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Inteligentni transportni sistemi - Protokol objave hitre storitve (FSAP) (ISO 22418:2018)

Intelligent transport systems - Fast service announcement protocol (FSAP) (ISO 22418:2018)

Systèmes de transport intelligents - Protocole d'annonce de service rapide (FSAP) (ISO 22418:2018)

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Intelligent transport systems — Fast service announcement protocol (FSAP)

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

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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).

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

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

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This first edition cancels and replaces ISO 24102-5:2013 which has been technically revised.

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 deciding 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 Advertisement" based on the internationally harmonized message format specified in ISO/TS 16460:2016, and builds on top of any localized communications protocol stack.

WAVE service advertisement (WSA) specified in IEEE 1609.3[3] is interoperable with the service advertisement specified in this document. However this document supports more features from ISO/TS 16460:2016 than WSA does.

Understanding service advertisement and the related protocol specified in this document requires understanding of ISO/TS 16460:2016.

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 9 specifies conformance declaration.

— Clause 10 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 compliant with ISO 17423:2018.

— Annex C specifies details of the optional support of path and flow management for FSAP compliant with ISO 24102-6:2018.

— Annex D presents the implementation conformance statement proforma.

Intelligent transport systems — Fast service announcement protocol (FSAP)

1 Scope

This document specifies the "Fast Service Announcement Protocol" (FSAP).

FSAP is in support of 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 16460:2016, and further related protocol requirements for operation of FSAP in the context of an ITS station specified in ISO 21217:2014.

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 — Part 2: 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 16460:2016, *Intelligent transport systems — Communications access for land mobiles (CALM) — Communication protocol messages for global usage*

ISO 17419, *Intelligent Transport Systems — Cooperative ITS — Globally unique identification*

ISO 17423:2018, *Intelligent Transport Systems — Cooperative ITS — Application requirements for selection of communication profiles*

ISO 21217:2014, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

ISO 21218, *Intelligent Transport Systems — Hybrid communications — Access technology support*

ISO 24102-3, *Intelligent Transport Systems — ITS station management — Part3: Service access points*

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

ISO 24102-6:2018, *Intelligent Transport Systems — 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 21217:2014 apply.

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

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

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

4 Symbols and abbreviated terms

FSAM	Fast service advertisement message
FSAP	Fast service announcement protocol
FSRM	Fast service response message
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
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 16460:2016 is a normative part of this document.

The "Fast Service Announcement Protocol" (FSAP) specified in this document shall be identified in FSAP application protocol data units (APDUs) by the version number three.

APDUs specified in this document are the "Fast Service Advertisement Message" (FSAM) and the "Fast Service Response Message" (FSRM).

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).

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 & transport layer by

— the well-known registered ITS port number (ITS-PN) PORT_SAM = 1 = 0x00.01 published on [10], identifying the FSAP port that is receiving groupcasted S-FSAMs, and

— 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 application identifier (ITS-AID) 2.113.664 published on [10]; 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 be compliant with ISO 24102-6:2018.

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 be compliant with ISO 24102-4.

As

— identical message formats for service advertisement are used in IEEE 1609.3[2] (WAVE SAM) and ETSI TS 102 890[16] (ESAM), and

— the features specifications in IEEE 1609.3[2] and ETSI TS 102 890[16] 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:

— WAVE SAM support

1) The only supported access technology is IEEE 802.11 OCB mode specified in IEEE 802.11[4] (ISO 21215[6] 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[2], which uses the same message format as FNTP with TPID-FS zero[8].

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[8]).

4) The WAVE SAM is identical to FSAM.

5) S-FSAM (Security encapsulated FSAM) uses the same format and encoding as WAVE does. WAVE security is specified in IEEE 1609.2[3].

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

— ESAM support

1) The only supported access technology is IEEE 802.11 OCB mode (ISO 21215[6] with EU frequency allocation and ETSI-specific details).

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

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

4) The ESAM is identical to FSAM except that ESAM is 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.

6 Architecture

6.1 ITS communications architecture

The "FAST Service Announcement Protocol" (FSAP) is designed as a functionality of the ITS station and communication architecture specified in ISO 21217:2014.

6.2 Implementation architecture

The "Fast Service Announcement Protocol" (FSAP) specified in this document supports the implementation architectures introduced in ISO 21217:2014.

6.3 Communication roles and entities

The "FAST Service Announcement Protocol" (FSAP) distinguishes the following roles identified in ISO/TS 16460:2016:

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.

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 21217:2014 (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[8].

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 preferably are 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 application identifier (ITS-AID) specified in ISO 17419; ITS-AID points to an ITS application object.

NOTE 1 Usage of some allocated ITS-AID values may not be 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 originally was motivated by the two ITS application objects

1) ITS application class[1] and

2) ITS application,

and was extended

3) to allocate private communication channels to individual ITS station units (ITS-SUs).

Option one, originally designed for ITS application classes (DSRC-like SrvIniP)[1], 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 [1], BST corresponds functionally to FSAM, and VST corresponds functionally to FSRM.

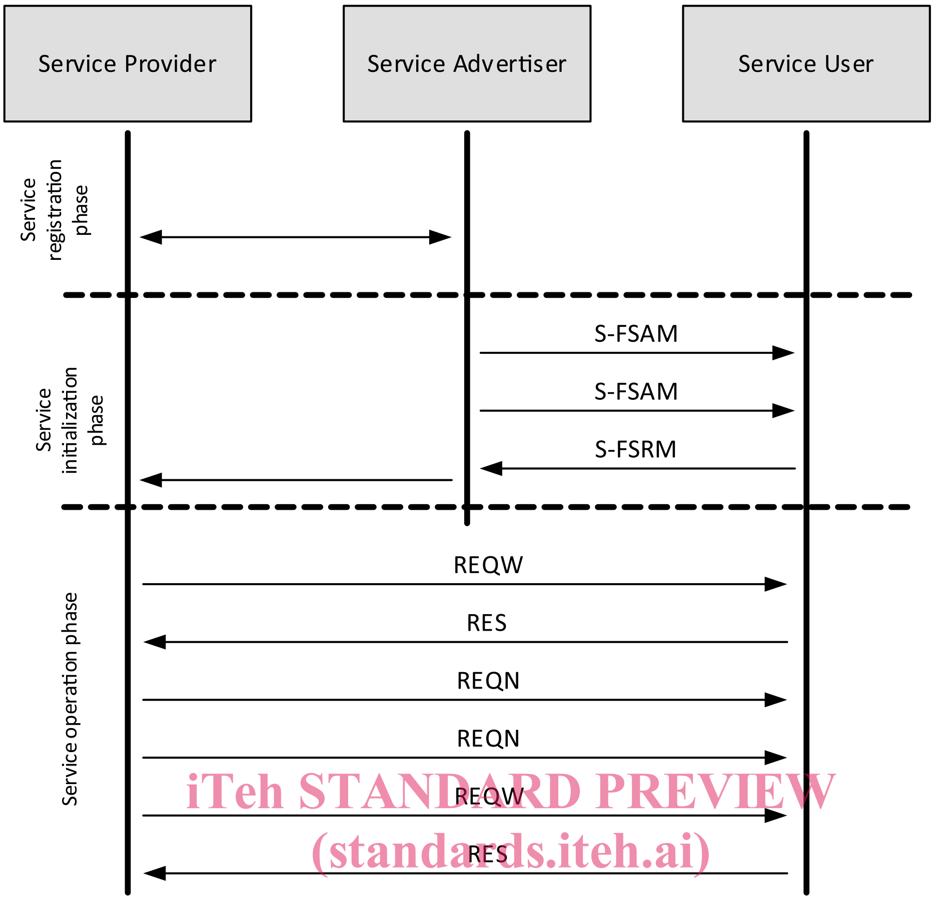

Figure 1 — ITS application session with FSRM

NOTE 3 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 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, 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,

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 [1]. In general, for ITS there are no such rules.

NOTE 5 As specified in ISO 21217:2014, 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 two, originally designed for ITS applications (WAVE-like SrvIniP)[2], 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.

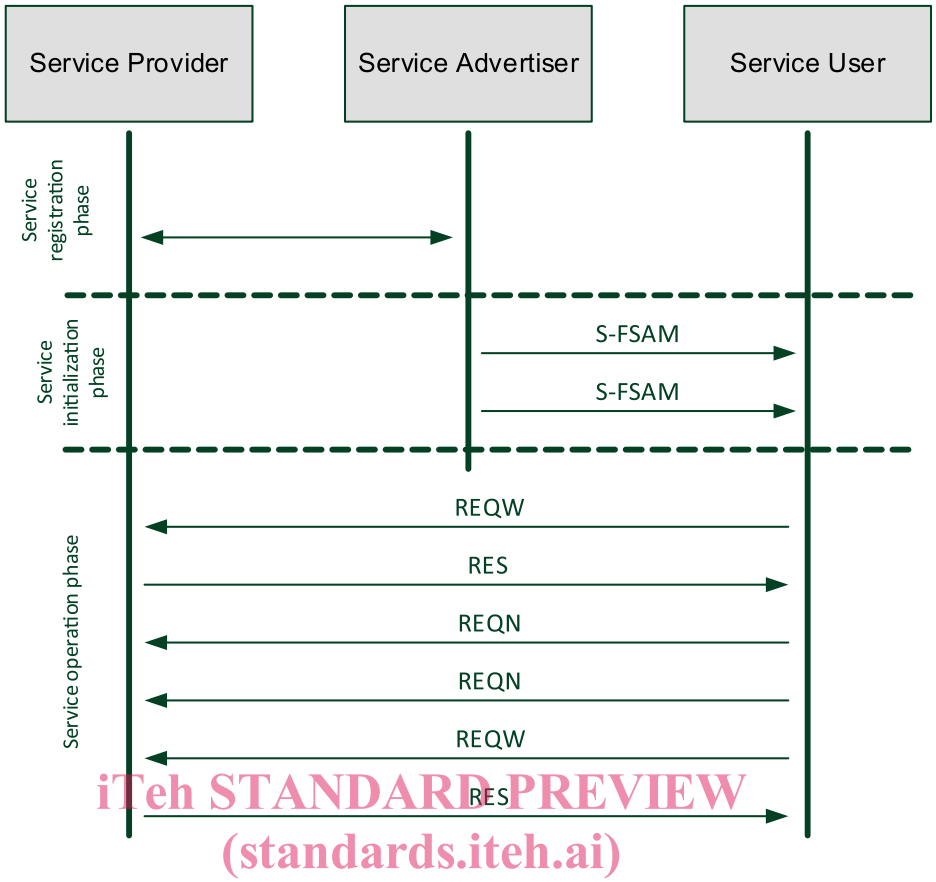

Figure 2 — ITS application session without FSRM

During a SrvOpP

— 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,

dependent on the specification of the ITS application.

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

Option three 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. The option three 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.