BS ISO 24102-5:2013

BSI Standards Publication

Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management

Part 5: Fast service advertisement protocol (FSAP)

National foreword

This British Standard is the UK implementation of ISO 24102-5:2013. Together with BS ISO 24102-1:2013, BS ISO 24102-2, BS ISO 24102-3:2013 and BS ISO 24102-4:2013, it supersedes BS ISO 24102:2010, which will be withdrawn upon publication of BS ISO 24102-2 of this series.

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

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Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management —

Part 5: Fast service advertisement protocol (FSAP)

Systèmes intelligents de transport — Accès aux communications des services mobiles terrestres (CALM) — Gestion des stations ITS -- —

Partie 5: Protocole d'avertissement de service rapide (FSAP)

Reference number
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Contents

Page

Foreword

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The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

ISO 24102 consists of the following parts, under the general title *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management:*

— *Part 1: Local management*

— *Part 3: Service access points*

— *Part 4: ITS station-internal management communications*

— *Part 5: Fast service advertisement protocol (FSAP)*

The following parts are under preparation:

— *Part 2: Remote management*

— *Part 6: Path and flow management*

Introduction

This International Standard is part of a family of International Standards for communications access for land mobiles (CALM). An introduction to the whole set of International Standards is provided in ISO 21217.

This part of ISO 24102 is part 5 of a multipart International Standard which determines the intelligent transport systems (ITS) station management - fast service advertisement protocol.

The ITS station management entity provides functionality related to the management of communication protocol layers and the security entity presented in the ITS station reference architecture specified in ISO 21217 and presented in Figure 1, and in line with the general ITS architecture specified in ISO 21217.

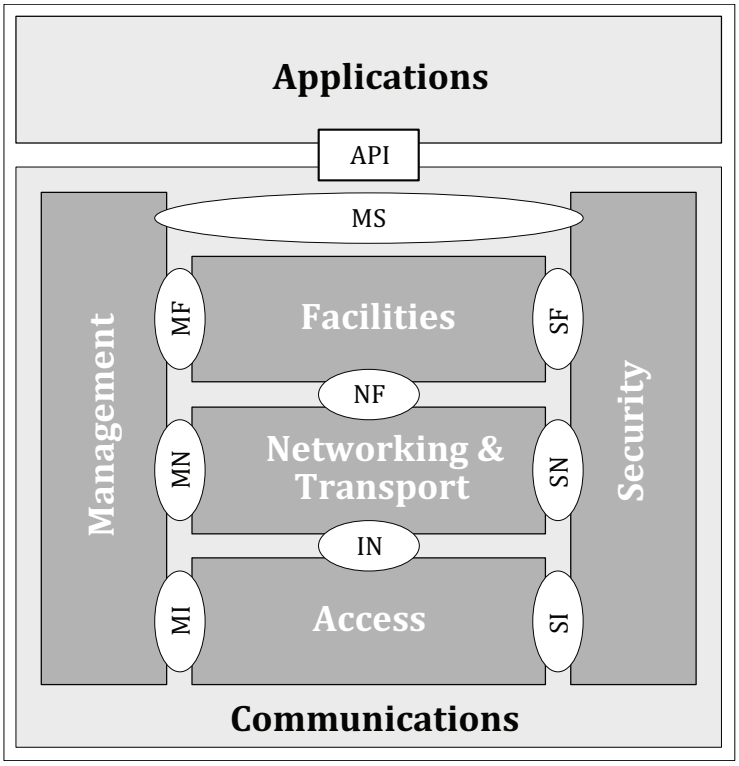

Figure 1 — ITS station reference architecture with named interfaces

ITS station management is specified as a distributed process, where no supervisory entity is employed.

INTERNATIONAL STANDARD **ISO 24102-5:2013(E)**

Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management —

Part 5: Fast service advertisement protocol (FSAP)

1 Scope

This part of ISO 24102 specifies procedures and data elements in the ITS station management entity and the ITS station facilities layer of the ITS station reference architecture for advertisement of locally available ITS services. These procedures and data elements constitute the "Fast Service Advertisement Protocol" (FSAP).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 21217, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

ISO 21218, *Intelligent transport systems — Communications access for land mobiles (CALM) — Access technology support*

ISO 24102-1, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 1: Local management*

ISO 24102-3, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 3: Service access points*

ISO 24102-4, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 4: Station-internal management communications*

ETSI TS 102 797-1, *Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102); Part 1: Protocol Implementation Conformance Statement (PICS) proforma*

ETSI TS 102 797-2, *Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102); Part 2: Test Suite Structure & Test Purposes (TSS&TP)*

ETSI TS 102 797-3, *Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102); Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma*

3 Terms and definitions

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

4 Abbreviated terms

ctx	FSAP message type for service context messages (CTX)
CTX	service context message PDU
FMT-ID	FSAP Message Type Identifier
FSA	fast service advertisement
FSAP	FSA protocol
REQN	request message PDU, no response message PDU expected
REQRES	request or response message PDU out of the set REQW, REQN, RES
REQW	request message PDU, response message PDU expected
RES	response message PDU, acknowledging a REQW
sam	fast message type for service advertisement message (SAM)
SAM	service advertisement message PDU
SIP	service initialization phase
SOP	service operation phase

5 Requirements

The ITS station management includes functionality specified in the various parts of this multipart International Standard:

1) The functionality of local ITS station management specified in ISO 24102-1.

2) The functionality of remote ITS station management specified in ISO 24102-2.

3) The functionality of management service access points specified in ISO 24102-3.

4) The functionality of ITS station-internal management communications specified in ISO 24102-4.

5) The functionality of the "Fast Service Advertisement Protocol" (FSAP) specified in this part of ISO 24102.

The means to secure the access to management functionality need to be specified within the global context of ITS security. Details are outside the scope of this part of ISO 24102.

Detailed mandatory requirements are specified in the following clauses of this part of ISO 24102.

— Clause 6 specifies architectural issues related to FSAP.

— Clause 7 specifies protocol elements of FSAP.

— Clause 8 specifies protocol procedures of FSAP.

— Clause 9 specifies conformance declaration.

— Clause 10 specifies test methods.

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

6 Architecture

6.1 ITS communications architecture

The “Fast Service Advertisement Protocol” (FSAP) is designed in line with the general ITS architecture specified in ISO 21217.

6.2 Implementation architecture

The “Fast Service Advertisement Protocol” (FSAP) specified in this part of ISO 24102 may support the implementation architectures introduced in ISO 21217 and illustrated in Figures 2, 3, and 4 with the peer ITS stations A and B.

NOTE Figures 2, 3, and 4 show the “Fast Network & Transport Protocol” (FNTP) as an example of a suitable protocol in the networking and transport layer.

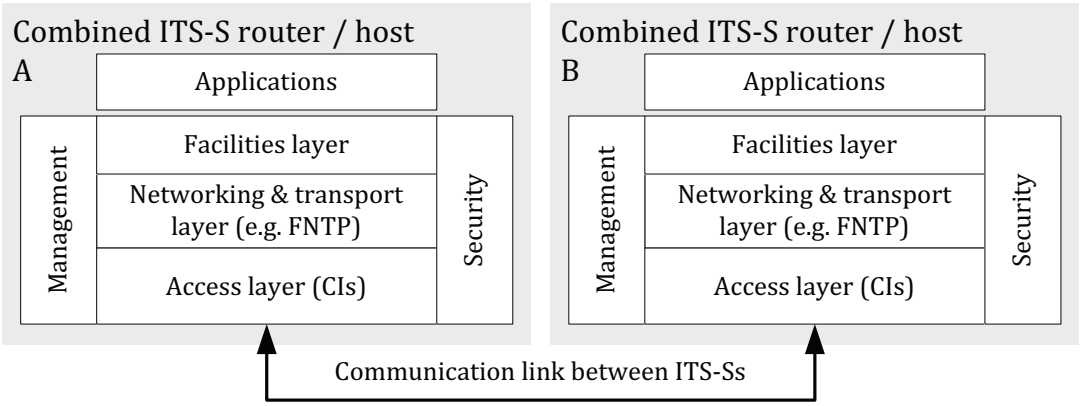

Figure 2 — Implementation architecture I

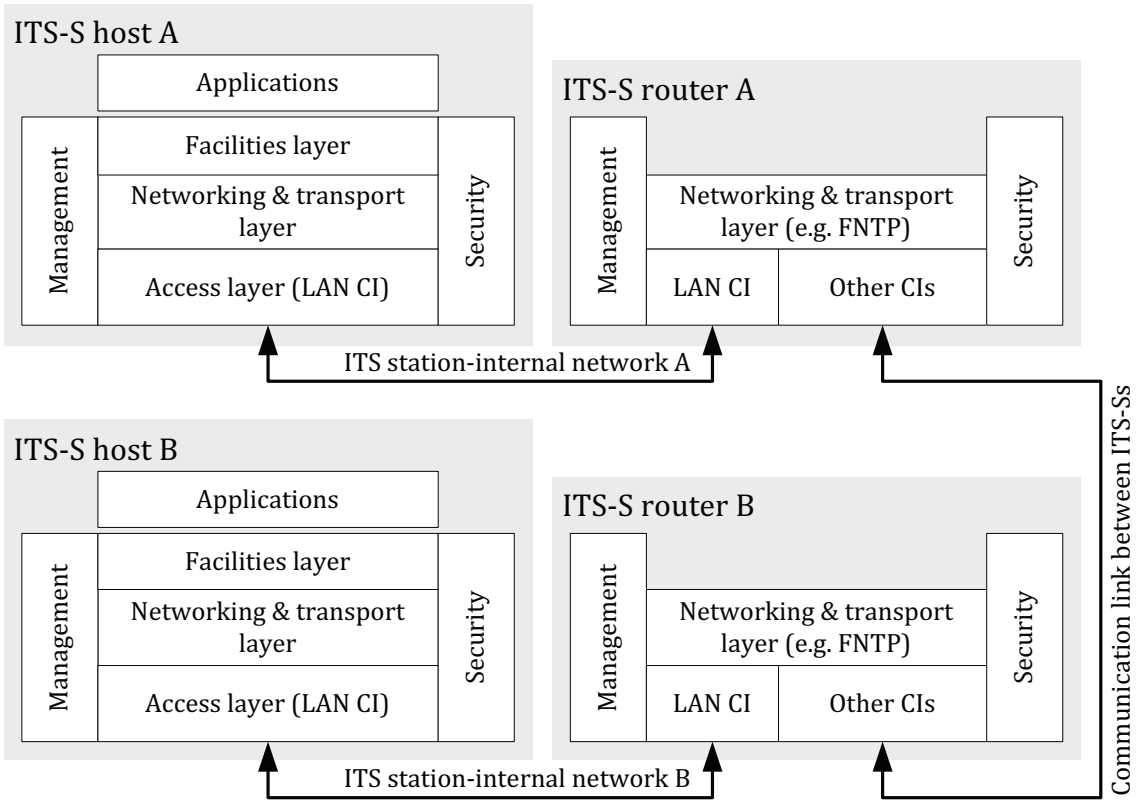

Figure 3 — Implementation architecture II

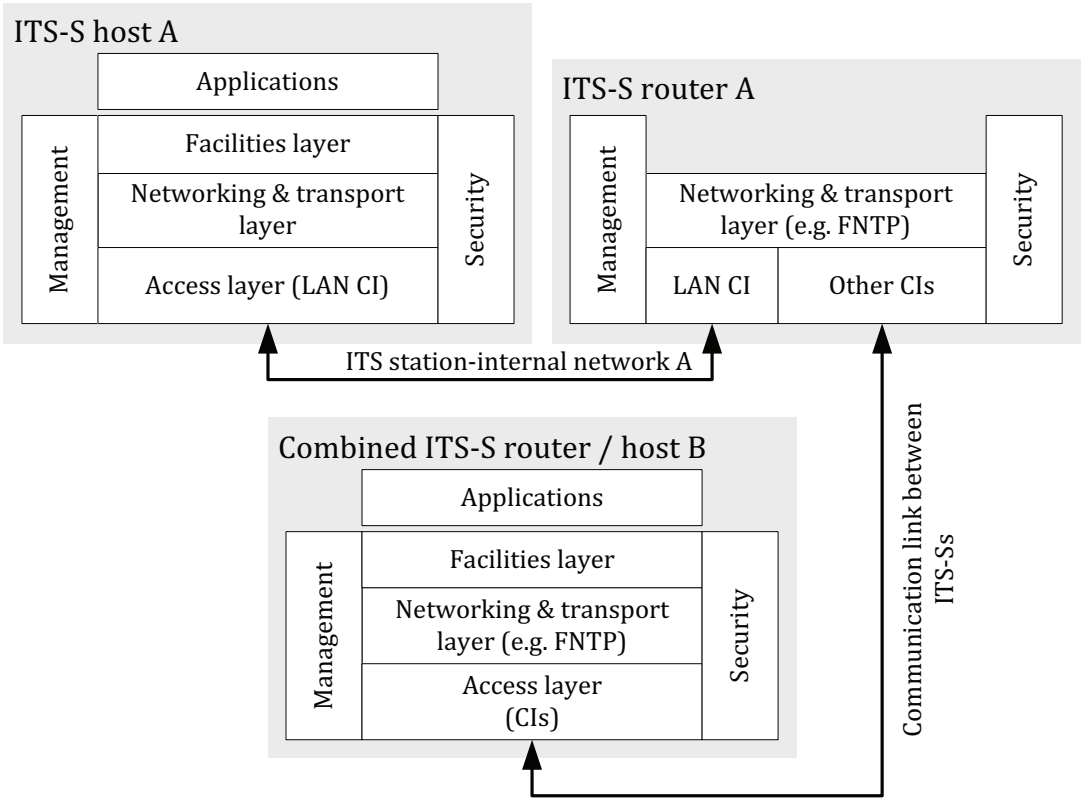

Figure 4 — Implementation architecture III

6.3 Communication entities

The “Fast Service Advertisement Protocol” (FSAP) distinguishes

— service provider ITS stations, and

— service user ITS stations.

An implementation of an ITS station may simultaneously or sequentially act as a service provider ITS station and as a service user ITS station.

An instance of any kind of ITS station identified in ISO 21217 may implement the FSAP.

6.4 Communication phases

6.4.1 Overview

In order to allow an instance of an ITS station to offer an ITS service to another instance of an ITS station by means of an application session, a service initialization phase (SIP) is performed by the FSAP, where the SIP is based on single-hop ad hoc communication, e.g. applying the FNTP networking and transport layer protocol specified in [5].

After initialization, the application session is performed during the service operation phase (SOP), where the SOP may be based on either single-hop ad hoc communication or e.g. IPv6 communication over any kind of access technology.

During SIP, handover to another access technology and IPv6 may be demanded.

The real-time SIP procedures shall be implemented in an ITS-S router.

SOP communications are between peer ITS-S hosts. Dependent on the implementation, this may require ITS station-internal forwarding of SOP packets between ITS-S router and ITS-S host.

NOTE The specification of SOP is outside the scope of this part of ISO 24102.

6.4.2 Service initialization phase

The purpose of SIP is to invite a peer ITS station unit by means of a service advertisement message (SAM) to use an ITS service which is uniquely identified by an ITS application object ID (ITS-AID) specified in [4].

Acceptance of such an invitation finally results in a session where the two peer ITS-S applications exchange data.

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

1) ITS application class[1]; and

2) ITS application.

NOTE A SAM may also contain just a message, which cannot result in a subsequent session.

Option one, originally designed for ITS application classes (DSRC-like SIP) [1], is illustrated in Figure 5. SAM is sent by a service provider ITS station to invite for a service initialization phase. CTX is sent by a service user ITS station to acknowledge SAM. Successful SIP is given by the first successful REQW or REQN of the service provider.

NOTE In [1], BST equals SAM, and VST equals CTX.

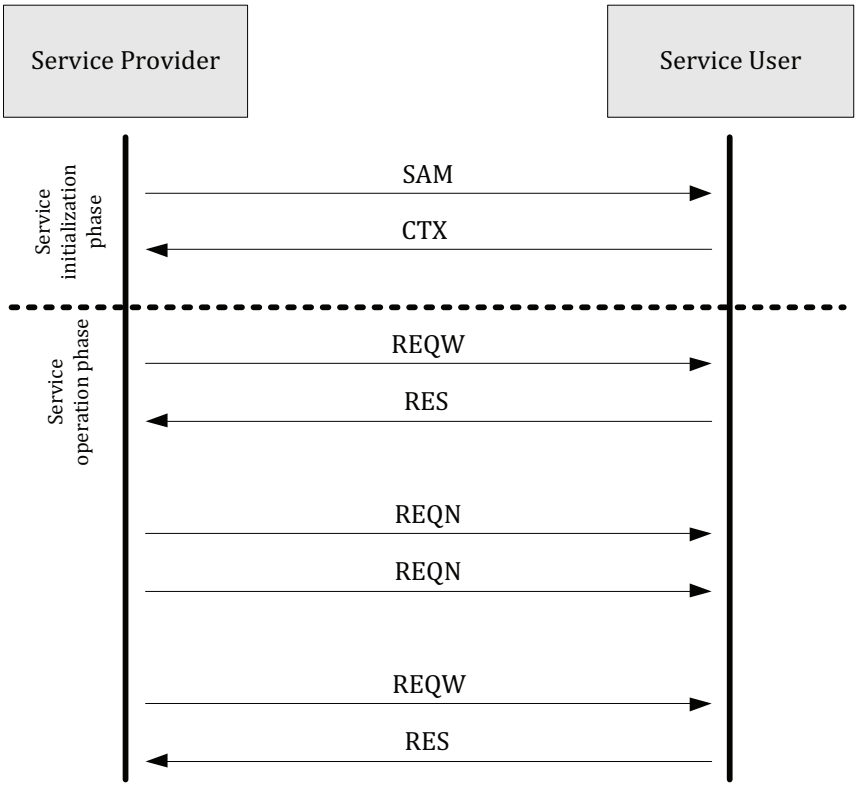

Figure 5 — ITS application session with CTX

NOTE The concept of application classes was introduced in [1]. Distinction of classes was done 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 object, several contexts exist. Each context itself can be referred to as an ITS application.

During an SOP

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

— responses typically are sent by the service user but may also be sent by the service provider, depending on the specification of the ITS application.

NOTE 1 The rule on which data are sent by a service provider or by a service user applies strictly for [1]. In general, for ITS there is no such rule.

NOTE 2 As specified in ISO 21217, the service user and the service client instances of an ITS application are referred to as ITS-S applications.

Option two, originally designed for ITS applications (WAVE-like SIP) [2], is illustrated in Figure 6. SAM is sent by a service provider ITS sub-system to perform service initialization. Successful SIP is given by the first successful REQW or REQN of the service user.

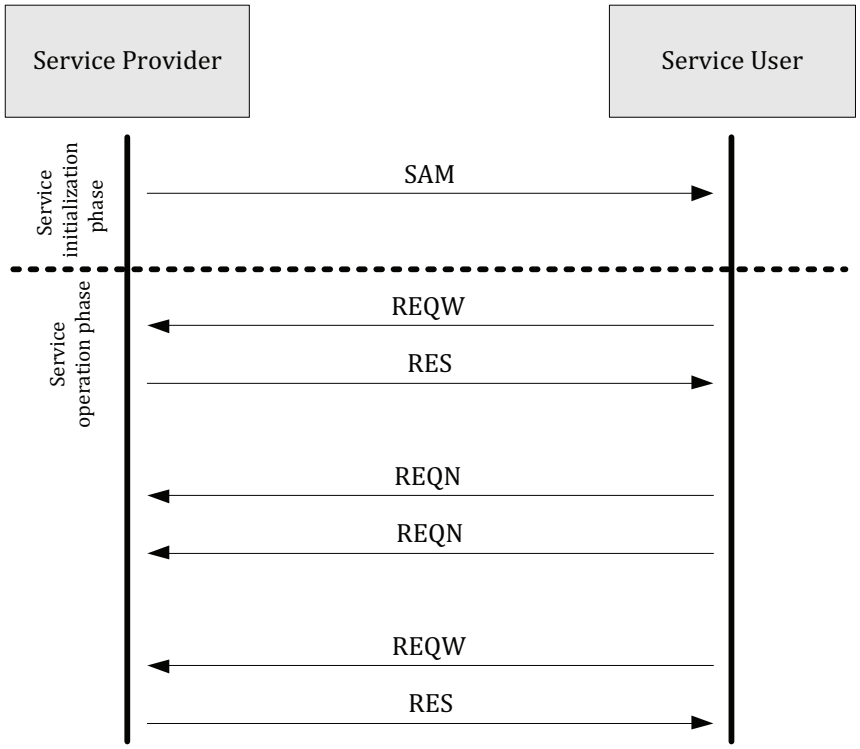

Figure 6 — ITS application session without CTX

During SOP

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

— responses typically are sent by the service provider but may also be sent by the service user, depending on the specification of the ITS application.

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

6.4.3 Service operation phase

An ITS service session support is located in the facilities layer. It manages reception and transmission of session messages, e.g.

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

— "Request with response expected" (REQW),

— "Response to a request" (RES)

as illustrated in Figures 5 and 6.

NOTE Details are outside the scope of this part of ISO 24102.

6.5 SAM frames

Depending on the capabilities of the access technology used to transmit SAMs, and depending on system requirements, the access technology may be accessed either by

— the IN-SAP which is specified in ISO 21218, or

— the MI-SAP which is specified in ISO 24102-3.

NOTE Usage of MAC management frames (access via MI-SAP) is specified in [2].

6.6 FSAP reference architecture

The FSAP reference architecture is illustrated in Figure 7.

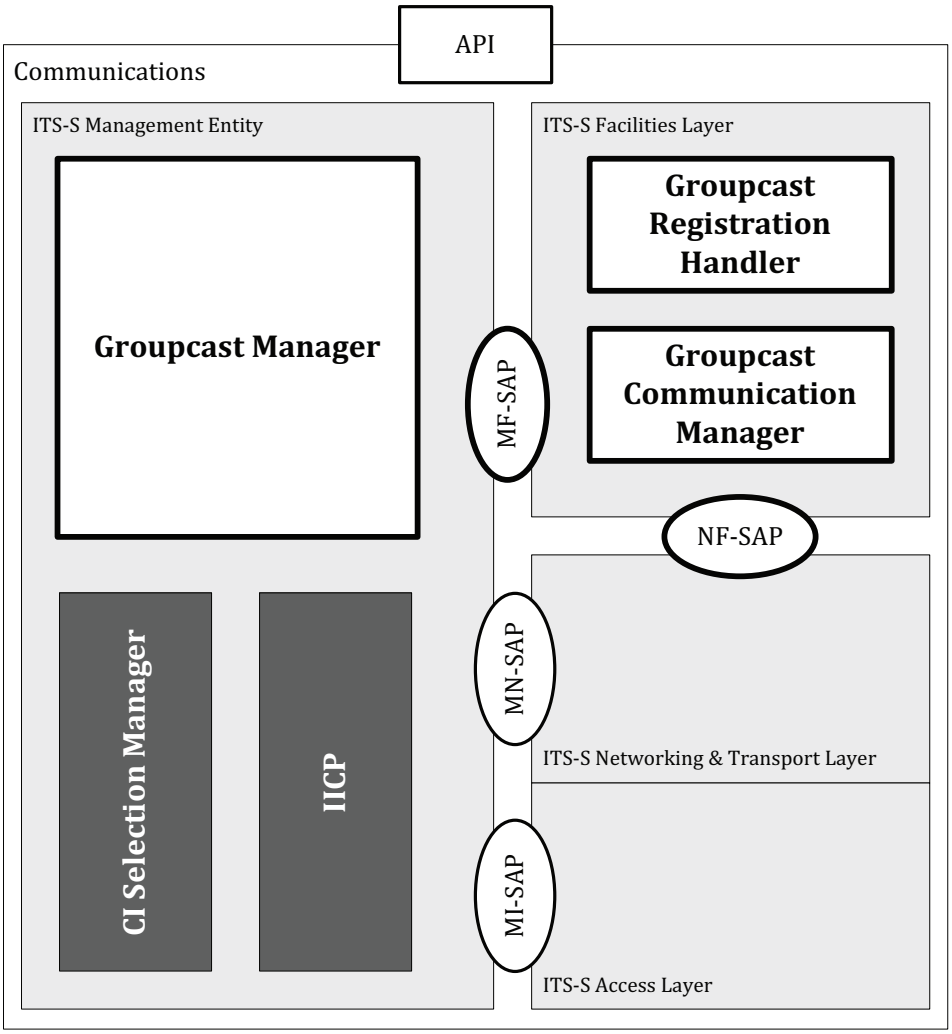

Figure 7 — FSAP reference architecture

Management of periodic groupcast for "Fast Service Advertisement Protocol" (FSAP) is specified by means of three functional entities located in the ITS station (see ISO 21217) i.e.

— "Groupcast registration handler" located in the ITS-S facilities layer,

— "Groupcast communication manager" located in the ITS-S facilities layer,

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

NOTE In case SAMs have to be transmitted in management frames of an access technology, parts of the functionality of the "Groupcast communication manager" is located in the "ITS-S management entity" of the ITS-S router used for transmission of SAMs.

7 Protocol elements

7.1 Management service access points

NOTE 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 part of ISO 24102 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 a PDU for ITS station-internal management communications specified in ISO 24102-4.

As specified in this part of ISO 24102, the FSAP shall support functionality of the MF-SAP specified in ISO 24102-3.

7.2 Protocol data units

7.2.1 Overview

Message protocol data units (PDUs) related to the FSAP port number PORT_SAM identified in [5] are distinguished by means of a "Fast Message Type Identifier" (FMT-ID). FMT-ID shall distinguish

— "sam" (0): Service advertisement message (SAM) PDU

— "ctx" (1): Service context message (CTX) PDU

FMT-ID is the ASN.1 tag number of the ASN.1 data type FmtID specified in Annex A.

7.2.2 Service advertisement message

The elements of the service advertisement message (SAM) protocol data unit (PDU) identified by FMT-ID = "sam" (0) are illustrated in Figure 8. The SAM PDU shall be of ASN.1 type SAM specified in Annex A.

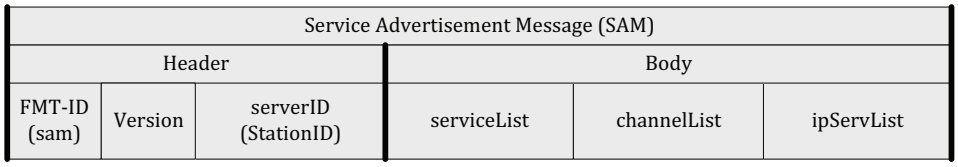

Figure 8 — Service advertisement message PDU

Elements of SAM are:

— Header

  — FMT-ID = "sam" (0), identifying SAM;

  — version number of this part of ISO 24102;

  — serverID of the service provider ITS station, which shall be of ASN.1 type StationID specified in Annex A.

— Body

  — serviceList: information on services offered, which are identified by ITS-AID;

  — channelList: information on channels to be used for the SOP;

  — ipServList: information on services offered, which are identified by ITS-AID, and which will require IPv6 networking in the SOP. Details of the element ipServList will be provided in a future version of this part of ISO 24102.

These elements in the Body consist each of a length field followed by the data as specified in Annex A. At least either serviceList or ipServList shall have a data length different to zero.

The serviceList shall be of ASN.1 type `ServiceList` containing one or several entries of ASN.1 type `NonipService` as illustrated in Figure 9. ASN.1 types shall be as specified in Annex A.

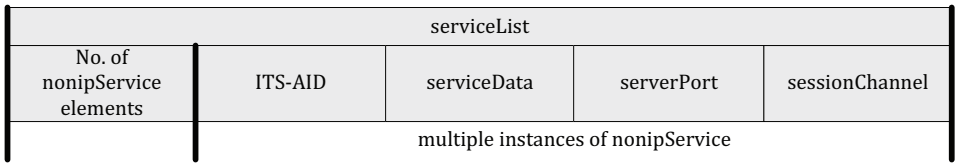

Figure 9 — serviceList

The elements serviceData, serverPort, and sessionChannel shall always be present, but may not be used always as explained below.

Elements of nonipservice are:

— ITS-AID: ITS application object identifier of ASN.1 type `ITSaid` specified in [4];

— serviceData: data of ASN.1 type `ServiceData` related to ITS-AID shall be present if required by the ITS application object specification. If this element is not used, the length indicator shall be set to zero;

— serverPort: information of ASN.1 type `PortNumber` on the receive port number of the service provider shall be present when a reply is expected. If this element is not used, the value PORT_UNK (unknown, don't care) identified in [5] shall be used;

— sessionChannel: pointer to a communication channel contained in channelList shall be present when the SOP shall use a communication channel different to the one used for the SIP. If this element is not used, the value zero shall be used.

The elements in channelList shall be of ASN.1 type `SessionChannel` specified in Annex A.

NOTE There may be a limitation on the size of a SAM depending on the properties of the access technology used to transmit it.

7.2.3 Service context message

The elements of the service context message (CTX) PDU identified by FMT-ID = "ctx" (1) are illustrated in Figure 10. The CTX PDU shall be of ASN.1 type `CTX` specified in Annex A. Details of the element ipContextList will be provided in a future version of this part of ISO 24102.

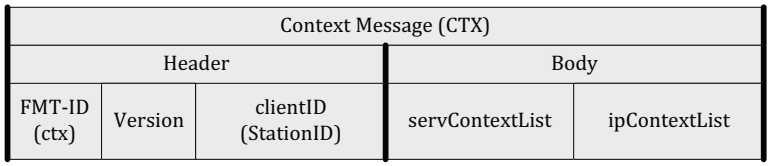

Figure 10 — Service context message PDU

Elements of CTX are:

— Header

  — FMT-ID = "ctx" (1), identifying CTX;

  — version number of this part of ISO 24102-5;

  - clientID of the service client ITS station, which shall be of ASN.1 type `StationID` specified in Annex A.

- Body
  - servContextList: information on service contexts of ASN.1 type `ServContextList` available at the service client ITS station. May be present as a reply to a service offered in serviceList;
  - ipContextList: information on service contexts of ASN.1 type `IpContextList` available at the service client ITS station, which will require IPv6 networking in the SOP. May be present as a reply to a service offered in ipServList.

These elements in the Body consist each of a length field followed by the data as specified in Annex A. At least either servContextList or ipContextList shall have a data length different to zero.

An entry in the servContextList shall be of ASN.1 type `noIpContexts` specified in Annex A and illustrated in Figure 11.

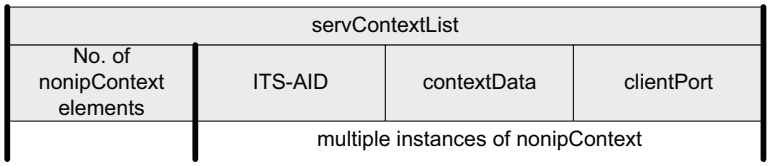

Figure 11 — servContextList

Elements of servContextList are:

- ITS-AID: ITS application object identifier of ASN.1 type `ITSaid` specified in [4];
- contextData: context data of ASN.1 type `ContextData` specified in Annex A;
- clientPort: information of ASN.1 type `PortNumber` on the port number of the service user.

7.2.4 Request and response messages

Request and response messages are exchanged between peer ITS-S units within SOP. Addressing in the ITS-S networking and transport layer uses port numbers identified within SIP.

NOTE Details are outside the scope of this part of ISO 24102.

7.3 Port numbers

FSAP uses an ITS-S network and transport layer protocol, where ports are used to identify source and destination end points in an ITS station. Port numbers are of ASN.1 type `PortNumber` specified in Annex A.

NOTE ITS-S networking and transport layer protocols may use different formats to present port numbers.

The groupcast communication manager is accessible with port number PORT_SAM identified in [5].

Source and destination end points of ITS-S applications, i.e. peer instances of ITS applications, managed 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 and transport layer protocol and the protocol procedures specified in this part of ISO 24102. Dynamically assigned port numbers PORT_DYN and static port numbers PORT_REG are identified in [5].

7.4 ITS application object identifier

ITS application objects are identified by means of an “ITS application object identifier” (ITS-AID) specified in [4]. ITS-AID is of ASN.1 type `ITSaid`.

8 Protocol procedures

8.1 General

8.1.1 Groupcast registration handler procedures

The groupcast registration handler located in the ITS-S facilities layer as illustrated in Figure 7 performs the following tasks:

— Cooperate with ITS-S applications in an implementation specific way, if not specified differently in other standards on ITS.

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

  — to register and deregister ITS-S applications as service providers or service users, and to maintain such registrations, and

  — to notify registered ITS-S applications about events of the FSAP. Details depend on the role as service provider or service user.

— Cooperate with the groupcast communication manager located in the ITS-S facilities layer in an implementation specific way, if not specified differently in other standards on ITS.

Details are given by dedicated procedures specified in this part of ISO 24102.

8.1.2 Groupcast communication manager procedures

The groupcast communication manager located in the ITS-S facilities layer as illustrated in Figure 1 shall perform the following tasks:

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

  — to register and deregister SAM entries at the groupcast scheduler for real-time transmission upon request of the groupcast manager,

  — to receive SAMs and CTXs from peer stations and forward it to the groupcast manager, and

  — to receive CTXs from the groupcast manager in order to send them to the proper peer station.

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

NOTE 1 For FNTP specified in [5], preparation of communication is done with NF-SAP service NF-FNTP-PORT.

— Generate SAM PDUs to be contained in MAC data frames and perform periodic transmission of them via the proper “Virtual Communication Interface” (VCI), accessible via the IN-SAP, specified in ISO 21218.

NOTE 2 For FNTP specified in [5], communications is done with NF-SAP service NF-FNTP-COMM.

Details are given by dedicated procedures specified in this part of ISO 24102.

8.1.3 Groupcast manager procedures

The groupcast manager located in the ITS-S management entity as illustrated in Figure 7 performs the following tasks:

— Cooperate with the groupcast registration handler located in the ITS-S facilities layer via the MF-SAP as illustrated in Figure 1, using MF-Commands and MF-Requests specified in ISO 24102-3 with details specified in this part of ISO 24102. The purposes are explained in 8.1.1.

— Cooperate with the groupcast communication manager located in the ITS-S facilities layer via the MF-SAP as illustrated in Figure 1, using MF-COMMANDs and MF-REQUESTs specified in ISO 24102-3 with details specified in this part of ISO 24102. The purposes are explained in 8.1.2.

— Cooperate with WAVE communication interfaces in the ITS-S access layer via the MI-SAP as illustrated in Figure 7, using MI-Command `UnitDataCmd` and MI-Request `UnitDataReq` specified in ISO 24102-3. The purposes are

  — periodic transmission of SAMs in 802.11 management frames, and

  — reception of SAMs contained in 802.11 management frames.

— 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.

— Manage selection of communication interfaces for ITS-S applications specified in ISO 24102-1.

Details are given by dedicated procedures specified in this part of ISO 24102.

8.2 Service provider

8.2.1 Groupcast registration

A service provider ITS-S application may register its offered service at the groupcast manager using the services of the groupcast registration handler. The registration data shall include

— an Application ID, i.e. the ITS-SCU-ID of the ITS-S host where the service provider ITS-S application resides together with an ITS-S application reference number being unique at this ITS-SCU, both combined in a date element of ASN.1 type `ApplicationID` specified in Annex A,

— one set or several sets of scheduling information of ASN.1 type `GCsched` specified in Annex A, each including the single required access technology (medium) / the supported access technologies, directivity of communications, the time period for periodic transmission of service advertisement messages,

— the priority of the ITS-S application, which presents the maximum possible priority of messages produced by this ITS-S application, and

— further service data contained in a data element of ASN.1 type `ServiceDataReg` specified in Annex A:

  — the globally unique ITS-AID of the ITS-S application,

  — further data elements for either

    — non-IP based services (timeout information), or

    — IP-based services.

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

NOTE The procedure to assign a port number to the service provider ITS-S application may depend on the ITS-S networking & transport layer protocol, thus it is outside the scope of this part of ISO 24102.

The groupcast registration handler shall forward this registration to the groupcast manager using MF-Request `GCregServer` specified in Annex A.

Requirements on when to register a service provider ITS-S application are not specified in this part of ISO 24102.

If an ITS-S application presents a registration request, but it is already registered, then the groupcast manager shall just acknowledge this request using the MF-Request.confirm service primitive of ASN.1 type `GCregServerConf` specified in Annex A with ErrStatus *"sequenceError"* specified in ISO 24102-3. The groupcast registration handler shall notify this acknowledgement to the ITS-S application.

8.2.2 Groupcast update

A service provider ITS-S application may update registration information of its offered service at the groupcast manager using the services of the groupcast registration handler. Possible registration update data are the same as for initial registration, except for the priority, which cannot be updated. The registration entry to be updated shall be identified by the ITS-SCU-ID of the ITS-S host where the service provider ITS-S application resides together with an ITS-S application reference number being unique at this ITS-SCU as used in the initial registration.

The groupcast registration handler shall forward this registration update to the groupcast manager using MF-Request `GCupdateServer` specified in Annex A.

Requirements on when to update a service provider ITS-S application are not specified in this part of ISO 24102.

If an ITS-S application presents a registration update request, but it is not yet registered, then the Groupcast manager shall just acknowledge this request using the MF-Request.confirm service primitive of ASN.1 type `GCupdateServerConf` specified in Annex A with ErrStatus *"sequenceError"* specified in ISO 24102-3. The groupcast registration handler shall notify this acknowledgement to the ITS-S application.

8.2.3 Groupcast deregistration

A service provider ITS-S application may deregister its registration information at the groupcast manager using the services of the groupcast registration handler. The deregistration data shall be the ITS-SCU-ID of the ITS-S host where the service provider ITS-S application resides together with an ITS-S application reference number being unique at this ITS-SCU as used in the initial registration.

Upon reception of a deregistration request from the service provider ITS-S application, the groupcast registration handler shall release all dynamically assigned port numbers of this ITS-S application.

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

The groupcast registration handler shall forward this deregistration to the groupcast manager using MF-Request `GCderegServer` specified in Annex A.

Requirements on when to deregister a service provider ITS-S application are not specified in this part of ISO 24102.

If an ITS-S application presents a deregistration request, but it is not yet registered, then the groupcast manager shall just acknowledge this request using the MF-Request.confirm service primitive of ASN.1 type `GCderegServerConf` specified in Annex A with ErrStatus *"sequenceError"* specified in ISO 24102-3. The groupcast registration handler shall notify this acknowledgement to the ITS-S application.

8.2.4 Groupcast communication management

The groupcast manager shall evaluate the scheduling information contained in the data element of ASN.1 type `GCschedule` for every registration/registration update request in order to select the proper VCI in the ITS-station for communication.

In case the date element of ASN.1 type `MedType` indicates a specific access technology, this one shall be selected, if it is available. If the requested access technology is not available, the registration request shall be just acknowledged using the corresponding MF-Request.confirm service primitive `GCregServerConf` or `GCupdateServerConf`, respectively, specified in Annex A with ErrStatus *"nonavailValue"*. In case no specific access technology is requested, the default access technology as identified by the CI selection management specified in ISO 24102-1 shall be used.

The groupcast manager shall notify every valid registration and registration update for all identified VCIs to the groupcast communication manager using MF-Command `GCperiodCmd` specified in Annex A.

A valid deregistration request received from the groupcast registration handler with MF-Request `GCderegServer` specified in Annex A shall be forwarded to the groupcast communication manager using MF-Command `GCdeleteCmd` specified in Annex A.

In case the access layer notifies that a CI which is used for transmission of SAMs by the groupcast communication manager no more is available for communications as specified in ISO 21218, a new access technology shall be selected and notified to the groupcast communication manager, if the related ITS-S application did not request this specific access technology.

In case the access layer notifies that a CI which is used for transmission of SAMs by the groupcast communication manager is not available anymore for communications as specified in ISO 21218, and the related ITS-S application explicitly requested this specific access technology, then a deregistration request shall be sent to the groupcast communication manager using MF-Command GCdeleteCmd specified in Annex A. The groupcast communication manager shall notify the related ITS-S application via the groupcast registration handler.

8.2.5 Transmission of SAM

For transmission of SAM PDUs, the groupcast communication manager shall use port number PORT_SAM identified in [5] as source port and destination port.

8.2.6 Reception of CTX

Upon reception of a CTX from a service user ITS station, notified by the groupcast communication manager to the groupcast manager with MF-Request `CTXrxNot` specified in Annex A, the service provider groupcast manager shall perform the following tasks:

— Notify the service provider ITS-S application with MF-Command `GCctx` specified in Annex A. A notification of reception of CTX shall be forwarded to the proper ITS-S host ITS-SCU, applying "ITS station-internal management communication" specified in ISO 24102-4, if the ITS-S application does not reside in the same ITS-SCU.

8.3 Service user

8.3.1 Groupcast registration

A service user ITS-S application may register its supported service at the groupcast manager using the services of the groupcast registration handler. The registration data shall include

— an Application ID, i.e. the ITS-SCU-ID of the ITS-S host where the service provider ITS-S application resides together with an ITS-S application reference number being unique at this ITS-SCU, both combined in a date element of ASN.1 type `ApplicationID` specified in Annex A,

— the priority of the ITS-S application, which presents the maximum possible priority of messages produced by this ITS-S application,

— the globally unique ITS-AID of the ITS-S application, and

— optional service context data as specified by the ITS-S application contained in a data element of ASN.1 type `ContextData` specified in Annex A.

A port number shall not be allocated prior to registration.

The groupcast registration handler shall forward this registration to the groupcast manager using MF-Request `GCregClient` specified in Annex A.

Requirements on when to register a service user ITS-S application are not specified in this part of ISO 24102.

If an ITS-S application presents a registration request, but it is already registered, then the groupcast manager shall just acknowledge this request using the MF-Request.confirm service primitive of ASN.1 type `GCregClientConf` specified in Annex A with ErrStatus *"sequenceError"* specified in ISO 24102-3. The groupcast registration handler shall notify this acknowledgement to the ITS-S application.

8.3.2 Groupcast update

A service user ITS-S application may update registration information of its supported service at the groupcast manager using the services of the groupcast registration handler. The possible registration update data are the same as for initial registration, except for the priority, which cannot be updated. The registration entry to be updated shall be identified by the ITS-SCU-ID of the ITS-S host where the service provider ITS-S application resides together with an ITS-S application reference number being unique at this ITS-SCU as used in the initial registration.

The groupcast registration handler shall forward this registration update to the groupcast manager using MF-Request `GCupdateClient` specified in Annex A.

Requirements on when to update a service user ITS-S application are not specified in this part of ISO 24102.

If an ITS-S application presents a registration update request, but it is not yet registered, then the groupcast manager shall just acknowledge this request using the MF-Request.confirm service primitive of ASN.1 type `GCupdateClientConf` specified in Annex A with ErrStatus *"sequenceError"* specified in ISO 24102-3. The groupcast registration handler shall notify this acknowledgement to the ITS-S application.

8.3.3 Groupcast deregistration

A service user ITS-S application may deregister its registration information at the groupcast manager using the services of the groupcast registration handler. The deregistration data are the ITS-SCU-ID of the ITS-S host where the service provider ITS-S application resides together with an ITS-S application reference number being unique at this ITS-SCU as used in the initial registration.

Upon reception of a deregistration request from the service user ITS-S application, the groupcast registration handler shall release all dynamically assigned port numbers of this ITS-S application.

The groupcast registration handler shall forward this deregistration to the groupcast manager using MF-Request `GCderegClient` specified in Annex A.

Requirements on when to deregister a service user ITS-S application are not specified in this part of ISO 24102.

If an ITS-S application presents a deregistration request, but it is not yet registered, then the groupcast manager shall just acknowledge this request using the MF-Request.confirm service primitive of ASN.1 type `GCderegClientConf` specified in Annex A with ErrStatus *"sequenceError"* specified in ISO 24102-3. The groupcast registration handler shall notify this acknowledgement to the ITS-S application.

8.3.4 Reception of SAM and transmission of CTX

Upon reception of a SAM from a service user ITS station, notified by the groupcast communication manager to the groupcast manager with MF-Request `SAMrxNot` specified in Annex A, the service user groupcast manager shall check, whether transmission of a CTX is required.

— If transmission of a CTX is required,

  — the groupcast manager shall notify reception of SAM to the service user ITS-S application via the groupcast registration handler using MF-Command `GCsamctx` specified in Annex A. This MF-Command shall be confirmed with a service user port number to be indicated in a CTX.

  — the groupcast manager shall request the groupcast communication manager to send the known CTX with the user port number received in the step before via the access technology indicated in the related `SAMrxNot` using MF-Command `GCctxTxCmd` specified in Annex A.

— If transmission of a CTX is not required,

  — the groupcast manager shall notify reception of SAM to the service user ITS-S application via the groupcast registration handler using MF-Command `GCsam` specified in Annex A.

If communication in the service operation phase shall use a different communication channel than the one used in the service initialisation phase, the groupcast manager shall select the appropriate VCI and indicate the choice in the notification to the groupcast communication manager.

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

8.4 Service operation phase

During the service operation phase, the service provider ITS-S application and the service user ITS-S application shall exchange packets based on the selected ITS-S networking and transport layer protocol with the port numbers exchanged during the service initialisation phase. Upon finalization of the session, the service user ITS-S application shall release the dynamically assigned port number used in the session.

8.5 ITS station-internal management communications

When ITS-S host and ITS-S router functionalities are located in different ITS-SCUs as illustrated in Figures 3 and 4, any implementation of the IICP shall use

— the MF-rcmd PDU specified in ISO 24102-4 to transport MF-Commands "GCsamctx", "GCsam", "GCctx", "GCperiodCmd", "GCctxTxCmd" specified in ISO 24102-3, with ASN.1 details specified in A.2,

— the MF-rreq PDU specified in ISO 24102-4 to transport MF-Requests "GCregServer", "GCupdateServer", "GCdeleteServer", "GCregClient", "GCupdateClient", "GCdeleteClient", "SAMrxNot", "CTXrxNot specified in ISO 24102-3, with ASN.1 details specified in A.2,

— the MI-rcmd PDU specified in ISO 24102-4 to transport MI-Command "UnitDataCmd" specified in ISO 24102-3,

— the MI-rreq PDU specified in ISO 24102-4 to transport MI-Request "UnitDataReq" specified in ISO 24102-3.

8.6 Duplicate service detection

Procedures on how duplicate services can be detected and avoided are outside the scope of this part of ISO 24102.

9 Conformance

The “Protocol Implementation Conformance Statements” (PICS) proforma is specified in ETSI TS 102 797-1.

10 Test methods

The “Test Suite Structure & Test Purposes” (TSS&TP) for conformance testing are specified in ETSI TS 102 797-2.

The “Abstract Test Suite” (ATS) for conformance testing is specified in ETSI TS 102 797-3.

Annex A
(normative)

ASN.1 modules

A.1 Overview

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

— CALMfsap { ISO (1) standard (0) calm-management (24102) fsap (5) version1 (1)}

NOTE The acronym CALM used in this annex was introduced in the previous edition of this part of ISO 24102. For backward-compatibility, the acronym is maintained here.

A.2 Module CALMfsap

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

Unaligned packed encoding rules (PER) as specified in ISO/IEC 8825-2 shall be applied for this ASN.1 module.

In order to achieve octet alignment enabling cheap implementations, "fill" bits were defined. All fill bits shall be set to the value '0'b.

```
CALMfsap { iso (1) standard (0) calm-management (24102) fsap (5) version1 (1)}

DEFINITIONS AUTOMATIC TAGS::=BEGIN

IMPORTS

ITSaid FROM CITSapplMgmtApplReg {iso(1) standard(0) cits-applMgmt (17419) applRegistry (2)
version1 (1)}

PortNumber FROM CALMfntp { iso (1) standard (0) calm-nonip(29281) fntp(1) version1 (1)}

Directivity, LLserviceAddr, MedType, UserPriority FROM CALMllsap {iso(1) standard(0)
calm-ll-sap(21218) version1(1)}

ApplicationID, ITS-scuId, StationID FROM CALMmanagement { iso (1) standard (0)
calm-management (24102) local (1) version1 (1)}

TransportAddressType, TransportAddress FROM TRANSPORT-ADDRESS-MIB

;

-- End of IMPORTS

-- Types

-- PDUs --

-- SAM --


SAM::=SEQUENCE{
     fmtID           FmtID, -- value sam

     version       VersionFSAP,
     serverID      StationID,
     serviceList   ServiceList,
     channelList   ChannelList,
     ipServList    IpServList
```

```
     }

FmtID::=INTEGER{
     sam (0),
     ctx (1)
     } (0..15)

VersionFSAP::=INTEGER(0..15)

ServiceList::=SEQUENCE (SIZE(0..noNonipServices))OF NonipService

ChannelList::=SEQUENCE(SIZE(0..noChannels)) OF SessionChannel
-- Name changed from ServiceChannel to SessionChannel for clarification

IpServList::=SEQUENCE (SIZE(0..noIpServices))OF IpService

NonipService::=SEQUENCE{
     serviceID       ITSaid,
     serviceData     ServiceData,
     serverPort      PortNumber, -- always transmitted, even if not used
     sessionChannel  INTEGER(0..noChannels) -- '0':no change of channel
     }

SessionChannel::= SEQUENCE{
     serviceChannel  INTEGER(0..255), -- medium-specific channel number
     medium          MedType, -- identification of access technology
     schParams       OCTET STRING -- medium-specific parameters
}

IpService::=SEQUENCE{
     serviceID       ITSaid,
     serviceData     IpServiceData,
     ipInfo          IpInfo,
     sessionChannel  INTEGER(0..noChannels)
}

-- CTX --

CTX::=SEQUENCE{
     fmtID           FmtID -- value ctx
     version         VersionFSAP,
     clientID        StationID,
     servContextList ServContextList,
     ipContextList   IpContextList
}

ServContextList::=SEQUENCE (SIZE(0..noNonipContexts))OF NonipContext

IpContextList::=SEQUENCE (SIZE(0..noIpContexts))OF IpContext

IpContext::=SEQUENCE{
     serviceID       ITSaid,
     contextData     IpContextData,
     ipInfo          IpInfo
}

-- MF-SAP services --

GCctxTxCmd::=SEQUENCE{
     link            LLserviceAddr, -- NT protocol and UC-VCI
     ctx             CTX
     }

GCperiodCmd::=SEQUENCE{
     applicationID   ApplicationID,
     bcVCIs          SEQUENCE  (SIZE(1..256)) OF LLserviceAddr,
     gcInterval      GcInterval, -- repetition interval
     priority        UserPriority, -- of advertisement
     serviceDataReg  ServiceDataReg -- advertisement details
     }
```

```
GCsamctx::= SEQUENCE{
     applicationID ApplicationID, -- unique in the host
     serverID      StationID, -- of peer station
     serviceInfo   ServiceInfo,
     link          LLserviceAddr
     }

GCsamctxConf::= SEQUENCE{
     port          PortNumber -- dynamically assigned port number to be used in CTX
     }

GCdeleteCmd::=SEQUENCE{
     applicationID   ApplicationID
     }

ServiceInfo::=SEQUENCE{
     fill      BIT STRING (SIZE(7)),
     info      CHOICE{
                    nonipService   NonipSAMctx,
                    ipService      IpSAMctx
               }
     }

NonipSAMctx::=SEQUENCE{
     serviceID     ITSaid,
     providerPort  PortNumber
     }

IpSAMctx::=SEQUENCE{
     serviceID     ITSaid,
     ipInfo        IpInfo
     }

-- MN-SAP services --

CTXrxNot::=SEQUENCE{
     link          LLserviceAddr,
     ctx           CTX
     }

SAMrxNot::=SEQUENCE{
     link          LLserviceAddr,
     sam           SAM
     }

GCsam::= SEQUENCE{
     applicationID  ApplicationID,  -- unique in the host
     serverID       StationID,  -- peer station
     serviceData    SAMserviceData,
     link           LLserviceAddr
}

SAMserviceData::=SEQUENCE{
     fill            BIT STRING (SIZE(7)),
     servData        CHOICE{
                          nonipService  NonipSAM,
                          ipService  IpSAM
                     }
     }

NonipSAM::=SEQUENCE{
     serviceID         ITSaid,
     serviceData       ServiceData,
     providerPort      PortNumber,
     sessionChannel    SessionChannel
}

IpSAM::=SEQUENCE{
     serviceID         ITSaid,
     serviceData       IpServiceData,
     ipInfo            IpInfo,
```

```
     sessionChannel    SessionChannel
     }

GCctx::= SEQUENCE{
     applicationID    ApplicationID, -- unique in the host
     clientID         StationID, -- peer station
     serviceContext   CTXserviceData
     }

CTXserviceData::=SEQUENCE{
     fill           BIT STRING (SIZE(7)),
     servData       CHOICE  {
                            nonipContext  NonipContext,
                            ipContext  IpContext
                    }
     }

NonipContext::=SEQUENCE{
     serviceID      ITSaid,
     contextData    ContextData,
     userPort       PortNumber
     }

GCregServer::= SEQUENCE{
     applicationID   ApplicationID,
     gCschedule      GCschedule,
     priority        UserPriority,
     serviceDataReg  ServiceDataReg
     }

GCupdateServer::= SEQUENCE{
     applicationID   ApplicationID,
     gCschedule      GCschedule,
     fill            BIT STRING (SIZE(7)),
     serviceDataReg  SEQUENCE (SIZE(0..1)) OF ServiceDataReg
     }

GCderegServer::= SEQUENCE{
     applicationID   ApplicationID
     }

GCregClient::= SEQUENCE{
     applicationID   ApplicationID,
     priority        UserPriority,
     serviceID       ITSaid,
     contextData     ContextData
     }

GCupdateClient::= SEQUENCE{
     applicationID   ApplicationID,
     serviceID       ITSaid,
     contextData     ContextData
     }

GCderegClient::= SEQUENCE{
     applicationID   ApplicationID
     }

GCregServerConf::= SEQUENCE{
     applicationID   ApplicationID
     }

GCupdateServerConf::= SEQUENCE{
     applicationID   ApplicationID
     }

GCderegServerConf::= SEQUENCE{
     applicationID   ApplicationID
     }

GCregClientConf::= SEQUENCE{
```

```
     applicationID   ApplicationID
     }

GCupdateClientConf::= SEQUENCE{
     applicationID   ApplicationID
     }

GCderegClientConf::= SEQUENCE{
     applicationID   ApplicationID
     }


-- General types --
ServiceData::=OCTET STRING (SIZE(0..noServiceDataOctets))

ContextData::=OCTET STRING (SIZE(0..noContextDataOctets))

IpServiceData::=OCTET STRING (SIZE(0..noIpServiceDataOctets))

IpContextData::=OCTET STRING (SIZE(0..noIpContextDataOctets))

GCschedule::= SEQUENCE (SIZE(0..255)) OF GCsched

GCsched::= SEQUENCE{
     medium        MedType,
     directivity   Directivity,
     gcInterval    GcInterval
     }

ServiceDataReg::= SEQUENCE{
     fill        BIT STRING (SIZE(7)),
     datareg     CHOICE{
                      nonipData  [0] NonipServiceReg,
                      ipData  [1] IpServiceReg
                 }
     }

NonipServiceReg::=SEQUENCE{
     serviceID       ITSaid,
     timeout         NTtimeout, -- formerly named FASTtimeout
     serviceData     OCTET STRING (SIZE(0..noServiceDataOctets)),
     providerPort    PortNumber -- if not used, put PORT_UNK
}

IpServiceReg::=SEQUENCE{
     serviceID       ITSaid,
     serviceData     OCTET STRING (SIZE(0..noIpServiceDataOctets)),
     ipInfo          IpInfo
     }

GcInterval::=INTEGER(0..65535) -- in ms

NTtimeout::=INTEGER(0..65535) -- in s

IpInfo::=SEQUENCE{
     address         IpAddressInfo
     }

IpAddressInfo::=SEQUENCE{
     addressType     TransportAddressType,
     address         TransportAddress
     }

-- Values
-- to be corrected / confirmed

noNonipServices INTEGER::=255

noChannels INTEGER::=255

noIpServices INTEGER::=255
```

```
noNonipContexts INTEGER::=255

noIpContexts INTEGER::=255

noServiceDataOctets INTEGER::=65535

noIpServiceDataOctets INTEGER::=65535

noContextDataOctets INTEGER::=65535

noIpContextDataOctets INTEGER::=65535

versionNoFSAP INTEGER::=0 -- This standard

/*
  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
```

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1) Under development.

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