119 = 0pef.ff.ff.ff with the meaning "unknown / invalid ITS-S application object".

8.2.5 Transmission of FSAM

As requested by the FSAP manager, the FSAP communication handler is in charge of:

— assembling and maintaining FSAMs;

— invoking security services for conversion of FSAMs into S-FSAMs (details are out of scope of this document);

— periodic groupcasting of S-FSAMs;

— identifying available communication channels for requested protocol stacks to be used in the SrvOpP, including channels for private usage (details are out of scope of this document); and

— transmitting S-FSAMs in unicast mode for the purpose of assigning private communication channels.

Unicast transmissions of S-FSAMs may be repeated if the respective S-FSRM is not received prior to timeout. Details are out of scope of this document.

8.2.6 Reception of FSRM

8.2.6.1 General

Upon reception of an S-FSRM from a service user ITS station, the procedure illustrated in Figure 8 applies.

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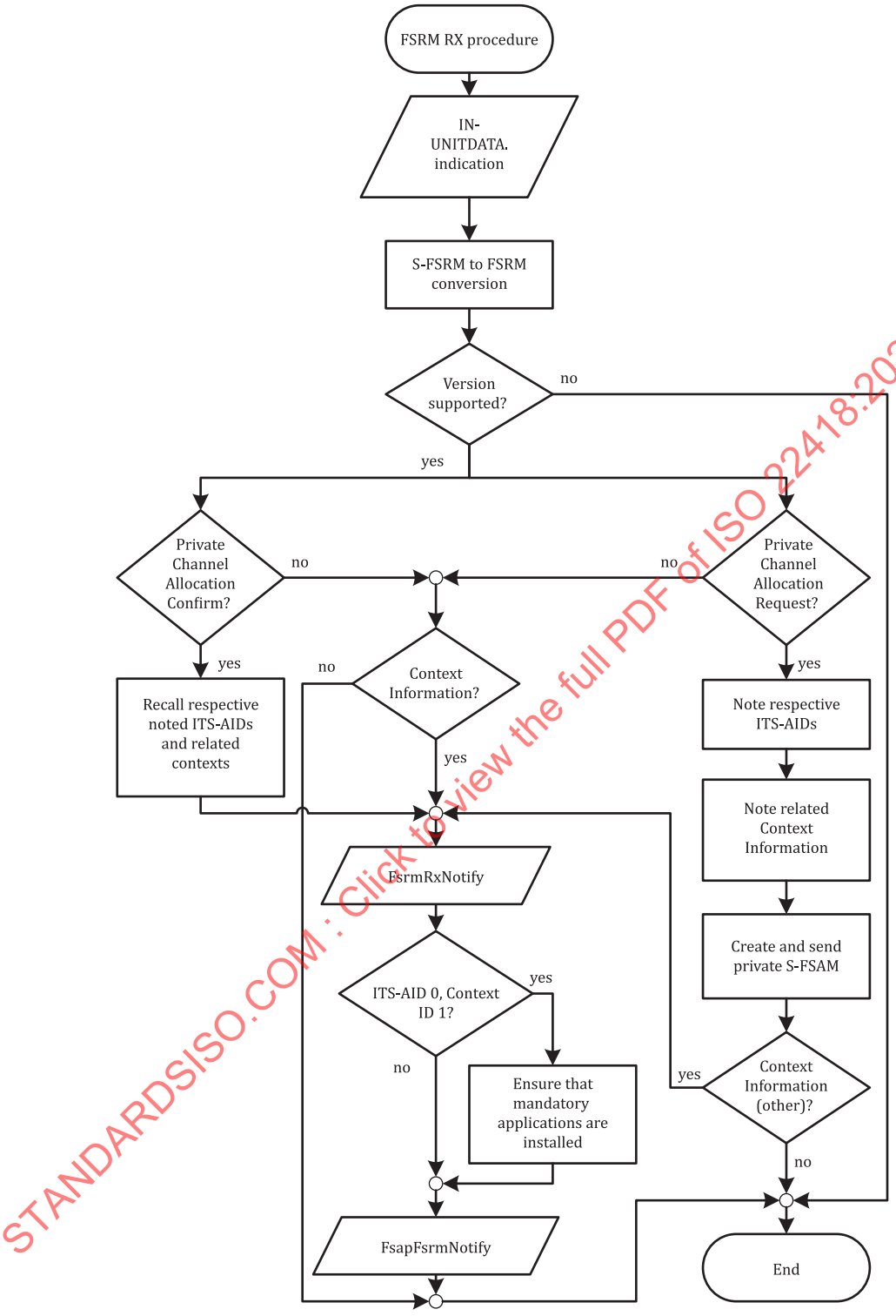

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Figure 8 — Procedure upon reception of an S-FSRM

The service provider FSAP communication handler shall perform the following tasks:

— Initiate conversion of S-FSRMs to FSRMs. Details are out of scope of this document.

— Check whether the "private allocation request" field is present. If the field is present, the "service provider private channel allocation request" procedure specified in 8.2.6.3 shall be performed.

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— Check whether the "private allocation confirm" field is present. If the field is present, the "service provider private channel allocation confirm" procedure specified in 8.2.6.4 shall be performed.

— Check whether the "context information" field is present with ITS-AIDs contained in it that are not used in an optionally present "private allocation request" field. If this is given, the "service provider context processing" procedure specified in 8.2.6.2 shall be performed.

8.2.6.2 Service provider context processing

Upon notification of the received context information by the FSAP communication handler to the FSAP manager with notification data presented in Table 8 (the appropriate MF-REQUEST.request service primitive function for notification of context information to the FSAP manager is of ASN.1 type `FsrmRxNotify` as specified in A.3), the FSAP manager shall perform the following tasks:

— Check for ITS-AID = zero (System ITS application class). Context ID zero shall be ignored, as this is managed by the FSAP communications handler. For context ID one (Mandatory applications) the FSAP manager shall perform the task specified in 8.7.2.

— For all other ITS-AIDs the FSAP manager shall notify the respective service provider ITS-S application with data presented in Table 9. The appropriate MA-COMMAND.request service primitive function for notification of context information to the ITS-S application process is of ASN.1 type `FsapFsrmNotify` as specified in A.3. Such notifications shall be forwarded to the proper ITS-S host ITS-SCU, applying "ITS station-internal management communication" as specified in ISO 24102-4 if the ITS-S application does not reside in the same ITS-SCU.

Table 8 — Notification of context information to the FSAP manager

Direction	Parameter / ASN.1 type	Purpose
From FSAP communications handler to FSAP manager	Receive protocol stack / `UcStack`	Information on the protocol stack on which the SrvOpP shall be performed.
	Context information `SrmContexts`	"Context information" field contained in a received FSRM.
From FSAP manager to FSAP communications handler	Response code	This empty acknowledgement is not required. It may carry only the result of a request indicated by the ASN.1 type `ErrStatus` as specified in ISO 24102-3.

Table 9 — Notification of context information to the ITS-S application process

Direction	Parameter / ASN.1 type	Purpose
From FSAP communications handler to FSAP manager	User application identifier / `ITSsapiid`	Identifier uniquely identifying the ITS-S application process related to the given context. The essential part of this application identifier is the ITS-AID that may be accompanied on purpose by the unique identifier of the instance of this ITS-S application process, and by the unique identifier of the ITS-SCU in which this ITS-S application process resides.
	Context information `SrmContexts`	"Context information" field contained in a received FSRM.
	Protocol stack / `UcStack`	Information on protocol stack to be used in SrvOpP.
From FSAP manager to FSAP communications handler	Response code	This empty acknowledgement is not required. It may carry only the result of a request indicated by the ASN.1 type `ErrStatus` as specified in ISO 24102-3.

8.2.6.3 Service provider private channel allocation request

The FSAP communication handler shall:

— Note the ITS-AIDs for which a private channel allocation is requested.

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— Note the respective context information, if present, for processing once a subsequent S-FSRM confirming usage of a private channel is received.

— Identify an appropriate communication channel and notify this to the respective FSAP user ITS-SU in the FSAM channel info segment or in the extended channel info FSAM extension element, as applicable, of a privately addressed S-FSAM containing the original groupcasted advertisement for the respective ITS-AIDs.

8.2.6.4 Service provider private channel allocation confirm

The FSAP communication handler shall notify the requested services to the FSAP manager as specified in 8.2.6.2.

8.3 Service user

8.3.1 FSAP registration

A service user ITS-S application may register its intended service at the FSAP. The registration data are presented in Table 10. The appropriate MA-REQUEST.request service primitive function is of ASN.1 type `FsapUserRegistration` as specified in A.3. The appropriate MA-REQUEST.confirm service primitive function is of ASN.1 type `FsapUserRegistrationConf` as specified in A.3.

Table 10 — Registration at FSAP service user

Direction	Parameter / ASN.1 type	Purpose
From service provider ITS-S application process to FSAP manager	User application identifier / `ITSsapiid`	Identifier uniquely identifying the ITS-S application process consuming the intended service to be identified in an FSAM with the service ITS-AID. The essential part of this user application identifier is its ITS-AID that may be accompanied on purpose by the unique identifier of the instance of this ITS-S application process, and by the unique identifier of the ITS-SCU in which this ITS-S application process resides.
	Service ITS-AID / `ITSaid`	ITS-AID of the ITS application object that is providing the intended ITS service. The value of the service ITS-AID may be the same as the ITS-AID value contained in the user application identifier.
	FSRM Context data / `SrmContexts`	FSRM context data contains one or several sets of: a) ITS port number (ITS-PN) of the service user process to be used by a service provider as destination port number during the session phase. b) In case the ITS-AID identifies an ITS application class, context information is needed. Details of context information depends on the specific ITS application class.
From FSAP manager to service provider ITS-S application process	User application identifier / `ITSsapiid`	As reported by user ITS-S application process.
	Service ITS-AID / `ITSaid`	As reported by user ITS-S application process.
	Response code	Result of a request indicated by the ASN.1 type ErrStatus as specified in ISO 24102-3.

Requirements on when to register a service user ITS-S application are not specified in this document.

If an ITS-S application presents a registration request, but it is already registered, then the FSAP manager shall acknowledge this request with:

— ErrStatus "*sequenceError*" as specified in ISO 24102-3;

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— the "Service ITS-AID" parameter set to the value 270.549.119 = 0pef.ff.ff.ff with the meaning "unknown / invalid ITS-S application object".

8.3.2 FSAP registration update

A service user ITS-S application may update registration information of its intended service at the FSAP manager. The registration update data are presented in Table 11. The appropriate MA-REQUEST.request service primitive function is of ASN.1 type `FsapUserUpdate` as specified in A.3. The appropriate MA-REQUEST.confirm service primitive function is of ASN.1 type `FsapUserUpdateConf` specified in A.3.

Table 11 — Registration update at FSAP service user

Direction	Parameter / ASN.1 type	Purpose
From service provider ITS-S application process to FSAP manager	User application identifier / `ITSsapiid`	Identifier uniquely identifying the ITS-S application process consuming the intended service to be identified in an FSAM with the service ITS-AID. The essential part of this user application identifier is its ITS-AID that may be accompanied on purpose by the unique identifier of the instance of this ITS-S application process, and by the unique identifier of the ITS-SCU in which this ITS-S application process resides.
	Service ITS-AID / `ITSaid`	ITS-AID of the ITS application object that is providing the intended ITS service. The value of the service ITS-AID may be the same as the ITS-AID value contained in the user application identifier.
	FSRM Context data / `SrmContexts`	FSRM context data contains one or several sets of: a) ITS port number (ITS-PN) of the service user process to be used by a service provider as destination port number during the session phase. b) In case the ITS-AID identifies an ITS application class, context information is needed. Details of context information depends on the specific ITS application class.
From FSAP manager to service provider ITS-S application process	User application identifier / `ITSsapiid`	As reported by user ITS-S application process.
	Service ITS-AID / `ITSaid`	As reported by user ITS-S application process.
	Response code	Result of a request indicated by the ASN.1 type `ErrStatus` specified in ISO 24102-3.

Requirements on when to update a service user ITS-S application are not specified in this document.

If an ITS-S application presents a registration update request, but it is not yet registered, then the FSAP manager shall acknowledge this request with:

— ErrStatus "*sequenceError*" as specified in ISO 24102-3; and

— the "Service ITS-AID" parameter set to the value 270.549.119 = 0pef.ff.ff.ff with the meaning "unknown / invalid ITS-S application object".

8.3.3 FSAP deregistration

A service user ITS-S application may deregister its registration information at the FSAP manager. The deregistration data are presented in Table 12. The appropriate MA-REQUEST.request service primitive function is of ASN.1 type `FsapUserDeregistration` specified in A.3. The appropriate MA-REQUEST.confirm service primitive function is of ASN.1 type `FsapUserDeregistrationConf` specified in A.3.

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Table 12 — Deregistration at FSAP service user

Direction	Parameter / ASN.1 type	Purpose
From service provider ITS-S application process to FSAP manager	User application identifier / `ITSsapiid`	Identifier uniquely identifying the ITS-S application process consuming the intended service to be identified in an FSAM with the service ITS-AID. The essential part of this user application identifier is its ITS-AID that may be accompanied on purpose by the unique identifier of the instance of this ITS-S application process, and by the unique identifier of the ITS-SCU in which this ITS-S application process resides.
	Service ITS-AID / `ITSaid`	ITS-AID of the ITS application object that is providing the intended ITS service. The value of the service ITS-AID may be the same as the ITS-AID value contained in the user application identifier.
From FSAP manager to service provider ITS-S application process	User application identifier / `ITSsapiid`	As reported by user ITS-S application process.
	Service ITS-AID / `ITSaid`	As reported by user ITS-S application process.
	Response code	Result of a request indicated by the ASN.1 type `ErrStatus` specified in ISO 24102-3.

Requirements on when to deregister a service user ITS-S application are not specified in this document.

If an ITS-S application presents a deregistration request, but it is not yet registered, then the FSAP manager shall acknowledge this request with:

— ErrStatus "*sequenceError*" as specified in ISO 24102-3; and

— the "Service ITS-AID" parameter set to the value 270.549.119 = 0pef.ff.ff.ff with the meaning "unknown / invalid ITS-S application object".

8.3.4 Reception of FSAM

8.3.4.1 General

Upon reception of a S-FSAM from a service user ITS station the procedure illustrated in Figure 9 applies.

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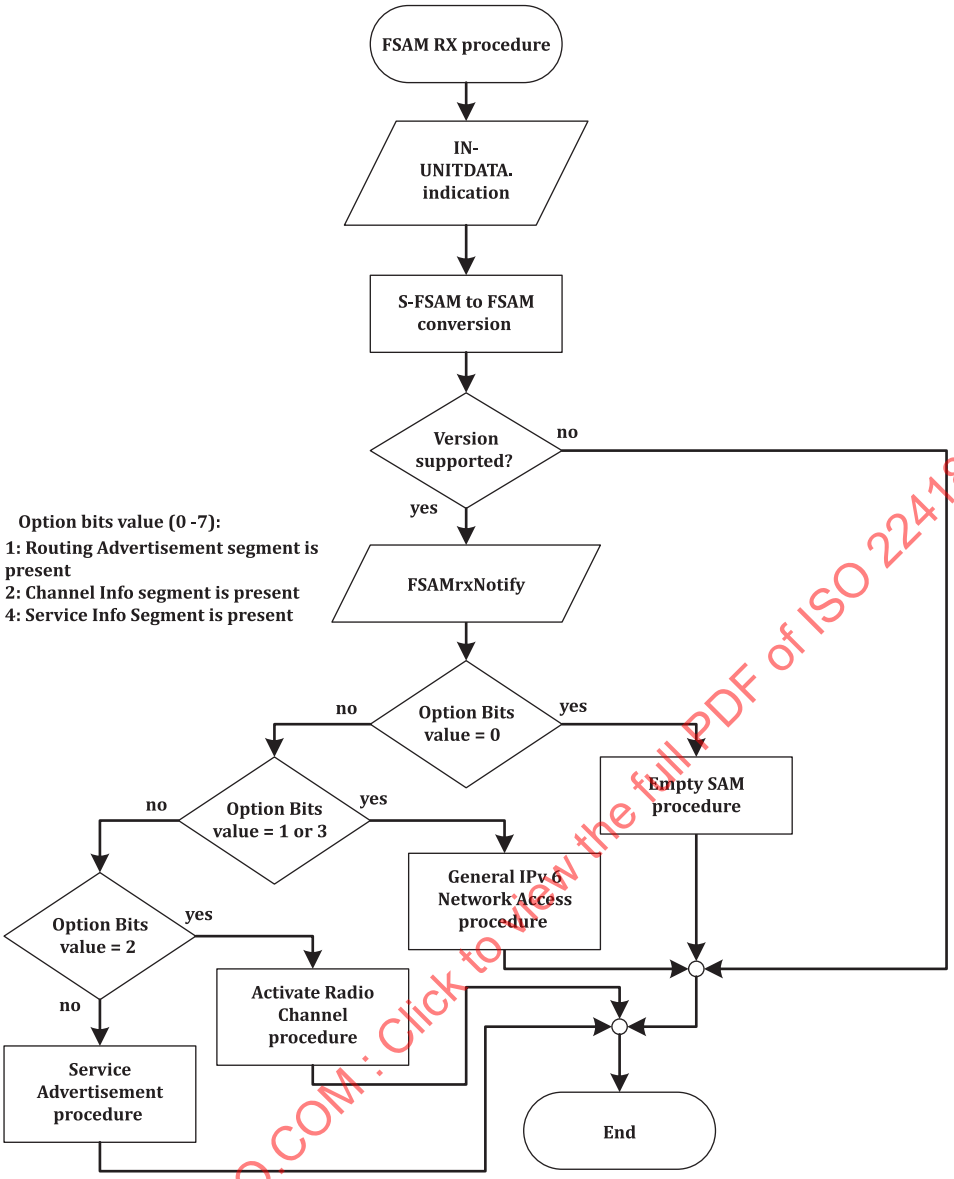

Figure 9 — Procedure upon reception of an S-FSAM

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The FSAP communication handler requests the conversion of S-FSAMs into FSAMs and checks the version number contained in the FSAM. Upon successful validation of the version number, the FSAP communication handler shall notify the received FSAM to the FSAP manager with notification data presented in Table 13. The appropriate MF-Request.request service primitive function for notification is `FsamRxNotify` as specified in A.2.

Table 13 — Notification of received FSAM to FSAP manager

Direction	Parameter / ASN.1 type	Purpose
From FSAP communications handler to FSAP manager	Receive protocol stack / `FsapStack`	Information on the protocol stack on which the SrvOpP shall be performed.
	FSAM `Fsam`	Received FSAM.
From FSAP manager to FSAP communications handler	Response code	This empty acknowledgement is not required. It may carry only the result of a request indicated by the ASN.1 type `ErrStatus` as specified in ISO 24102-3.

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The FSAP manager shall check the availability of options:

— Option bits value = 0: The "Empty SAM" procedure specified in 8.3.4.2 applies.

— Option bits value = 1: The "General IPv6 network" procedure specified in 8.3.4.3 applies.

— Option bits value = 2: The "Activate radio channel" procedure specified in 8.3.4.4 applies.

— Option bits value = 3: The "General IPv6 network" procedure with required change of radio channel as specified in 8.3.4.3 applies.

— Option bits value >3: The "Service advertisement" procedure specified in 8.3.4.5 shall be performed.

8.3.4.2 Empty SAM procedure

The FSAM indicated by FSAM-ID and FSAM-Count (see Figure 5) is empty. All previously announced services are no longer available. Eventually present FSAM extensions may be ignored.

8.3.4.3 General IPv6 network access procedure

General access to an IPv6 network is available on the same or optionally on another radio channel as used for S-FSAM transmission. The FSAP manager shall inform the ITS station management about availability of this new IPv6 network and the required communication channel. Further details are out of scope of this document.

8.3.4.4 Activate radio channel procedure

The ITS-SU is invited to listen on another radio channel. The FSAP manager shall inform the ITS station management about potentially valuable information on another radio channel. Further details are out of scope of this document.

8.3.4.5 Service advertisement procedure

Specific services are announced. For every announced service that is required by a service user ITS-S application process, the FSAP manager shall perform the one applicable procedure out of the four complementary procedures:

— If allocation of a private channel as specified in ISO/TS 16460 is to be performed, the "service user private channel allocation" procedure specified in 8.3.4.6 shall be performed.

— If transmission of an FSRM as specified in ISO/TS 16460 is required for the purpose of providing context information for an ITS application class, the "service user context processing" procedure specified in 8.3.4.7 shall be performed.

— If transmission of a FSRM for the purpose of confirming a private channel allocation is required, the "service user private channel confirmation" procedure specified in 8.3.4.8 shall be performed.

— If neither the "service user private channel allocation" procedure, nor the "service user context processing" procedure, nor the "service user private channel confirmation" procedure applies, the FSAP manager shall perform the "FSAM reception notification" procedure specified in 8.3.4.9.

"ITS station-internal management communication" specified in ISO 24102-4 shall be applied to remotely access the MA-SAP of the ITS-S host if the service user ITS-S application resides in a different ITS-SCU.

NOTE Privately addressed FSRMs can simultaneously contain several of the optional fields by combining the respective procedures listed in 8.3.4.5 for the different ITS-AIDs. Details are out of scope of this document.

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8.3.4.6 Service user private channel allocation

Upon request of the FSAP manager to the FSAP communication handler with data presented in Table 14, an appropriate MF-COMMAND.request service primitive function is of ASN.1 type `FsrmTxRequest` as specified in A.3 and the FSAP communication handler shall:

a) initiate conversion of the given FSRM into a S-FSRM, and

b) send the S-FSRM via the selected UC-VCI.

Table 14 — Request of FSRM transmission for private channel allocation request

Direction	Parameter / ASN.1 type	Purpose
From FSAP manager to FSAP communications handler	Unicast protocol stack / `UcStack`	Information on the protocol stack to be used for unicast transmission of the S-FSRM.
	FSRM / `Fsrm`	Containing private channel allocation request field, and an optionally needed context information field.
From FSAP communications handler to FSAP manager	Response code	This empty acknowledgement is not required. It may carry only the result of a request indicated by the ASN.1 type `ErrStatus` as specified in ISO 24102-3.

NOTE Reception of a privately addressed S-FSAM is expected, providing information on the allocated private channel and on missing context information if applicable.

8.3.4.7 Service user context processing

Upon request of the FSAP manager to the FSAP communication handler with data presented in Table 15, an appropriate MF-COMMAND.request service primitive function is of ASN.1 type `FsrmTxRequest` as specified in A.3 and the FSAP communication handler shall:

a) initiate conversion of the given FSRM into a S-FSRM, and

b) send the S-FSRM via the selected UC-VCI.

Table 15 — Request of FSRM transmission for context notification

Direction	Parameter / ASN.1 type	Purpose
From FSAP manager to FSAP communications handler	Unicast protocol stack / `UcStack`	Information on the protocol stack to be used for unicast transmission of the S-FSRM.
	FSRM / `Fsrm`	Containing context information.
From FSAP communications handler to FSAP manager	Response code	This empty acknowledgement is not required. It may carry only the result of a request indicated by the ASN.1 type `ErrStatus` specified in ISO 24102-3.

8.3.4.8 Service user private channel confirmation procedure

Upon request of the FSAP manager to the FSAP communication handler with data presented in Table 16, an appropriate MF-COMMAND.request service primitive function is of ASN.1 type `FsrmTxRequest` as specified in A.3 and the FSAP communication handler shall:

a) initiate conversion of the given FSRM into a S-FSRM, and

b) send the S-FSRM via the selected UC-VCI.

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Table 16 — Request of FSRM transmission for private channel confirmation

Direction	Parameter / ASN.1 type	Purpose
From FSAP manager to FSAP communications handler	Unicast protocol stack / `UcStack`	Information on the protocol stack to be used for unicast transmission of the S-FSRM.
	FSRM / `Fsrm`	Containing the private channel confirmation.
From FSAP communications handler to FSAP manager	Response code	This empty acknowledgement is not required. It may carry only the result of a request indicated by the ASN.1 type `ErrStatus` as specified in ISO 24102-3.

8.3.4.9 FSAM reception notification

The FSAP manager shall notify reception of an FSAM to the service user ITS-S application process with data presented in Table 17. An appropriate MA-COMMAND.request service primitive function is of ASN.1 type `FsapFsamNotify`, as specified in A.2.

Table 17 — Notification of received service advertisement to ITS-S application process

Direction	Parameter / ASN.1 type	Purpose
From FSAP manager to ITS-S application process	Advertised ITS-AID / `ITSaid`	The content of the ITS-AID field in the service info segment of the FSAM.
	Reply Port Number/ `ReplyAddress`	As contained in the service info segment of the FSAM for the given ITS-AID. Otherwise, the value PORT_UNK as specified in ISO 17419.
	Service InfoExtensions / `ServiceInfoExts`	Service info extensions as contained in the service info segment of the FSAM for the given ITS-AID.
	Protocol stack / `UcStack`	Information on the protocol stack to be used during the SrvOpP.
From ITS-S application process to FSAP manager	Response code	This empty acknowledgement is not required. It may carry only the result of a request indicated by the ASN.1 type `ErrStatus` specified in ISO 24102-3.

8.4 Service operation phase

During the service operation phase (SrvOpP), also referred to as service session, the service provider ITS-S application and the service user ITS-S application exchange packets based on the applicable communications protocol stack with port number values exchanged during the service initialization phase.

The default applicable protocol stack for the SrvOpP is the same as used for FSAM transmission. During the SrvOpP the default protocol stack shall not be used according to requirements presented:

— by the `channelIndex` component of the service info, pointing to either an entry in the optionally present channel info segment, or the optionally present extended channel info FSAM extension, as specified in ISO/TS 16460, or

— by requiring IPv6 connectivity indicated by the optionally present IPv6 routing advertisement field in the FSAM, as specified in ISO/TS 16460, and

— by the optionally present "service info" extension element "SrvOpP Protocol Stack" of ASN.1 type `SrvOpP-ProtocolStack`, as specified in A.4.

The combined usage of the above listed mechanisms allows for a flexible selection of the communications protocol stack being applicable during the SrvOpP.

Management of the SrvOpP protocol stack extension element is done by the ITS-S station management in cooperation with the FSAP manager in an implementation-specific way.

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Upon finalization of the session, the service user ITS-S application may release dynamically assigned port numbers used in the session.

Some ITS services may not need a service operation phase, namely information distribution services where provisioning of the service is done by means of the SAM application data extension.

8.5 ITS station-internal management communications

When ITS-S host and ITS-S router functionalities are located in different ITS-SCUs, an implementation of the IICP shall use:

— the MF-rcmd PDU specified in ISO 24102-4 to transport MF-Commands as specified in A.2 and in ISO 24102-3.

— the MF-rreq PDU specified in ISO 24102-4 to transport MF-Requests as specified in A.2 and in ISO 24102-3.

8.6 Duplicate service detection

Duplicate execution of the same service can be avoided by evaluation of the:

— FSAM-ID,

— FSAM-Count,

— Advertiser Identifier SAM extension, and

— identifier of the station that transmits S-FSAMs, e.g. its MAC address,

as partly specified in ISO/TS 16460. As a minimum, FSAM-ID and FSAM-Count shall be used to detect duplicate advertisement of services. Further details are out of scope of this document.

8.7 System service

8.7.1 General

The ITS application class "system" specified in ISO 15628 is identified by ITS-AID = zero as specified in ISO 17419.

The system service context "mandatory applications" is specified in ISO/TS 16460. Further system service contexts may be added.

In FSAMs containing a service info set with ITS-AID = zero, the "system service" field of ASN.1 type `SystemService` as specified in ISO/TS 16460 shall be present.

The ITS application class "system" shall be auto-registered at the service user FSAP manager if ITS application classes are supported.

8.7.2 Mandatory applications

Mandatory applications are ITS applications that are required by either regulations or policies. Information on details of mandatory applications, e.g. usage, and area and time of applicability, are contained in the related ITS-S applications. Mandatory applications shall be supported if ITS application classes are supported.

Upon reception of an FSAM advertising ITS-AID = zero with the system service context "Mandatory Applications", the service user FSAP manager shall notify the ITS-S application processes with data presented in Table 9 as indicated by the ITS-AIDs and related contexts contained in the "mandatory application" context, i.e. given by the ASN.1 type `MandAppCtx` as specified in ISO/TS 16460. If one or several of these ITS-S applications are not available in the service user ITS-SU, the FSAP manager shall

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request the ITS station remote management to download and install the missing ITS-S applications, e.g. as specified in ISO 24102-4.

9 Optionally supported features

Further optionally supported features are specified in Annex B and Annex C.

10 Conformance

The "Protocol Implementation Conformance Statements" (PICS) proforma presented in Annex D allows a declaration of conformance of an implementation with this document. With respect of mandatory, conditional, and optional requirements, the statements provided in this PICS proforma shall prevail in case of unintended differences between the PICS proforma and the normative clauses of this document.

NOTE Conformance tests for WAVE SAM support and ETSI SAEM support are out of scope of this document.

11 Test methods

The "Test Suite Structure & Test Purposes" (TSS&TP), and the "Abstract Test Suite" (ATS) for conformance testing will be specified in a separate test standard.

A test architecture for cooperative ITS is specified in ISO 20026. This test architecture is based on ISO 24102-4.

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Annex A
(normative)

ASN.1 modules

A.1 Overview

The following ASN.1 module is specified in this annex:

— ITSfsap { ISO (1) standard (0) fsap (22418) asnm-1 (1) version0 (0)}

Updates of this ASN.1 module will be published on http://standards.iso.org/iso/22418/ed-2/en.

In case of unintended differences between the ASN.1 definitions in this annex and normative requirements in the other parts of this document, the definitions provided in this annex shall prevail.

A.2 Module ITSfsap

This module specifies ASN.1 type definitions together with useful ASN.1 value definitions.

The encoding rule applicable for the definitions of this ASN.1 module depends on the target environment.

Unaligned packed encoding rules (PER) specified in ISO/IEC 8825-2 shall be applied for:

— transmission of FSAM and FSRM with FNTP specified in ISO 29281-1;

— support of WSA and SAEM, see Clause 5;

— SAP service primitives as specified in ISO 24102-3 and transmitted with IICP as specified in ISO 24102-4.

```
ITSfsap {iso (1) standard (0) fsap (22418) asnm-1 (1) version0 (0)}

DEFINITIONS AUTOMATIC TAGS::=BEGIN

IMPORTS
-- ISO 17419:2017 - Data Dictionary
UserPriority, NullType, PortNumber, TimeUnit FROM CITSdataDictionary1 {iso(1) standard(0)
cits-applMgmt (17419) dataDictionary (1) version1 (1)}

-- ISO 17419:2017
ITSaid, ITSsapID, ITSatt, ITSprotID FROM CITSapplMgmtApplReg {iso(1) standard(0)
cits-applMgmt (17419) applRegistry (2) version2 (2)}

-- ISO 21218:2017
Directivity, Ethertype, SourceLinkID, DestinationLinkID FROM ITSllsap {iso(1) standard(0)
calm-ll-sap(21218) asnm-1 (1) version2 (2)}

-- ISO 24102:2017
ITS-scuId, StationID FROM ITSmanagement { iso (1) standard (0) calm-management (24102)
local (1) asnm-1 (1) version2 (2)}

-- ISO/TS 16460:2016amd
Sam, Srm, RoutingAdvertisement, ChannelInfoExts, ServiceInfoExts, SystemService,
SrvAdvMsgHeaderExts, ServiceInfo, SrmContexts, ReplyAddress, SrvAdvContentCount, SrvAdvID
FROM ITSsa1 { iso (1) standard (0) localized(16460) sa(2) version1 (1)}

-- ISO 24102-6:2017
FlowID FROM ITSpfm2 { iso (1) standard (0) calm-management (24102) pfm (6) asnm-1 (1)
version2(2) }
```

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```
; -- End of IMPORTS
-- Note: C-ITS Release 2 results in reorganization of ASN.1 modules
-- This module is based on the set of C-ITS Release 2 ASN.1 modules


-- Service Advertisement Message
Fsam::=Sam -- As specified in ISO/TS 16460

-- Service Response Message
Fsrm::=Srm -- As specified in ISO/TS 16460

-- MA-SAP services --
-- MA-COMMAND.request primitive functions

-- Notification of received FSAM
FsapFsamNotify::= SEQUENCE{
    its-aid          ITSaid,
    replyPort        ReplyAddress,
    extensions       ServiceInfoExts,
    srvOpPlink       UcStack
    }

-- Notification of received FSRM
FsapFsrmNotify::= SEQUENCE{
    applicationID    ITSsapiid, -- unique in the host
    serviceContext   SrmContexts, -- from ISO/TS 16460
    srvOpPlink       UcStack
    }

-- MA-COMMAND.confirm primitive functions

-- Not to be used, just for completeness
FsapFsamNotifyConf ::= NullType

-- Not to be used, just for completeness
FsapFsrmNotifyConf ::= NullType

-- MA-REQUEST.request primitive functions

-- Registration of server ITS-S application process
FsapProviderRegistration::= SEQUENCE{
    applicationID    ITSsapiid,
    flowId            FlowID, -- from ISO 24102-6
    priority         UserPriority,
    fsamDissem       FsamDissemination,
    serviceDataReg   FsapServiceDataRegistration
    }

-- Registration update of server ITS-S application process
FsapProviderUpdate::= SEQUENCE{
    applicationID    ITSsapiid, -- as in GCregServer
    flowId            FlowID, -- from ISO 24102-6
    saID             SrvAdvID, -- ISO/TS 16460
    contentCount     SrvAdvContentCount, -- ISO/TS 16460
    fsamDissem       FsamDissemination, -- as in GCregServer
    serviceDataReg   FsapServiceDataRegistration -- as in GCregServer
    }

-- deletion of registration of server ITS-S application process
FsapProviderDeregistration::= SEQUENCE{
    applicationID    ITSsapiid, -- ISO 17419
    flowId            FlowID, -- from ISO 24102-6
    saID             SrvAdvID, -- ISO/TS 16460
    contentCount     SrvAdvContentCount -- ISO/TS 16460
    }

-- Registration of client ITS-S application process
FsapUserRegistration::= SEQUENCE{
    userApplicationID   ITSsapiid, -- identifies the service user
    serviceID           ITSaid,
```

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```
    contextData         SrmContexts -- from ISO/TS 16460
    }

-- Registration update of client ITS-S application process
FsapUserUpdate::= SEQUENCE{
    userApplicationID    ITSsapiid,
    serviceID            ITSaid,
    contextData          SrmContexts -- from ISO/TS 16460
    }

-- deletion of registration of client ITS-S application process
FsapUserDeregistration::= SEQUENCE{
    userApplicationID    ITSsapiid,
    serviceID             ITSaid
    }

-- MA-REQUEST.confirm primitive functions

FsapProviderRegistrationConf::= SEQUENCE{
    applicationID    ITSsapiid, -- ISO 17419
    advertisedID     ITSaid,
    saID             SrvAdvID, -- ISO/TS 16460
    contentCount     SrvAdvContentCount -- ISO/TS 16460
    }

FsapProviderUpdateConf::= SEQUENCE{
    applicationID    ITSsapiid, -- ISO 17419
    advertisedID     ITSaid,
    saID             SrvAdvID, -- ISO/TS 16460
    contentCount     SrvAdvContentCount -- ISO/TS 16460
    }

FsapProviderDeregistrationConf::= SEQUENCE{
    applicationID    ITSsapiid,
    advertisedID     ITSaid
    }

FsapUserRegistrationConf::= SEQUENCE{
    userApplicationID   ITSsapiid,
    serviceID           ITSaid
    }

FsapUserUpdateConf::= SEQUENCE{
    applicationID   ITSsapiid,
    serviceID       ITSaid
    }

FsapUserDeregistrationConf::= SEQUENCE{
    applicationID   ITSsapiid,
    serviceID       ITSaid
    }

-- MF-SAP services --
-- COMMAND.request primitive functions

-- Request for periodic transmission of FSAM
FsamRequest ::= SEQUENCE{
    applicationID   ITSsapiid, -- contains ITS-AID
    gcVCIs          GcStacks,
    priority        UserPriority, -- of advertisement
    serviceDataReg FsapServiceDataRegistration -- advertisement details
    }

-- Update of request for periodic transmission of FSAM
FsamUpdate ::= SEQUENCE{
    applicationID   ITSsapiid, -- contains ITS-AID
    saID            SrvAdvID, -- ISO/TS 16460
    contentCount    SrvAdvContentCount, -- ISO/TS 16460
    gcVCIs          GcStacks,
    serviceDataReg  FsapServiceDataRegistration -- advertisement details
    }
```

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```
-- Cancelation of request for periodic transmission of FSAM
FsamDelete ::= SEQUENCE{
    applicationID   ITSsapiid, -- contains ITS-AID
    saID            SrvAdvID, -- ISO/TS 16460
    contentCount    SrvAdvContentCount -- ISO/TS 16460
    }

-- Request for single unicast transmission of FSAM
FsamTxRequest ::= SEQUENCE{
    ucVCI    UcStack,
    fsam     Fsam
    } -- single transmission to unicast address

-- Request for single unicast transmission of FSRM
FsrmTxRequest ::= SEQUENCE{
    ucVCI    UcStack,
    fsrm     Fsrm
    } -- single transmission to unicast address

-- COMMAND.confirm primitive functions

FsamRequestConf ::= SEQUENCE{
    applicationID    ITSsapiid, -- contains ITS-AID
    saID             SrvAdvID, -- ISO/TS 16460
    contentCount     SrvAdvContentCount -- ISO/TS 16460
    }

FsamUpdateConf ::= SEQUENCE{
    applicationID    ITSsapiid, -- contains ITS-AID
    advertisedID     ITSaid,
    saID             SrvAdvID, -- ISO/TS 16460
    contentCount     SrvAdvContentCount -- ISO/TS 16460
    }

FsamDeleteConf ::= SEQUENCE{
    applicationID   ITSsapiid, -- contains ITS-AID
    advertisedID    ITSaid
    }

FsamTxRequestConf ::= NullType

FsrmTxRequestConf ::= NullType

-- REQUEST.request primitive functions

-- Notification of FSAM reception to FSAP manager
FsamRxNotify::=SEQUENCE{
    link    FsapStack,
    sam     Fsam
    }

-- Notification of FSRM reception to FSAP manager
FsrmRxNotify::=SEQUENCE{
    link    UcStack,
    srm     SrmContexts -- From ISO/TS 16460
    }

-- REQUEST.confirm primitive functions

FsrmRxNotifyConf::=NullType -- never used

FsamRxNotifyConf::=NullType -- never used


-- General types --

FsamDissemination ::= SEQUENCE OF FsamDisseminationSet

FsamDisseminationSet::=SEQUENCE{
    protocols    FsamCommunicationsProtocols,
```

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```
    medium       ITSatt,
    directivity  Directivity, -- ISO 21218
    gcInterval   GcInterval
    }

FsamCommunicationsProtocols::=SEQUENCE OF ITSprotID

FsapServiceDataRegistration::= SEQUENCE{
    unused              BIT STRING (SIZE(2)), -- all bits set to '0'b
    fsamExtensions      SrvAdvMsgHeaderExts OPTIONAL, -- from ISO/TS 16460
    systemService       SystemService OPTIONAL, -- from ISO/TS 16460
    providerPort        PortNumber OPTIONAL, -- if not used, PORT_UNK
    serviceExtensions   ServiceInfoExts OPTIONAL, -- from ISO/TS 16460
    channelExtensions   ChannelInfoExts OPTIONAL, -- from ISO/TS 16460
    routingIPv6         RoutingAdvertisement OPTIONAL -- from ISO/TS 16460
    }

GcInterval::=TimeUnit -- ISO 17419

-- Communication protocol stacks for FSAM transmission
GcStacks ::= SEQUENCE OF GcStack

GcStack ::= SEQUENCE{
    stack       FsapStack,
    gcInterval  GcInterval
    }

FsapStack ::= SEQUENCE{
    flowId            FlowID, -- from ISO 24102-6. 65535 if not used
    nt-protocol-id    Ethertype,
    source-addr       SourceLinkID, -- from ISO 21218
    dest-addr         DestinationLinkID -- from ISO 21218
    }

UcStack ::= FsapStack


/*
   The ASN.1 specification has been checked for conformance to the ASN.1
   standards by OSS ASN.1 Syntax Checker, and by OSS ASN-1STEP
*/

END
```

A.3 Definitions to be added in ISO 24102-3

The following definitions are dynamic extensions of types defined in ISO 24102-3 with CLASS.

IMPORT statement to be added:

```
/* registration of ITS-S application process at FSAP*/ FsapProviderRegistration,
FsapProviderUpdate, FsapProviderDeregistration, FsapUserRegistration, FsapUserUpdate,
FsapUserDeregistration, FsapProviderRegistrationConf, FsapProviderUpdateConf,
FsapProviderDeregistrationConf, FsapUserRegistrationConf, FsapUserUpdateConf,
FsapUserDeregistrationConf,

/* FSAM groupcast TX requests from FSAP */ FsamRequest, FsamUpdate, FsamDelete,
FsamRequestConf,FsamUpdateConf, FsamDeleteConf,

/* FSAM and FSRM unicast TX requests from FSAP */ FsamTxRequest, FsrmTxRequest,
FsamTxRequestConf, FsrmTxRequestConf,

/* RX notification to FSAP */ FsrmRxNotify, FsamRxNotify, FsrmRxNotifyConf,
FsamRxNotifyConf,

/* RX notification to ITS-S application process */ FsapFsamNotify, FsapFsrmNotify,
FsapFsamNotifyConf, FsapFsrmNotifyConf

FROM ITSfsap {iso (1) standard (0) fsap (22418) asnm-1 (1) version0 (0)}
```

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To be added to MA-Command:

```
fsapFsamNotify    MASAP-CR::={&mxref c-fsapFsamNotify, &MXParam FsapFsamNotify}
fsapFsrmNotify    MASAP-CR::={&mxref c-fsapFsrmNotify, &MXParam FsapFsrmNotify}
```

To be added to MA-CmdConfirm:

```
fsapFsamNotifyConf    MASAP-CC::={&mxref c-fsapFsamNotify, &MXParam FsapFsamNotifyConf}
fsapFsrmNotifyConf    MASAP-CC::={&mxref c-fsapFsrmNotify, &MXParam FsapFsrmNotifyConf}
```

To be added to MA-Request:

```
fsapProviderRegistration      MASAP-RR::={&mxref c-fsapProviderRegistration, &MXParam
FsapProviderRegistration}
fsapProviderUpdate            MASAP-RR::={&mxref c-fsapProviderUpdate, &MXParam
FsapProviderUpdate}
fsapProviderDeregistration    MASAP-RR::={&mxref c-fsapProviderDeregistration, &MXParam
FsapProviderDeregistration}
fsapUserRegistration          MASAP-RR::={&mxref c-fsapUserRegistration, &MXParam
FsapUserRegistration}
fsapUserUpdate                MASAP-RR::={&mxref c-fsapUserUpdate, &MXParam
FsapUserUpdate}
fsapUserDeregistration        MASAP-RR::={&mxref c-fsapUserDeregistration, &MXParam
FsapUserDeregistration}
```

To be added to MA-ReqConfirm:

```
fsapProviderRegistrationConf    MASAP-RC::={&mxref c-fsapProviderRegistration, &MXParam
FsapProviderRegistrationConf}
fsapProviderUpdateConf          MASAP-RC::={&mxref c-fsapProviderUpdate, &MXParam
FsapProviderUpdateConf}
fsapProviderDeregistrationConf  MASAP-RC::={&mxref c-fsapProviderDeregistration, &MXParam
FsapProviderDeregistrationConf}
fsapUserRegistrationConf        MASAP-RC::={&mxref c-fsapUserRegistration, &MXParam
FsapUserRegistrationConf}
fsapUserUpdateConf              MASAP-RC::={&mxref c-fsapUserUpdate, &MXParam
FsapUserUpdateConf}
fsapUserDeregistrationConf      MASAP-RC::={&mxref c-fsapUserDeregistration, &MXParam
FsapUserDeregistrationConf}
```

To be added to MF-Command:

```
fsamRequest     MFSAP-CR::={&mxref c-fsamRequest, &MXParam FsamRequest}
fsamUpdate      MFSAP-CR::={&mxref c-fsamUpdate, &MXParam FsamUpdate}
fsamDelete      MFSAP-CR::={&mxref c-fsamDelete, &MXParam FsamDelete}
fsamTxRequest   MFSAP-CR::={&mxref c-famTxRequest, &MXParam FsamTxRequest}
fsrmTxRequest   MFSAP-CR::={&mxref c-fsrmTxRequest, &MXParam FsrmTxRequest}
```

To be added to MF-CmdConfirm:

```
fsamRequestConf   MFSAP-CC::={&mxref c-fsamRequest, &MXParam FsamRequestConf}
fsamUpdateConf    MFSAP-CC::={&mxref c-fsamUpdate, &MXParam FsamUpdateConf}
fsamDeleteConf    MFSAP-CC::={&mxref c-fsamDelete, &MXParam FsamDeleteConf}
fsamTxRequestConf MFSAP-CC::={&mxref c-famTxRequest, &MXParam FsamTxRequestConf}
fsrmTxRequestConf MFSAP-CC::={&mxref c-fsamDelete, &MXParam FsrmTxRequestConf}
```

To be added to MF-Request:

```
fsamRxNotify    MFSAP-RR::={&mxref c-fsamRxNotify, &MXParam FsamRxNotify}
fsrmRxNotify    MFSAP-RR::={&mxref c-fsrmRxNotify, &MXParam FsrmRxNotify}
```

To be added to MF-ReqConfirm:

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```
fsamRxNotifyConf  MFSAP-RC::={&mxref c-fsamRxNotify, &MXParam FsamRxNotifyConf}
fsrmRxNotifyConf  MFSAP-RC::={&mxref c-fsrmRxNotify, &MXParam FsrmRxNotifyConf}
```

The following ASN.1 value definitions (values 'a1', 'a2', 'b1', 'b2', 'b3', 'b4', 'b5', 'b6', 'c1', 'c2', 'c3', 'c4', 'c5', 'd1', 'd2') will be assigned by ISO/TC 204 for ISO 24102-3.

```
c-fsapFsamNotify    RefMASAP-C ::= <'a1' tbd> -- 63
c-fsapFsrmNotify    RefMASAP-C ::= <'a2' tbd> -- 64

c-fsapProviderRegistration   RefMASAP-R ::= <'b1' tbd> -- 60
c-fsapProviderUpdate         RefMASAP-R ::= <'b2' tbd> -- 61
c-fsapProviderDeregistration RefMASAP-R ::= <'b3' tbd> -- 62
c-fsapUserRegistration       RefMASAP-R ::= <'b4' tbd> -- 65
c-fsapUserUpdate             RefMASAP-R ::= <'b5' tbd> -- 66
c-fsapUserDeregistration     RefMASAP-R ::= <'b6' tbd> -- 67

c-fsamRequest   RefMFSAP-C ::= <'c1' tbd> -- 60
c-fsamUpdate    RefMFSAP-C ::= <'c2' tbd> -- 61
c-fsamDelete    RefMFSAP-C ::= <'c3' tbd> -- 62
c-famTxRequest  RefMFSAP-C ::= <'c4' tbd> -- 63
c-fsrmTxRequest RefMFSAP-C ::= <'c5' tbd> -- 64

c-fsamRxNotify    RefMFSAP-R ::= <'d1' tbd> -- 63
c-fsrmRxNotify    RefMFSAP-R ::= <'d2' tbd> -- 64
```

A.4 Definitions to be added in ISO/TS 16460

A.4.1 ITSsa1

The following definitions are dynamic extensions of types defined in ISO/TS 16460 with CLASS.

IMPORT statement to be added:

```
SrvOpP-ProtocolStack, c-SrvOpP-ProtocolStack FROM ITSee1 { iso (1) standard (0)
localized(16460) ee(4) version1 (1)}
```

To be added to ServiceInfoExtTypes EXT-TYPE ::= {

```
    { SrvOpP-ProtocolStack    IDENTIFIED BY c-SrvOpP-ProtocolStack },
```

A.4.2 ITSee1

The following definitions are dynamic extensions of types defined in ISO/TS 16460 with CLASS.

IMPORT statement to be added:

```
VarLengthNumber FROM CITSdataDictionary1 {iso(1) standard(0) cits-applMgmt (17419)
dataDictionary (1) version1 (1)
```

To be added:

```
SrvOpP-ProtocolStack::= VarLengthNumber
```

NOTE 1 The ASN.1 data type `ProtocolType` specified in draft ETSI EN 302 890-1 is identical to `SrvOpP-ProtocolStack`.

The following ASN.1 value definition (values 'a1') will be assigned by the registrar for ISO/TS 16460.

```
c-SrvOpP-ProtocolStack    RefExt ::= <'a1' tbd> -- 24
```

NOTE 2 The ASN.1 data type c-`ProtocolType` specified in draft ETSI EN 302 890-1 is identical to `c-SrvOpP-ProtocolStack`. Draft ETSI EN 302 890-1 shows initial assignment of values. The number space ranging from 0 through 50 is under control of ETSI. Further numbers and related meanings are specified in draft CEN/TS 21185, which is currently under development in the EU-funded Project Team PT1605 of CEN/TS 278.

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Annex B
(normative)

Support of application requirements for communications

In ITS-SUs supporting

— hybrid communications, and

— abstraction of applications from communication details,

ITS-S application processes shall initially register at the ITS station management to present their communication requirements as specified in ISO 17423. This also applies for the FSAP ITS-S application process.

Parameter values to be used by FSAP in this registration process are specified in Table B.1.

Table B.1 — FSAP initial registration — Parameter values

Communication service parameter	Value	Comment		
Operational communication service parameters				
CSP_LogicalChannelType	SaCH	Service advertisement channel		
CSP_SessionCont	'false': no private channel allocation 'true': with private channel allocation	The default is 'false": No session continuity needed		
CSP_AvgADUrate	n.a.	Repetition rate of FSAMs depends on advertised services.		
CSP_FlowType	See registry.	Well-known registered flow type, if existent.		
CSP_MaxPrio	Dependent on advertised services <254	FSAM transmission should be with highest priority of announced applications, not exceeding the value 253.		
CSP_PortNo	Service User: rx1, PORT_SAM rx2, PORT_DYN_SAM tx1, PORT_SAM tx2, PORT_DYN_SAM Service Advertiser: rx3, PORT_DYN_SRM tx3, PORT_DYN_SRM	***Role***	***Source ITS-PN***	***Destination ITS-PN***
		service user	tx1	rx3
			tx2	rx3
		service advertiser	tx3	rx1
			tx3	rx2
CSP_ExpFlowLifetime	n.a.: no private window allocation value: with private window allocation	The expected flow lifetime presented takes care of the handshake for private window allocation and a reasonable number of retransmissions needed to finalize the handshake.		
Destination communication service parameters				
CSP_DestinationType	broadcast multicast unicast	Default is broadcast. Multicast may be used in case FSAMs are only disclosed to selected multicast groups. Unicast applies as specified in this document.		
CSP_DestinationDomain	local	No networking and no forwarding.		

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Table B.1 *(continued)*

Communication service parameter	Value	Comment
CSP_CommDistance	Default value: 200 m	Depends on advertised services.
CSP_Directivity	Default: n.a.	Depends on installation.
Performance communication service parameters		
CSP_Resilience	'notRelevant': no private window allocation 'highestRelevance' with private window allocation	
CSP_MinThP	n.a.	
CSP_MaxLat	less than 10 ms	
CSP_MaxADU	<max message size>	Limited by capability of access technology. No fragmentation of FSAM allowed.
Security communication service parameters		
CSP_DataConfidentiality	n.a.	FSAP uses a built-in security mechanism.
CSP_DataIntegrity	n.a.	FSAP uses a built-in security mechanism.
CSP_NonRepudiation	n.a.	FSAP uses a built-in security mechanism.
CSP_SourceAuthentication	n.a.	FSAP uses a built-in security mechanism.
Protocol communication service parameters		
CSP_Protocol	optional as applicable	Applicable protocol stack for transmission of S-FSAMs and S-FSRMs.
CSP_SpecificCommsProts	optional as applicable	Required protocols for transmission of S-FSAMs and S-FSRMs.

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Annex C
(normative)

Support of path and flow management

In ITS-SUs supporting path and flow management as specified in ISO 24102-6, ITS-S application processes shall initially register at the ITS station management to present their communication requirements as specified in ISO 17423 with details specified in Annex B. This also applies for the FSAP ITS-S application process.

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