ITS Stations

Webinar 2021-01-12

13:00 – 15:00 CET

CEN/TC 278 PT1605

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Status of PT1605

PT1605 runs from April 2019 through June 2021.

Standard development is finished. All deliverables are approved.

- Technical Specifications
  1. CEN/ISO TS 21177 "Secure sessions" (already published)
  2. CEN/ISO TS 21176 "Position, velocity, time facility" (already published)
  3. CEN/ISO TS 21184 "Global transport data management (GTDM) framework" (in the process of publication)
  4. CEN/TS 17496 "Communication profiles" (in the process of publication)
- Technical Reports providing guidelines on the usage of C-ITS standards
  1. CEN/ISO TR 21186-1 "Global standardisation landscape" (already published)
     - C-ITS Brochure
  2. CEN/ISO TR 21186-2 "Hybrid communications" (in the process of publication)
  3. CEN/ISO TR 21186-3 "Cyber security" (in the process of publication)

PT1605 (http://its-standards.eu/PTs/PT1605/index.html) is offering a sequence of webinars. Please contact webinar@its-standards.eu.

CEN/TC 278 PT1605

ITS stations

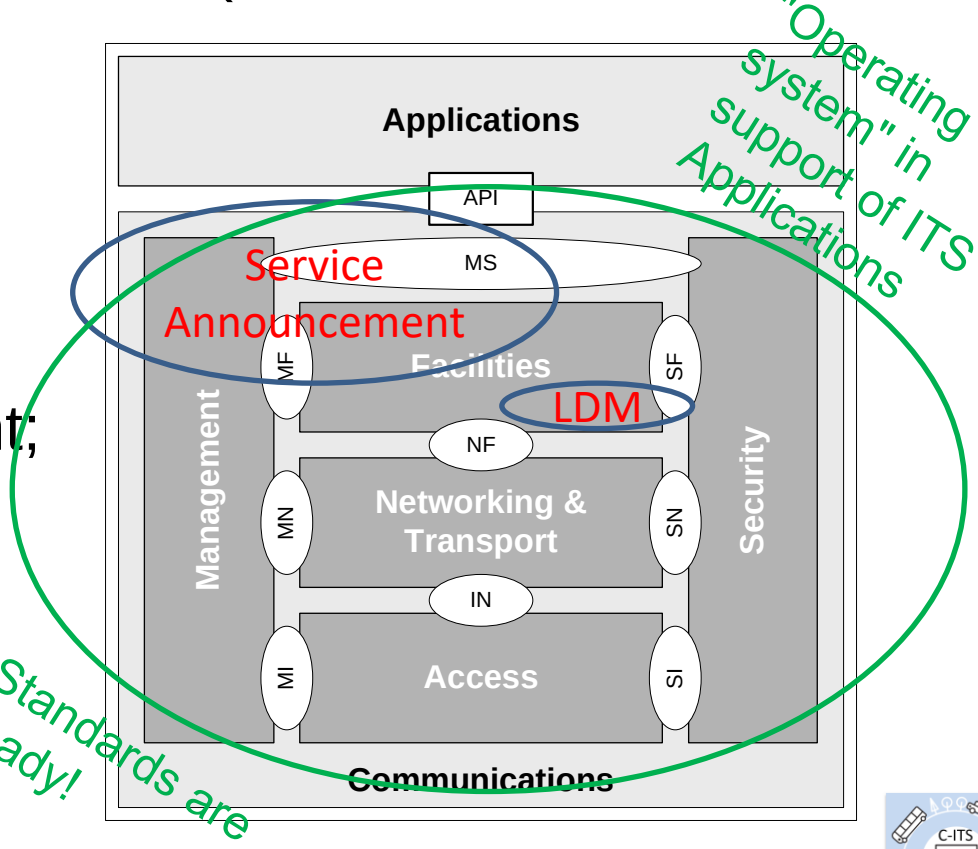
Facilities (Service Announcement, Local Dynamic Map)

Lifecycle management

Basics on "ITS stations"

The term "ITS station" is used with different meanings:

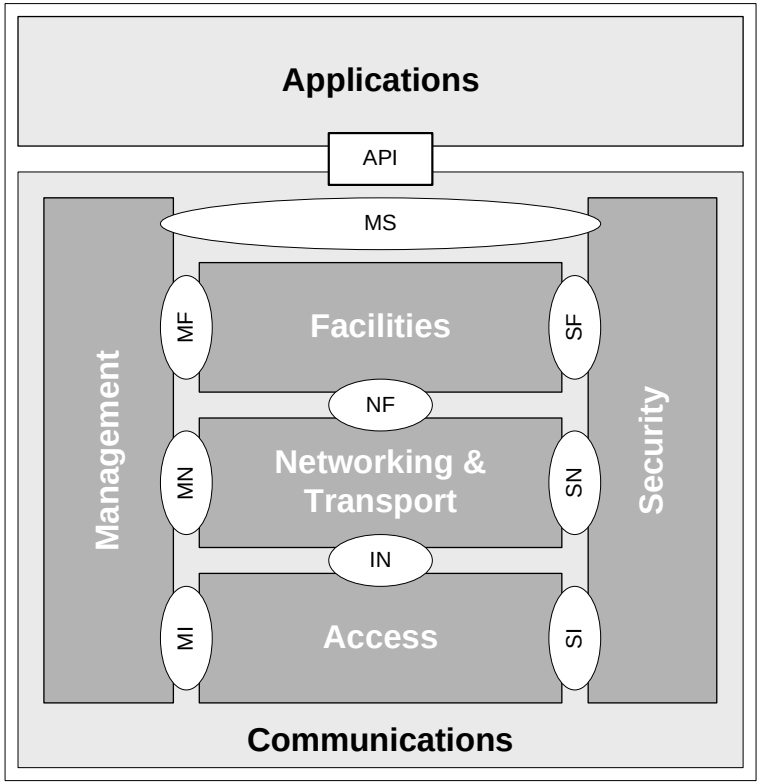
- ✓ a physical device used in Intelligent Transport Systems in various implementation contexts (roadside, vehicle, centre, portable/personal);
- ✓ a functional architecture specified in ISO 21217 with normative requirements on security and lifecycle management;
- ✓ an architectural station model used in many standards to explain the topic being specified.



Lifecycle management

During the lifecycle of an implementation of the "ITS station" functionality, such a physical device needs continuous local and remote management.

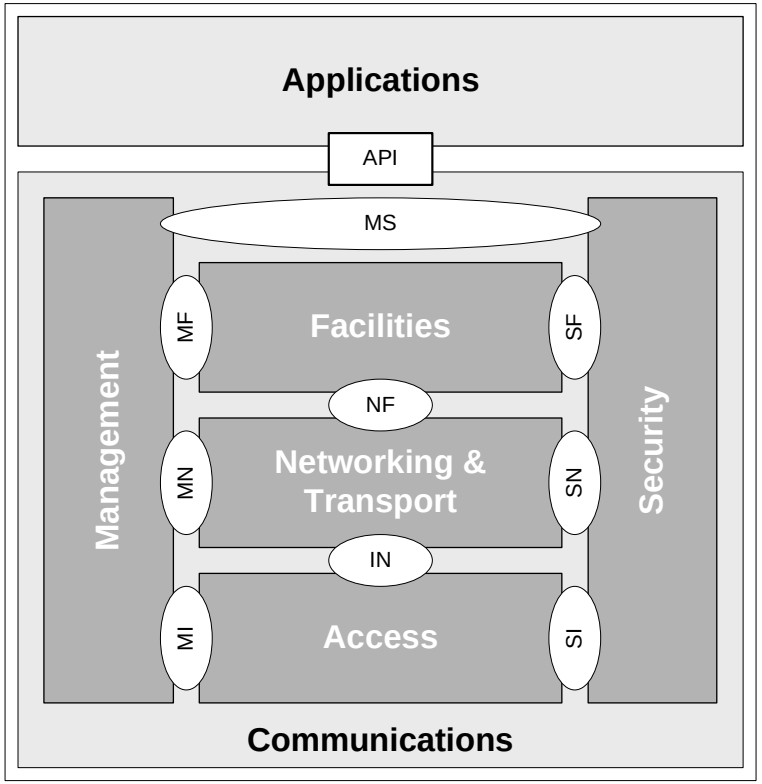
- ✓ the functional behaviour of station management is specified e.g. in ISO 24102 parts 1 (local), 2 (remote), 4 (station-internal);
- ✓ a real implementation may depend on the technological platform used;
- ✓ more details will be presented in a subsequent webinar.



"ITS station management centre": update of firmware, software and data.

Facilities

Strictly speaking, the ITS-S facilities layer is a combination of the OSI layers 5, 6, and 7. More generally, the term "facilities" points to tools offered to other entities in the ITS station, e.g. to the Applications and to other Facilities.



Examples of facilities are:

- ✓ PVT service (TS 21176)
- ✓ LDM (EN ISO 18750)
- ✓ GTDM framework (TS 21184)
- ✓ Message handler / publish-subscribe service (TS 17429)
- ✓ Service announcement (EN ISO 22418).

Service provisioning

A prerequisite for performing an ITS service is the knowledge about existence of such a service:

- a-priori knowledge (example: CA service or DEN service broadcast data; message parsers use station-internal publish-subscribe mechanisms including LDM)
- pulling of information (example: Google search)
- push of information (examples:
  - ✓ service announcement EN ISO 22418 - typically broadcast of SAMs from a roadside ITS-SU
  - ✓ local dynamic map EN ISO 18750).

Note: a special approach is to use the LDM as a "virtual roadside ITS-SU" for "station-internal broadcast" of SAMs at a defined geographical location.

FSAP: EN ISO 22418

ISO 16460 specifies basics of service announcement, and is used in the Service Announcement Profiles

- IEEE 1609.3 WSA: for US DSRC
- ETSI EN 302 890-1: for ITS-G5 only
- EN ISO 22418 "Fast Service Announcement Protocol (FSAP): full support of all features of ISO 16460, and supporting any kind of access technology

which are using the same frame structure of the service announcement message (SAM).
Using the same technology for broadcast of SAMs, the three profiles are "interoperable".

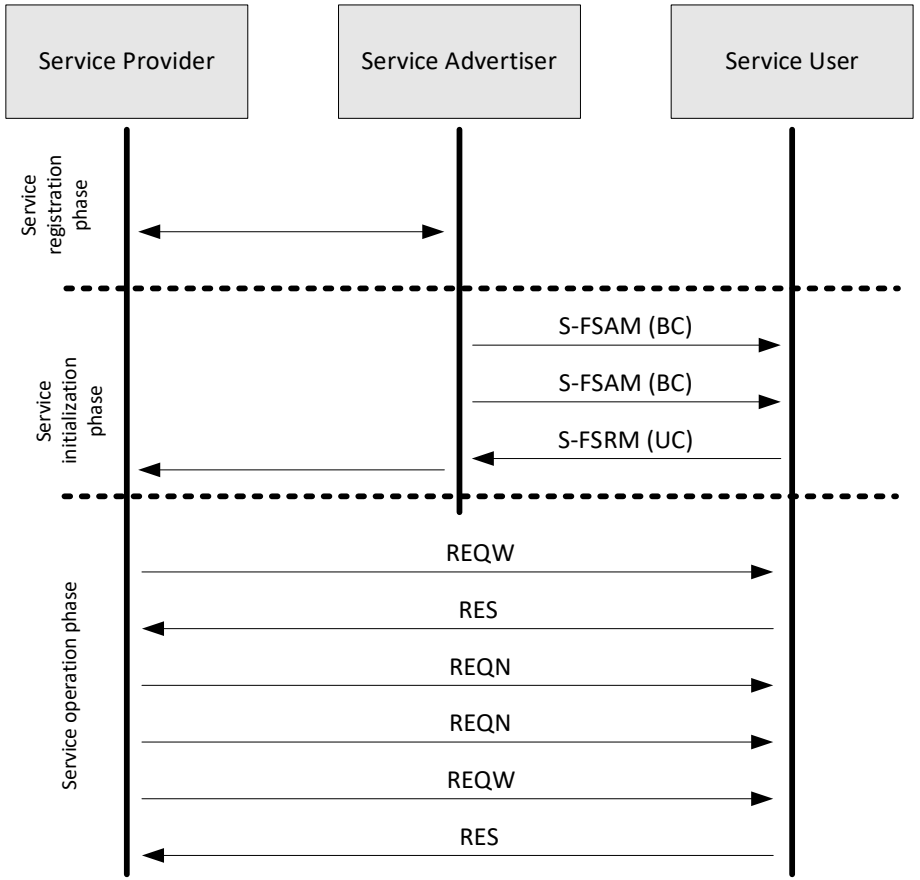
Note that the IEEE and ETSI profiles do not mandate to support all optional features and the service response message (SRM).

FSAP modes of operation

EN ISO 22418 supports all three modes of operation:

- ✓ "traditional mode"
  SAM (broadcast) /
  SRM (unicast)
  - ➢ private acknowledge-ment of SAM

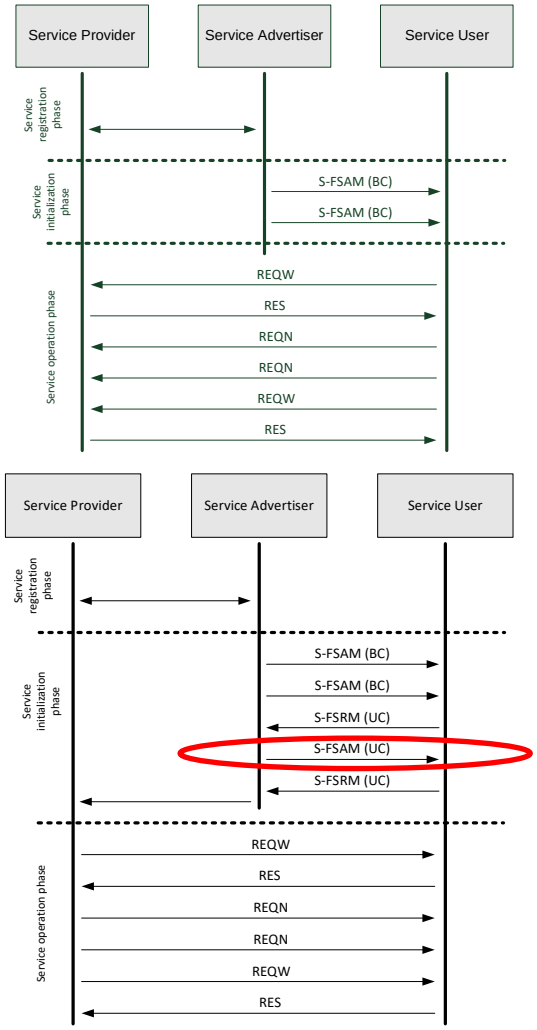
  (similar to DSRC BST / VST, using the same set of application identifiers, and the concept of application contexts)



FSAP modes of operation

- ✓ "simple mode":
  - ➢ only broadcast of SAM
  - ➢ only ITS applications; no ITS appl. classes (i.e. application contexts are not supported!)

- ✓ additional private SAM
  - ➢ to confirm allocation of a private service channel



FSAP Extensions

Extensions are a means to make FSAP future proof, applying "Information Object Classes / Sets"

SAM extensions

Element ID	Element type (ASN.1)	Element name
c-2Dlocation = 5	TwoDLocation	2D Location (specified in IEEE 1609.3™-2016) of advertiser station
c-3Dlocation = 6	ThreeDLocation	3D Location (specified in IEEE 1609.3™-2016) of advertiser station
c-advertiserID = 7	AdvertiserIdentifier	Advertiser Identifier (specified in IEEE 1609.3™-2016)
c-RepeatRate = 17	RepeatRate	Repeat Rate of SAM (specified in IEEE 1609.3™-2016)
c-ExtendedChannelInfos = 84	ExtendedChannelInfos	Extended Channel Info Segment
New proposal: c-LdmAnnouncerInfo	LdmAnnouncerInfo	Time and location reference for notification of the SAM by the LDM

Service Info extensions

Element ID	Element type (ASN.1)	Element name
c-ProviderServContext = 8	ProviderServiceContext	Provider Service Context (PSC) (specified in IEEE 1609.3™-2016)
c-IPv6Address = 9	IPv6Address	IPv6 Address of service provider (specified in IEEE 1609.3™-2016)
c-servicePort = 10	ServicePort	Service Port (specified in IEEE 1609.3™-2016)
c-ProviderMACaddress = 11	ProviderMacAddress	Service provider MAC address (specified in IEEE 1609.3™-2016)
c-RCPIthreshold = 19	RcpiThreshold	RCPI Threshold (specified in IEEE 1609.3™-2016)
c-WSAcountThreshold = 20	WsaCountThreshold	SAM Count Threshold (specified in IEEE 1609.3™-2016)
c-WSAcountThresInt = 22	WsaCountThresholdInterval	SAM Count Threshold Interval (specified in IEEE 1609.3™-2016)
c-SAMapplicationData = 85	SAMapplicationData	SAM Application Data

could contain all information of an information service

FSAP Extensions

Channel Info extensions

Element ID	Element type (ASN.1)	Element name
`c-EDCAparameterSet` = 12	`EdcaParameterSet`	EDCA Parameter Set (specified in IEEE 1609.3™-2016)
`c-ChannelAccess` = 21	`ChannelAccess80211`	Channel Access (specified in IEEE 1609.3™-2016)

Routing Info extensions

Element ID	Element type (ASN.1)	Element name
`c-SecondaryDNS` = 13	`SecondaryDns`	Secondary DNS (specified in IEEE 1609.3™-2016)
`c-GatewayMACaddress` = 14	`GatewayMacAddress`	Gateway MAC address (specified in IEEE 1609.3™-2016)

Highlights - LDM

LDM acts as virtual service announcer:

If the newly proposed SAM extension `LdmAnnouncerInfo` is present, the SAM shall be stored in the LDM rather than to be processed directly.

The LDM shall notify a stored SAM to the FSAP receive processor once the ITS-SU is in the area indicated in `LdmAnnouncerInfo`, and the actual time is within the validity time indicated in `LdmAnnouncerInfo`.

```
LdmAnnouncerInfo ::= SEQUENCE{
    location      ThreeDLocation,
    time          TimeValidity
    }
```

Goal: Format of data in LDM is the GTDM format (TS 21184)

Highlights – private service channel

A roadside ITS station unit (R-ITS-SU) acting as a service announcer / provider may use an ITS-M5 (IEEE 802.11 OCB) multi-channel transceiver with SAM transmission in the respective C-ITS channel, and service channels in the BRAN band (5,4 – 5,7 GHz) with channel spacings exceeding 10 MHz.

This allows to significantly increase the channel capacity of ITS-M5 for local C-ITS service provisioning.

Applying this method of operation may require regulatory clarifications on the usage of the BRAN band with the OCB mode and DFS performed by the R-ITS-SU.

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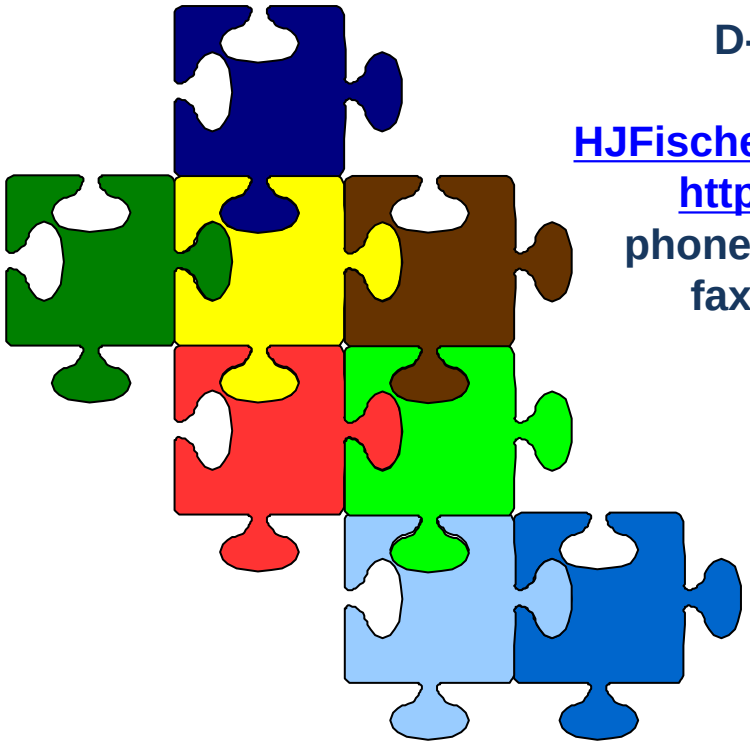

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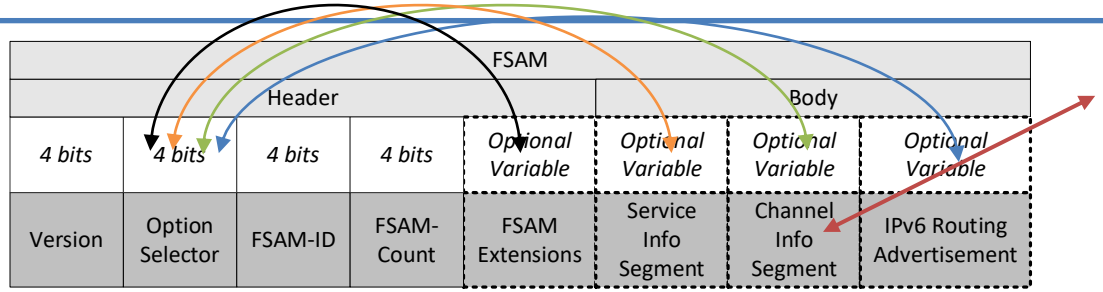
Complementary slides

Service Announcement Message



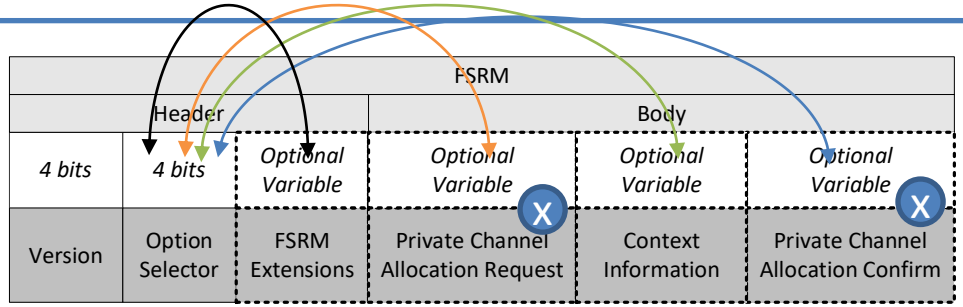
Dedicated to ITS-M5 / US-DSRC / ITS-G5.
An FSAM Extension extends this feature to any communication protocol stack.

Extensions are a means to make FSAP future proof, applying "Information Object Classes / Sets"

Table 1 — SAM body configurations

Service Info Segment	Channel Info Segment [a]	Routing Advertisement	Informative explanations
absent	absent	absent	Empty SAM
present	absent	absent	Service advertisement. Service accessible on the same radio channel as used for SAM
absent	present	absent	Invitation to switch a receiver to the indicated channel.
present	present	absent	Service advertisement One or several services accessible on a different radio channel as used for SAM
absent	absent	present	Advertisement of access to an IPv6 network (e.g. Internet) on the same radio channel as used for SAM.
present	absent	present	Service advertisement. Service accessible on the same radio channel as used for SAM. Usage of IPv6 communications.
absent	present	present	Advertisement of access to an IPv6 network (e.g. Internet) on a different radio channel as used for SAM.
present	present	present	Service advertisement One or several services accessible on a different radio channel as used for SAM. Usage of IPv6 communications.

Service Response Message



x: typically mutually exclusive

Table 1 — SRM body configurations

simple

complex

Private Channel Allocation Request	Context Information	Private Channel Allocation Confirm	Informative explanations
absent	absent	absent	Empty SRM. Potential usage is not specified.
present	absent	absent	Reply to an advertised ITS Application that requires assignment of a private communication channel.
absent	present	absent	Reply to an advertised ITS Application Class, providing context information.
present	present	absent	Reply to an advertised ITS Application and / or an ITS Application Class that requires assignment of a private communication channel, together with the provision of context information related to an ITS Application Class.
absent	absent	present	Acknowledgement of a privately allocated channel
present	absent	present	Typically not used. Combination of an acknowledgement of a privately allocated channel with a new reply to an advertised ITS Application that requires assignment of a private communication channel.
absent	present	present	Combination of an acknowledgement of a privately allocated channel with a reply to an advertised ITS Application Class, providing context information.
present	present	present	Typically not used. Combination of an acknowledgement of a privately allocated channel with a new reply to an advertised ITS Application and / or ITS Application Class that requires assignment of a private communication channel.

Secured messages

Secured message				
Header			Body	Trailer
4 bit	*4 bit*	*Optional Variable*	*Variable*	*Optional Variable*
Version	Security Option Selector	Security Header	Original or processed FSAM / FSRM	Security Trailer

No specific security means required.
It is recommended to sign SAMs the same way as CAMs are signed.

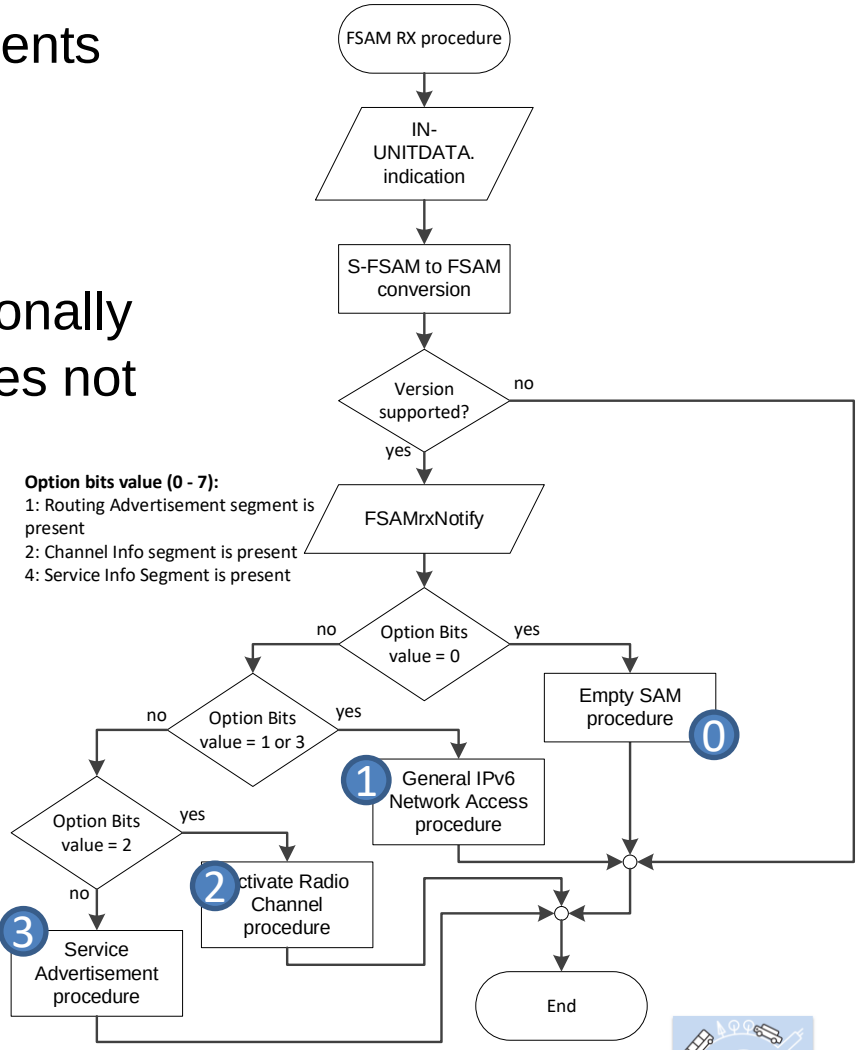
FSAP SAM options

0: SAM is empty. All previous announcements from the given advertiser station are deprecated.

1: IPv6 Routing Advertisement, and optionally also Channel Info available. This SAM does not announce a specific C-ITS service.

2: Channel Info only. This SAM does not announce a specific C-ITS service.

3: This SAM announces specific ITS services, and optionally contains IPv6 Routing Advertisement, Channel Info, and FSAM Extensions.



FSAP SRM options

0: Reply to an advertised ITS Application that requires assignment of a private communication channel.

1: Acknowledgement of a privately allocated channel.

2: Reply to an advertised ITS Application Class, providing context information.