INTERNATIONAL STANDARD

**ISO 24102**

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# Intelligent transport systems — Communications access for land mobiles (CALM) — Management

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

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 24102 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

# 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 International Standard determines the intelligent transport systems (ITS) station management.

# Intelligent transport systems — Communications access for land mobiles (CALM) — Management

## 1 Scope

This International Standard provides specifications for intelligent transport systems (ITS) station management to be compliant with the ITS station reference architecture and the set of communications access for land mobiles (CALM) related standards.

Management actions are specified via

a) service access points,

b) messages and data that flow between the ITS station management entity and the security entity, the application entity and the various communication protocol layers of the ITS station reference architecture, and

c) protocol data units for management communications between addressable instances of functionality of an ITS station.

## 2 Normative references

The following referenced documents are indispensable for the application 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)*

ISO 15628:2007, *Road transport and traffic telematics — Dedicated short range communication (DSRC) — DSRC application layer*

ISO 21210, *Intelligent transport systems — Communications access for land mobiles (CALM) — IPv6 Networking*

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

ISO 21218:2008, *Intelligent transport systems — Communications access for land mobiles (CALM) — Medium service access points*

ISO 29281, *Intelligent transport systems — Communications access for land mobiles (CALM) — Non-IP networking*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21217, ISO 21210, ISO 29281, ISO 21218, and the following apply.

NOTE Terminology in the set of CALM standards was modified during the process of harmonizing International Standards. This might lead to an editorial difference in terms used in this International Standard and in other International Standards from the set of CALM standards. These editorial differences will be resolved during the ongoing process of harmonizing the whole set of CALM standards.

**3.1**
**regulatory information**
set of regulatory requirements for radio wave emission

**3.2**
**ITS-S communication unit**
addressable instance of the ITS station reference architecture comprising as a minimum the ITS-S router functionality

NOTE ITS-SCU (ITS-S communication unit) previously was named CCK (CALM communication kernel).

## 4 Abbreviated terms

For the purposes of this document, the abbreviated terms given in ISO 21217, ISO 21210, ISO 29281, ISO 21218, and the following apply.

| | |
|---|---|
| CI | Communication Interface |
| ETSI | European Telecommunications Standards Institute |
| ITS-SCU | ITS Station Communication Unit |
| ITSSI | ITS State Information |
| LDM | Local Dynamic Map |
| MAC | Medium Access Control |
| MIB | Management Information Base |
| MF-COMMAND | command issued by the ITS station management entity and sent to the facilities layer via the MF-SAP |
| MF-REQUEST | command issued by the facilities layer and sent to the ITS station management entity via the MF-SAP |
| MI-COMMAND | command issued by the ITS station management entity and sent to the access layer via the MI-SAP |
| MI-GETPARAM | command issued by the ITS station management entity in order to get the value of one or several CI parameters; it is sent via the MI-SAP to the access layer |
| MI-REQUEST | command issued by the access layer and sent to the ITS station management entity via the MI-SAP |
| MI-SETPARAM | command issued by the ITS station management entity in order to set the value of one or several CI parameters. It is sent via the MI-SAP to the access layer |
| MN-COMMAND | command issued by the ITS station management entity and sent to the networking and transport layer via the MN-SAP |

| | |
|---|---|
| MN-REQUEST | command issued by the networking and transport layer and sent to the ITS station management entity via the MN-SAP |
| n.a. | not applicable |
| PDUs | Protocol Data Units |
| QoS | Quality of Service |
| RI | Regulatory Information |
| SAF | Service Advertisement Frame |
| SCF | Service Context Frame |
| SID | Service Identifier |
| STA | Service Table for Advertisement |
| VCI | Virtual Communication Interface |

NOTE During the process of harmonizing the CALM standards, the SAP names were changed. Subsequently, the names of services and service primitives changed accordingly.

## 5 Requirements

The ITS station management entity specified in this International Standard 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

— station-local management communications (Inter-ITS-SCU communications) enabling a sub-division of an ITS station into several addressable entities, e.g. hosts and routers,

in line with the general ITS architecture specified in ISO 21217.

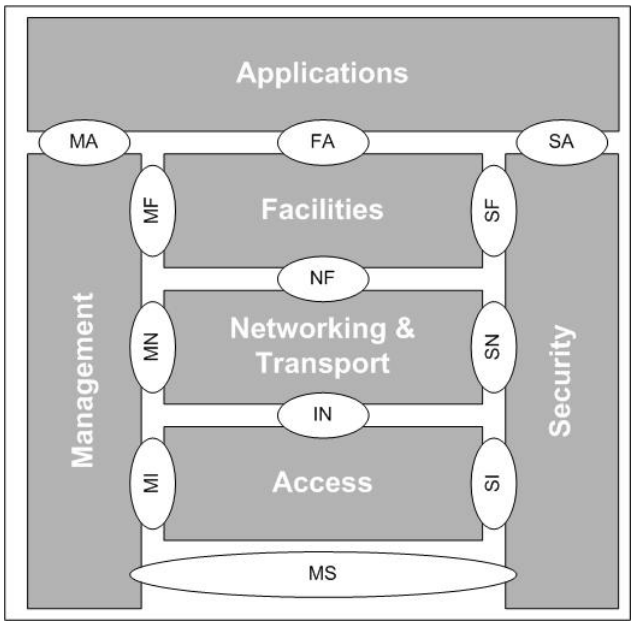


**Figure 1 — ITS station reference architecture with named interfaces**

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

The ITS station management entity shall provide the service primitives of the

a) MI-SAP, specified in ISO 21218,

b) MN-SAP, specified in this International Standard,

c) MF-SAP, specified in this International Standard.

NOTE 1 SAPs can be non-exposed interfaces. Thus service primitives of SAPs are not subject to conformance tests.

NOTE 2 The MA-interface presented in Figure 1 is not specified in this International Standard, although it is recognized as part of the ITS station reference architecture specified in ISO 21217.

The ITS station management entity shall use the service primitives provided in the NF-SAP, specified in ISO 29281 and in ISO 21210 for the purpose of "Inter-ITS-SCU Communication".

NOTE 3 Figure 18 in ISO 21217 presents details on the ITS-SCU, i.e. an extension on the basic ITS station reference model presenting the NF-SAP connected to the management entity.

Means to secure the access to management functionality need to be specified within the global context of CALM security. This may require, e.g. defining further Inter-ITS-SCU communication PDUs for authentication of ITS-SCUs. Details are outside the scope of this International Standard.

Detailed mandatory requirements are specified in the following clauses of this International Standard.

— Clause 6 specifies "Inter-ITS-SCU communications", i.e. how management commands are exchanged between different addressable entities of an ITS station.

— Clause 7 specifies basic management procedures related to communication interfaces.

— Clause 8 specifies groupcast management.

— Clause 9 specifies FAST service provisions.

— Clause 10 specifies congestion control.

— Clause 11 specifies the concept of "Radar View" and the link to the "Local Dynamic Map" (LDM) application.

— Clause 12 specifies communication interfaces (CI) selection management.

— Clause 13 specifies management of "Legacy CIs".

— Clause 14 specifies management data elements.

— Clause 15 specifies the MN-SAP of the networking and transport layer.

— Clause 16 specifies the MF-SAP of the facilities layer.

— Clause 17 specifies conformance declaration and test methods.

— Annexes provide further mandatory requirements.

# 6 Inter-ITS-SCU communication

## 6.1 Basics

Management communications between ITS-SCUs of the same ITS station, as specified in ISO 21217, shall be based on the ITS station-internal network presented in ISO 21217.

NOTE Installations can provide technically different realizations of the ITS station internal network which can be used to carry inter-ITS-SCU management packets. Details are outside the scope of this International Standard.

The following protocol data units (PDU) shall be used:

— ITS-SCU-Mngmt-Request;

— ITS-SCU-Mngmt-Response.

Details on parameters of these PDUs are shown in Table 1.

**Table 1 — Inter-ITS-SCU management PDUs**

| PDU element | ITS-SCU-Mngmt-Request | ITS-SCU-Mngmt-Response |
|---|---|---|
| **SourceITS-SCU-ID** | ITS-SCU-ID of source ITS-SCU, which produces the request. See parameter 3 "ITS-scuId" specified in Annex A. | ITS-SCU-ID of ITS-SCU, which produces the response. |
| **DestinationITS-SCU-ID** | ITS-SCU-ID of destination ITS-SCU, which shall evaluate the request. | Same as SourceITS-SCU-ID of related request if not requested otherwise in this International Standard. |
| **PDU-Counter** | Even number generated from a cyclic counter at the ITS-SCU, which produces the request. | PDU-Counter of related request incremented by one. |
| **PDU-ID** | Unique identifier of the content of the request. | Same as in ITS-SCU-Mngmt-Request. |
| **Data** | Octet string specific to the PDU-ID, carrying the request. | Octet string specific to the PDU-ID, carrying the response. |
| **ErrorStatus** | Not existent. | Existent.<br>0: No error happened<br>>0: Number indicating type of error. |

Figure 2 illustrates Table 1. The element "SourceITS-SCU-ID" shall be transmitted first. In a serial communication link, the most significant byte of an element shall be transmitted first, and the least significant bit of a byte shall be transmitted first.

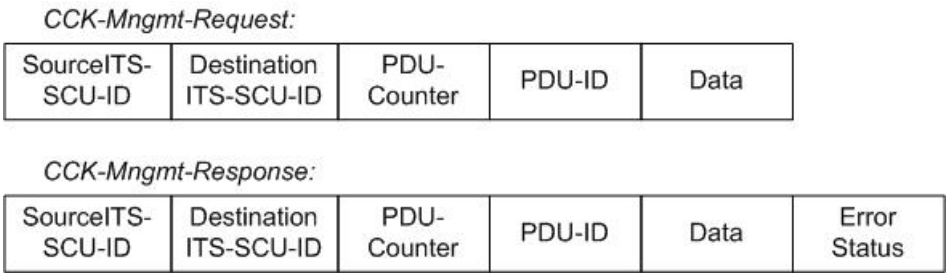


**Figure 2 — Inter-ITS-SCU PDU structure**

The ASN.1 specification of the PDUs is provided in Annex B of this International Standard.

NOTE PDU-ID and Data are coded together in an ASN.1 "CHOICE" type. The ASN.1 tag number equals the PDU-ID.

ITS-SCU-ID values used in parameters "SourceITS-SCU-ID" and "DestinationITS-SCU-ID" shall be as specified in Table 2.

**Table 2 — ITS-SCU-ID value assignment**

| SourceITS-SCU-ID | DestinationITS-SCU-ID | Description |
|---|---|---|
| 0 | | Reserved. Used to indicate "own/local ITS-SCU". |
| n.a. | 1 | ITS-SCU-ID identifying ITS-SCUs of all hosts. |
| n.a. | 2 | ITS-SCU-ID identifying ITS-SCUs of all routers. |
| 3 - 7 | | Reserved for future use. |
| 8 .. 254 | | ITS-SCU-ID identifying uniquely a specific ITS-SCU in an ITS station. |
| n.a. | 255 | ITS-SCU-ID identifying all ITS-SCUs, i.e. those of hosts and routers. |

"PDU-ID" values and the related "Data" values shall be set as specified in Annex C of this International Standard.

"ErrorStatus" values shall be set as specified in Table 3.

**Table 3 — ErrorStatus value assignment**

| ErrorStatus | Description |
|---|---|
| 0 | No error |
| 1 | PDU-ID unknown or not implemented |
| 2 | Duplicate ITS-SCU-ID |
| 3 .. 254 | Reserved for future use |
| 255 | Unspecified error |

## 6.2 Procedures

### 6.2.1 PDU-Counter

"PDU-Counter" values shall be set uniquely in an ITS-SCU under the control of the ITS station management entity issuing the request. For every next ITS-SCU-Mngmt-Request PDU, the counter value shall be incremented by two. It shall wrap from 254 to zero.

### 6.2.2 ITS-SCU-ID assignment

The ITS-SCU shall randomly generate a unique ITS-SCU-ID as specified in Table 2 as its own ITS-SCU-ID and shall put the selected ITS-SCU-ID to its local ITS-SCU-list. ITS-SCU-ID values already being in the local ITS-SCU-list indicate usage by another ITS-SCU in the same station and shall not be selected. Then the ITS-SCU-Mngmt-Request 0 "ITS-SCU-id(new)" shall be sent to all ITS-SCUs, indicating a first choice of ITS-SCU-ID in the "SourceITS-SCU-ID element, or a new choice of ITS-SCU-ID, and the type of ITS-SCU in the "Data" element. In case of a negative acknowledgement, i.e. indication of usage of this ITS-SCU-ID value by another ITS-SCU, see below, the ITS-SCU shall repeat the procedure with a new ITS-SCU-ID value.

Upon activation, an ITS-SCU may listen to receive ITS-SCU-Mngmt-Request 0 "ITS-SCU-id" messages or ITS-SCU-Mngmt-Response 0 "ITS-SCU-id" messages in order to identify already allocated ITS-SCU-IDs.

Upon reception of an ITS-SCU-Mngmt-Request 0 "ITS-SCU-id(new)", an ITS-SCU shall check the SourceITS-SCU-ID.

— If the SourceITS-SCU-ID is equal to the own ITS-SCU-ID, the receiving ITS-SCU shall send an ITS-SCU-Mngmt-Response 0 "ITS-SCU-id" to all ITS-SCUs, reporting the own ITS-SCU-ID and type of ITS-SCU to all ITS-SCUs, indicating ErrorStatus=2.

— If the SourceITS-SCU-ID is different to the own ITS-SCU-ID, the ITS-SCU shall take this information to its local ITS-SCU-list, if not already present there. An existing entry shall not be updated with this new information. The ITS-SCU shall acknowledge the ITS-SCU-Mngmt-Request with the ITS-SCU-Mngmt-Response 0 "ITS-SCU-id", reporting the own ITS-SCU-ID and type of ITS-SCU, indicating ErrorStatus=0.

Upon reception of an ITS-SCU-Mngmt-Request 0 "ITS-SCU-id(alive)", an ITS-SCU shall check the SourceITS-SCU-ID.

— If the SourceITS-SCU-ID is equal to the own ITS-SCU-ID, the receiving ITS-SCU shall send an ITS-SCU-Mngmt-Response 0 "-id" to all ITS-SCUs, reporting the own ITS-SCU-ID and type of ITS-SCU to all ITS-SCUs, indicating ErrorStatus=2. All ITS-SCUs with this ITS-SCU-ID shall invalidate this ITS-SCU-ID and shall start the procedure to select a new ITS-SCU-ID.

— If the SourceITS-SCU-ID is different to the own ITS-SCU-ID, the ITS-SCU shall take this information to its local ITS-SCU-list, if not already present there. The ITS-SCU-Mngmt-Request shall not be acknowledged with an ITS-SCU-Mngmt-Response.

Upon reception of an ITS-SCU-Mngmt-Response 0 "ITS-SCU-id", an ITS-SCU shall check the ErrorStatus.

— In case of ErrorStatus=0, the ITS-SCU shall take this information to its local ITS-SCU-list, if not already present there.

— In case of ErrorStatus=2, an address conflict was detected. The procedure to be selected upon this event depends on the value of "Message" and SourceITS-SCU-ID contained in the ITS-SCU-Mngmt-Response as presented in Table 4.

**Table 4 — Error handling procedure for ITS-SCU-Mngmt-Response 0**

| ITS-SCU-Mngmt-Response 0 "ITS-SCU-id (ErrorStatus = 2)" | SourceITS-SCU-ID = own ITS-SCU-ID | SourceITS-SCU-ID ≠ own ITS-SCU-ID |
|---|---|---|
| Message = new | Map ITS-SCU-ID to ITS-SCUtype reported in the response.<br><br>Restart ITS-SCU-ID assignment process. | Nothing shall be done. |
| Message = alive | **IMPORTANT — This should never happen.**<br><br>Reset ITS-SCU and restart ITS-SCU-ID assignment process. | **IMPORTANT — This should never happen.**<br><br>Delete SourceITS-SCU-ID from local ITS-SCU-list.<br><br>Request deletion of related entries in forwarding tables. |
| Message = delete | **IMPORTANT — This should never happen.**<br><br>Nothing shall be done. | |

AN ITS-SCU shall be considered to be fully alive only upon first successful reception of ITS-SCU-Mngmt-Request 0 "ITS-SCU-id(alive)".

### 6.2.3 Maintenance of ITS-SCU-ID

Every ITS-SCU shall periodically transmit the "alive-signal" Mngmt-Request 0 "ITS-SCU-id(alive)" in order to indicate its presence in the ITS station. The period of transmission shall be as set in parameter 11 "Talive" specified in Annex A. The value of "Talive" shall be defined by implementation and shall be unique in an ITS station.

The ITS-SCU periodically shall check the local ITS-SCU-list. If for a period of at least three times "Talive" no "alive-signal" Mngmt-Request 0 "ITS-SCU-id(alive)" was received, the ITS-SCU shall assume that this ITS-SCU is no longer alive. The ITS-SCU-ID shall be deleted from the local ITS-SCU-list.

### 6.2.4 Deletion of ITS-SCU-ID

Deletion of an ITS-SCU-ID from the local ITS-SCU-list shall result in deleting all related entries in forwarding tables.

### 6.2.5 Shut-down of ITS-SCU

Prior to performing a shut-down of ITS-SCU, the Mngmt-Request 0 "ITS-SCU-id(delete)" message shall be sent to all ITS-SCUs.

# 7 CI basic management

## 7.1 General

Basic management procedures related to communication interfaces (CI) shall access a CI/VCI via the MI-SAP specified in ISO 21218.

Any change of status of a CI/VCI shall be reported to all ITS-SCUs with ITS-SCU-Mngmt-Request 10 "VCI-update". Reception of such a notification shall not be acknowledged.

Management communications with CIs/VCIs in other ITS-SCUs shall be with Inter-ITS-SCU communication PDUs 5 "MI-rcmd", 6 "MI-rreq", 7 "MI-rget" and 8 "MI-rset" as specified in this International Standard.

SAPs and the related service primitives can not be tested and are not mandatory. However in the context of this International Standard, the elements of the service primitives may be an integral part of PDUs exchanged between physical entities in an ITS station using "Inter-ITS-SCU Communications". As PDUs are testable, those elements of service primitives that are part of a PDU become testable.

## 7.2 CI status

### 7.2.1 CI state machine

Figure 3 shows the CI state machine specified in ISO 21218.

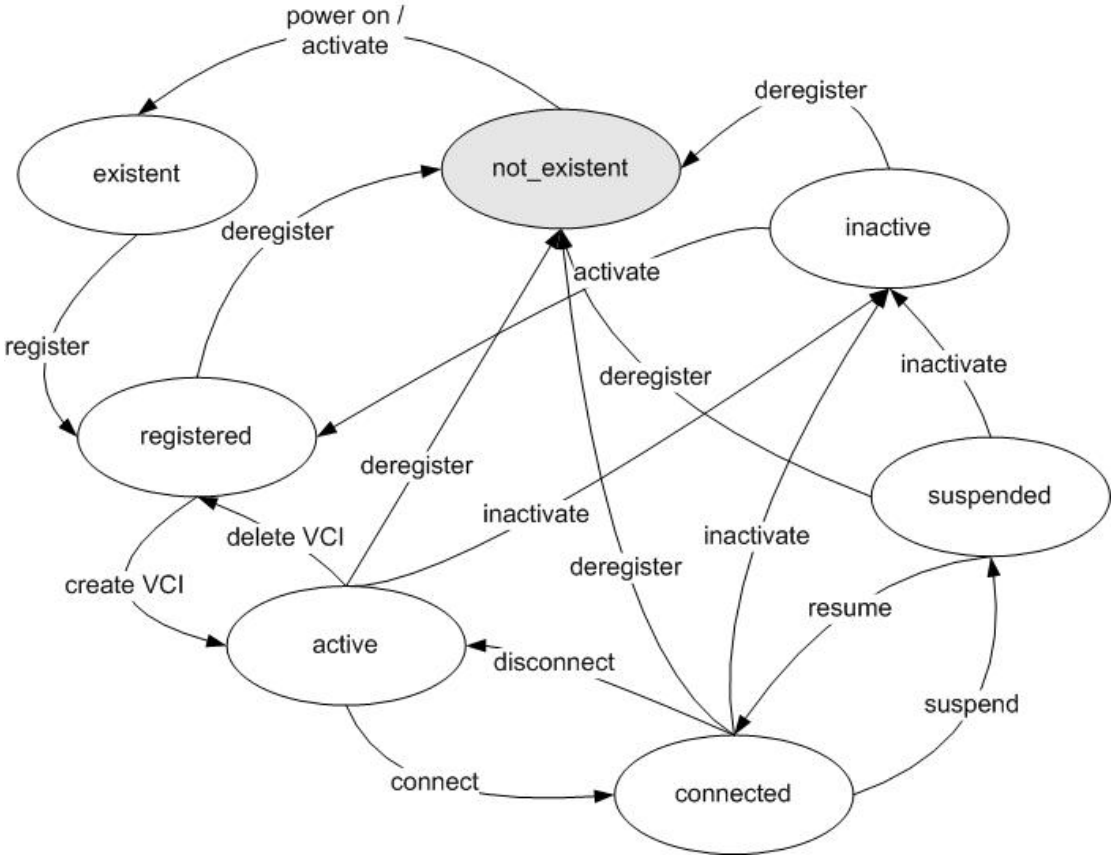


**Figure 3 — CI state machine ISO 21218**

NOTE ISO 21218:2008 uses the term "reactivate" instead of "resume".

### 7.2.2 Registration

Registration of a CI at the ITS station management entity is the process to make the CI known to the ITS station management entity, and to make it addressable via a unique MedID, see ISO 21218.

Registration of a CI shall be done as specified in ISO 21218.

The medium identifier MedID, part of the CI-ID as specified in ISO 21218, and assigned to a CI during the process of registration shall be generated randomly. The MedID shall be unique within an ITS-SCU.

Upon successful registration of a CI, the ITS station management entity shall create an entry in the VCI list with the values specified in Table 5.

**Table 5 — Entry in VCI list upon registration of CI**

| CI-ID | Medium | CI/VCI Status | ConnectMode | NWsupport | Peer MAC address |
|---|---|---|---|---|---|
| ITS-SCU-ID and MedID set. SerialNumber set to zero. CtrlCI bits set to zero. | Set equal to MI-parameter 22 "Medium". See ISO 21218. | "registered", see ISO 21218. | Set equal to MI-parameter 51 "Connect". | Set equal to MI-parameter 23 "NWsupport". | Set to zero. |

### 7.2.3 VCI creation

Creation of a VCI may be done

— upon request of the ITS station management entity, or

— upon request of a networking protocol, or

— by the CI on its own.

Creation of a VCI shall be done as specified in ISO 21218.

Upon successful creation of a VCI the ITS station management entity

— shall create an entry in the VCI list with the values specified in Tables 6, 7 and 8, as applicable,

— shall create initial entries in the forwarding tables of all supported networking protocols using MN-COMMAND 1, if applicable.

**Table 6 — Entry in VCI list indicating an active CI**

| CI-ID | Medium | CI/VCI Status | ConnectMode | NWsupport | Peer MAC address |
|---|---|---|---|---|---|
| ITS-SCU-ID and MedID set. SerialNumber set to zero. CtrlCI bits set to zero. | Set equal to MI-parameter 22 "Medium". See ISO 21218. | "active", see ISO 21218. | Set equal to MI-parameter 51 "Connect". | Set equal to MI-parameter 23 "NWsupport". | Unknown, set to zero. |

**Table 7 — Entry in VCI List upon creation of a broadcast VCI**

| CI-ID | Medium | CI/VCI Status | ConnectMode | NWsupport | Peer MAC address |
|---|---|---|---|---|---|
| ITS-SCU-ID and MedID set. SerialNumber set to 65535. G/U bit set to 1. Other CtrlCI bits set to zero. | Set equal to MI-parameter 22 "Medium". See ISO 21218. | "active", see ISO 21218. | Not used. Set equal to MI-parameter 51 "Connect". | Set equal to MI-parameter 23 "NWsupport". | Not used. Set to zero. |

**Table 8 — Entry in VCI List upon creation of a multicast VCI**

| CI-ID | Medium | CI/VCI Status | ConnectMode | NWsupport | Peer MAC address |
|---|---|---|---|---|---|
| ITS-SCU-ID and MedID set. SerialNumber set to multicast group number. G/U bit set to 1. Other CtrlCI bits set to zero. | Set equal to MI-parameter 22 "Medium". See ISO 21218. | "active", see ISO 21218. | Not used. Set equal to MI-parameter 51 "Connect". | Set equal to MI-parameter 23 "NWsupport". | Not used. Set to zero. |

Upon request of a networking protocol to create a VCI with a specific relation to a peer station, of which the MAC address is known a priori, and with specific settings of the MI-parameters, the ITS station management entity shall create the VCI and perform all required settings. The state of the VCI shall be set to "connected", see Table 9. The ITS station management entity shall update the VCI list and the forwarding tables.

### 7.2.4 Deregistration

Deregistration of a CI at the ITS station management entity is the process reversal to the registration process. Successful deregistration is a prerequisite to remove a CI from the system during operation.

Deregistration of a CI may be done

— by the CI on its own,

— upon request of the ITS station management entity as specified in this International Standard.

Deregistration of a CI shall be done as specified in ISO 21218.

Upon successful deregistration, the ITS station management entity

— shall delete all entries of this CI and the related VCIs in the VCI list,

— may re-use the value of MedID of this CI, but only in case there are no more so far unused MedID values available for registration of a new CI, and

— shall delete all entries of this CI and the related VCIs in the forwarding tables using MN-COMMAND 3.

NOTE Not to reuse a MedID value immediately allows the upper OSI layers to "time-out", i.e. to avoid addressing conflicts.

### 7.2.5 Inactivation

Inactivation of a CI is the process to reset the CI and to block all subsequent communications.

Inactivation of a CI may be done upon request of the ITS station management entity.

NOTE Conditions when a CI shall or may be inactivated are not specified in this International Standard.

Inactivation of a CI shall be done as specified in ISO 21218.

Upon successful inactivation, the ITS station management entity

— shall change the status element of this CI in the VCI list to "inactive", and shall delete the entries of all related VCIs in the VCI list,

— change the CI state of this CI in the forwarding tables to "inactive", and shall delete the entries of all related VCIs in the forwarding tables using MN-COMMAND 3.

### 7.2.6 Activation

Activation of a CI is the process to enable communications in an inactive CI. Upon successful activation the ITS station management entity shall change the status element of this CI to the value "registered".

Activation of a CI may be done upon request of the ITS station management entity as specified in this International Standard.

NOTE Requirements on events upon which a CI shall or may be activated are not specified in this International Standard.

Activation of a CI shall be done as specified in ISO 21218.

Upon successful activation, the ITS station management entity shall change the status element of this CI in the VCI list to the value "registered".

### 7.2.7 Suspension of a CI

Suspension of a CI is the process to put all communications of a CI on hold, without deleting any packets or state variables.

Suspension of a CI may be done upon request of the ITS station management entity as specified in this International Standard.

NOTE Requirements when a CI shall or may be suspended are not specified in this International Standard.

Suspension of a CI shall be done as specified in ISO 21218.

Upon successful suspension, the ITS station management entity

— shall change the status element of this CI and the related VCIs in the VCI list to "suspended", and

— shall change the CI state of this CI and the related VCIs in the forwarding tables to "suspended" using MN-COMMAND 2.

### 7.2.8 Resuming

Resuming of a CI is the process to enable communications in a suspended CI.

Resuming of a CI may be done upon request of the ITS station management entity.

NOTE 1 Conditions when a CI shall or may be reactivated are not specified in this International Standard.

Resuming of a CI shall be done as specified in ISO 21218.

Upon successful resuming, the ITS station management entity shall change

— the status element of this CI in the VCI list to "active", and the status of the related VCIs in the VCI list to "connected", and

— the CI state of this CI and the related VCIs in the forwarding tables to "connected" using MN-COMMAND 2.

NOTE 2 This VCI state might be wrong. However this will be resolved automatically.

NOTE 3 ISO 21218:2008 uses the term "reactivation" instead of "resuming".

### 7.2.9 Connection

Connection establishment of a CI is the process to initiate and maintain a relation to a specific peer station. Distinction is made according to the CI access class.

Connection of a VCI may be done

— by the CI on its own,

— upon request of the ITS station management entity as specified in this International Standard.

Connection of a VCI shall be done as specified in ISO 21218.

Upon successful connection to a peer station, the ITS station management entity

— shall create an entry in the VCI list with the values specified in Table 9, and

— change the CI state of this VCI in the forwarding tables to "connected", using MN-COMMAND 2.

**Table 9 — Entry in VCI list upon creation of a unicast VCI**

| CI-ID | Medium | CI/VCI Status | ConnectMode | NWsupport | Peer MAC address |
|---|---|---|---|---|---|
| ITS-SCU-ID and MedID set. SerialNumber set to value, pointing to peer MAC address. CtrlCI bits set to zero. | Set equal to MI-parameter22 "Medium". See ISO 21218. | "connected", see ISO 21218. | Set equal to MI-parameter 51 "Connect". | Set equal to MI-parameter 23 "NWsupport". | Set equal to MAC address of peer station. |

There are media which do not provide information on the peer MAC address. For such media all bits of the "Peer MAC address" field in the VCI list shall be set to one.

#### 7.2.10 Disconnection

Disconnection of a VCI is the process to close relations to peer stations. Distinction is made according to the CI access class as specified in ISO 21218.

Disconnection of a VCI may be done

— by the CI on its own,

— upon request of the ITS station management entity as specified in this International Standard.

Disconnection of a VCI shall be done as specified in ISO 21218. Upon successful disconnection of a VCI by the ITS station management entity or by the CI, the ITS station management entity shall delete

— the entry of the VCI in the VCI list, and

— the entries of this VCI in the forwarding tables using MN-COMMAND 3.

#### 7.2.11 Deletion of a VCI

Deletion of a VCI may be done

— by the CI on its own,

— upon request of the ITS station management entity as specified in this International Standard.

Deletion of a VCI shall be done as specified in ISO 21218.

Upon successful deletion of a VCI the ITS station management entity shall delete

— the entry in the VCI list, and

— the entries of this VCI in the forwarding tables using MN-COMMAND 3.

### 7.3 Cross-CI prioritization

#### 7.3.1 General

Wireless TX-VCIs in an ITS station might suffer from cross-interference. This clause considers the case that at least two local TX-VCIs, e.g. using the same medium, need to be synchronized in order to avoid cross-interference. The procedure to synchronize transmission of multiple CIs based on user priority is called "Cross-CI prioritization".

The design and integration goal shall be to avoid such cross-interference as far as possible. A possible means to achieve this is proper assignment of orthogonal wireless communication channels to the CIs.

Priority management across CIs is a somewhat slow process which requires involvement of the ITS station management entity for every packet to be prioritized.

The procedure of cross-CI prioritization is an optional procedure. The part of it related to the CI is specified in ISO 21218.

NOTE An implicit option of cross-CI prioritization is CI protection. A CI to be protected is a device for radio communications such as passive transponder systems based on [4] and ISO 15628:2007 which can not harm other CIs.

In CI protection mode, the CI to be protected does not need to await the positive acknowledgement of a prioritization request, but may try to perform communication at any time.

### 7.3.2 Registration of CI for prioritization request

Upon request of a CI to register for the cross-CI prioritization procedure by means of the MI-REQUEST 1 "PrioReg", see ISO 21218, the ITS station management entity shall

— create the header of the prioritization table for this CI, see Table 21, containing the MedID of the CI and the timeout information. The list entries "Request number", "Priority" and "Status", if already created, shall be set to zero,

— evaluate the list of MedType information contained in "PrioReg" in order to identify the MedID and ITS-SCU-ID of all possible interferers in the ITS station, and

— create an entry in the prioritization table for each identified interferer with the interferer ITS-SCU-ID and MedID, and with "Status Interferer" set to "released".

### 7.3.3 Prioritization request

As specified in ISO 21218, a CI may request cross-CI prioritization by means of the MI-REQUEST 2 "RTSreq".

Upon reception of such a request, the ITS station management entity shall compare the presented priority with the minimum priority required for cross-CI prioritization given in parameter 1 "MinPrioCrossCI" specified in Annex A. If the presented priority is less than the minimum priority required, then the ITS station management entity shall notify unsuccessful prioritization to the requesting CI by means of MI-COMMAND "RTSackCmd", see ISO 21218, with priority set equal to parameter 1 "MinPrioCrossCI" and with status set to "ignored". Otherwise continue with the following steps.

The ITS station management entity shall

— either create or update the cross-CI prioritization list entries "Status", "Priority" and "Request number" as given in RTSreq,

— start a prioritization timer T_prioritization for this request,

— forward the prioritization request to all known potential interferers by means of the MI-COMMAND 3 "RTScmd", and shall update the status interferer entries in Table 21 to the value "requested",

— await acknowledgement messages from all interferers until end of the prioritization period, i.e. either

  — the timer T_prioritization expired according to the timeout value given in Table 21, or

  — the CI requesting prioritization released prioritization by means of MI-REQUEST 2 "RTSreq" with "status" set to "release".

Upon expiration of the timer T_prioritization, the ITS station management entity shall notify unsuccessful prioritization to the requesting CI by means of MI-COMMAND 4 "RTSackCmd" with "priority" set equal to parameter 1 "MinPrioCrossCI" and with "status" set to "ignored".

Upon reception of an acknowledgement message from an interferer, the ITS station management entity shall

— set the status of the interferer in Table 21 to "prioritization granted", and

— notify successful prioritization to the requesting CI by means of MI-COMMAND 4 "RTSackCmd" with "priority" set equal to parameter 1 "MinPrioCrossCI" and with status set to "granted" once all interferers disabled their transmitter.

The ITS station management entity shall apply "Inter-ITS-SCU communications" in case other ITS-SCUs need to be addressed.

### 7.3.4 Prioritization release

Upon the end of the prioritization period, the ITS station management entity shall

— send the prioritization release MI-COMMAND 3 "RTScmd" with status = "release" to all known potential interferers, and shall update Table 21 for this request, and

— stop the timer T_prioritization, if applicable.

The ITS station management entity shall apply "Inter-ITS-SCU communications" in case other ITS-SCUs need to be addressed.

## 7.4 VCI MIB

### 7.4.1 Basics

Upon registration of a CI, its RX-VCI and TX-VCI, if applicable, shall operate on the default MIB settings.

NOTE The default MIB settings are specified in the media standards.

### 7.4.2 Setting of parameter values

Setting of MIB values shall be done as specified in ISO 21218.

MIB settings of a VCI may be changed

— by the ITS station management entity according to rules specified in this International Standard,

— by the VCI on its own according to rules specified in the related medium standard.

MIB values shall be set in accordance with regulatory requirements, if applicable.

Transmit parameters of a VCI may be changed temporarily on a packet by packet basis applying CIP-management as specified in ISO 29281. This shall not affect VCI MIB-settings.

### 7.4.3 Retrieval of parameter values

Retrieval of MIB values - either of a single parameter, or of multiple parameters, or of the complete MIB - of a VCI shall be done as specified in ISO 21218.

Retrieval of MIB values may be done by the ITS station management entity according to rules specified in this International Standard.

### 7.4.4 Monitoring of parameters

CIs/VCIs shall notify the ITS station management entity of changes of the following parameters:

— those that are required to be reported, i.e. mandatory change notification according to Table 10,

— those requested by the ITS station management entity by means of the MI-COMMAND 10 "Monitor", see ISO 21218.

Table 10 shows those MI-parameters for which mandatory monitoring shall apply, and the related mandatory behaviour of the ITS station management entity upon notification of a new value. The ITS station management entity shall request automatic monitoring to be performed by all CIMAEs, see ISO 21218.

A specific access technology may not support all parameters listed in Table 10. Consequently, non-supported parameters never will change value, thus a notification never will happen.

Further parameters may be subject to automatic notification of value-changes as defined by implementation or according to other specifications.

### 7.4.5 Access to other ITS-SCUs

Direct access of the ITS station management entity in an ITS-SCU to the MIB of other ITS-SCUs shall be prohibited, except for the following cases:

— read only access;

— manufacturer access.

Access to an MIB of another ITS-SCU shall be achieved by means of the Inter-ITS-SCU PDUs "MI-rget" 7 and "MI-rset" 8, see Annex C.

**Table 10 — List of CI parameters subject to mandatory notification**

| M-Param.No | Parameter Name | Behaviour |
|---|---|---|
| 25 | RI | Upon notification of change of regulatory information, the ITS station management shall accept the new limits for subsequent operations until a new update of RI will be available. |
| 35 | MACaddrTemp | Upon notification of change of own MAC address, the ITS station management entity shall send "ITSSI Data", see ISO 29281, in a broadcast frame. |
| 42 | CIstatus | See 7.2. |
| The following parameters are contained in the VCI performance parameter list presented in Table 20. | | Upon notification of change of a performance parameter, the CI selection manager shall recalculate the mapping of ITS-S applications on CIs. |
| n.a. | ChannelType | |
| n.a. | ChannelNo | |
| 6 | DataRateNW | |
| 7 | DataRatesNW | |
| 9 | Directivity | |
| 11 | MinimumUserPriority | |
| 16 | CommRangeRef | |
| 17 | Cost | |
| 18 | Reliability | |
| All parameters subject to regulation, e.g. frequencies of operation, maximum transmit power. | | |

### 7.5 Regulatory information management

All ITS stations shall comply with regional regulations. Management of regulatory information (RI) uses mechanisms specified in ISO 21218. A request from the ITS station management entity to set one or more parameters in a CI/VCI that would violate the associated regulatory information contained in the CI/VCI shall result in a confirm from the CI/VCI containing the error code "RI VIOLATION" as specified in ISO 21218. Upon such an error indication, the ITS station management entity may

— retrieve from the CI/VCI the RI parameter values,

— retrieve RI from a trusted source,

— request new settings of RI in the CI.

### 7.6 Manufacturer access

A manufacturer of a CI may access its CI via the MI-SAP as specified in ISO 21218.

Access to the MI-SAP shall be performed applying "Inter-ITS-SCU Communications".

Access security is outside the scope of the set of CALM International Standards, i.e. the manufacturer shall implement its own security scheme.

## 8 Groupcast management

### 8.1 Architecture

Groupcasting is specified in ISO 29281.

Groupcast management handles data transmissions based on MAC groupcast frames, i.e. broadcast frames and multicast frames. The groupcast manager shall manage

— periodic groupcasting, especially FAST service advertisement,

— MAC management groupcast frames.

This International Standard specifies the elements and procedures of the groupcast manager.

### 8.2 Groupcast manager

The groupcast manager of an ITS-SCU shall perform the following tasks:

1) check whether a groupcast registration/update/de-registration request received via MF-SAP with MF-REQUESTs 1, 2, 3, 4, 5 and 6 specified in Annex E, either broadcast pool data or service advertisement information, can be satisfied at this ITS-SCU, and which CIs in this ITS-SCU shall groupcast which data and service advertisements using which network protocol;

2) if a groupcast registration/update/de-registration request can not be satisfied at this ITS-SCU, then this request shall be forwarded to the proper ITS-SCU using "Inter-ITS-SCU Communications" with PDU-ID 2, see Table C.1;

3) if a groupcast registration/update/de-registration request can be satisfied at this ITS-SCU, it shall be forwarded to the proper groupcast scheduler via the MN-SAP using MN-COMMAND 4 specified in Annex F;

4) check whether groupcast data received from a groupcast scheduler via MN-SAP with MN-REQUESTs 6 and 7 specified in Annex G can be processed in the local ITS-SCU, or at which ITS-SCU the final recipient resides;

5) if received groupcast data can not be finally processed at this ITS-SCU, then these groupcast data shall be forwarded to the proper ITS-SCU using "Inter-ITS-SCU Communications" with PDU-ID 1;

6) if received groupcast data can be finally processed at this ITS-SCU, then these groupcast data shall be processed. The processing shall result in either sending service table contexts (STCs) via the MN-SAP using MN-COMMAND 5 or optionally forwarding the received groupcast data to the proper destination using MF-COMMANDs 1, 2 and 3 specified in Annex D;

7) manage FAST service session initialization as specified in ISO 29281 which includes maintenance of FAST forwarding tables using MN-COMMANDs 1, 2, 3 specified in Annex G;

8) handle MI-COMMANDs 9 "VCIcmd", 10 "Monitor" and 255 "UnitDataCmd" specified in ISO 21218;

9) handle MI-REQUESTs 9 "Events" and 255 "UnitDataReq" specified in ISO 21218;

10) handle MI-SETPARAM and MI-GETPARAM commands specified in ISO 21218 in order to manage parameters of VCIs.

# 9 FAST service provision

## 9.1 FAST services

FAST services are services provided to ITS-S applications that make use of the FAST networking protocol as defined in ISO 29281. These services are categorized as follows:

— registered service;

— non-registered service;

— forwarding of information in a standardized way to a registered actor, e.g. Man-Machine Interface (display, beeper, ...) or an actor in the vehicle.

All possibilities are treated equally, i.e. by means of a standardized service identifier (SID); see Table 15. SID is reported e.g. in the ASN.1 element serviceID; see Tables 11 and 13.

Syntax and semantics of the packets are known a-priori, partly to the communication system, and partly to the service.

Each service consists of a provider part, i.e. the service provider application, and a user part, i.e. the client (service user) application. Service user application and service provider application generally are referred to as ITS-S applications as specified in ISO 21217.

NOTE 1 ISO 29281 uses terms such as "client entity", "client groupcast manager", "client application". Within this International Standard, "client" and "service user", used in ISO 29281, are treated as synonyms. Terminology will be editorially aligned during the next revision of ISO 29281.

NOTE 2 Access of ITS-S applications, including those designed for the FAST protocol, to the communication protocol stack is controlled in order to ensure preferred operation of important ITS-S applications. Quality of service (QoS) means are specified in ISO 21218.

## 9.2 Frame flow

### 9.2.1 Overview

Communication is structured in a service initialization phase and a service operation phase as illustrated in Figures 4 and 5. During the service initialization phase, service advertisement frames (SAF) and service context frames (SCF) are exchanged.

NOTE Figures 4 and 5 show examples of the service operation phase. It is also possible to have requests without responses.

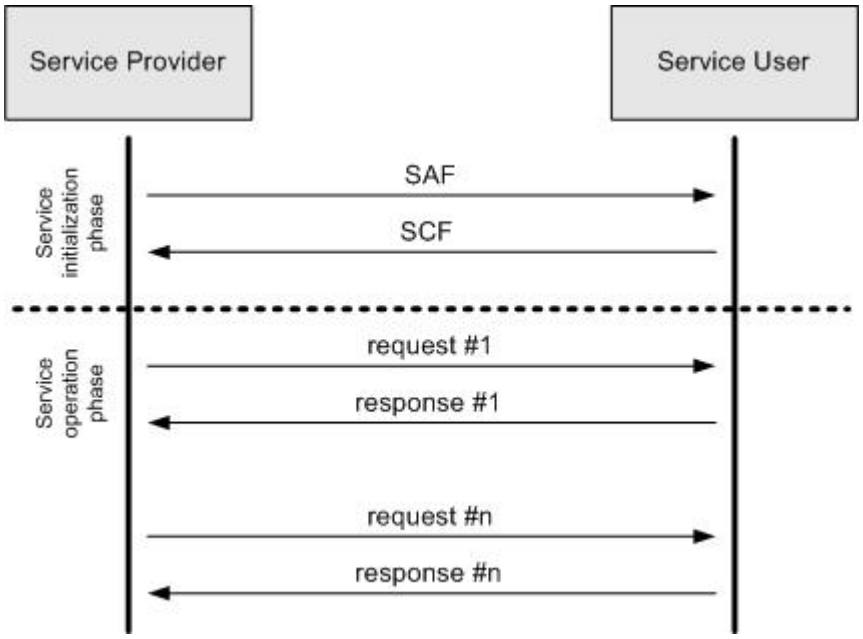


**Figure 4 — Service provision with SCF**

NOTE In case SCF is not present, request #1 will not be present. See the following Figure 5.

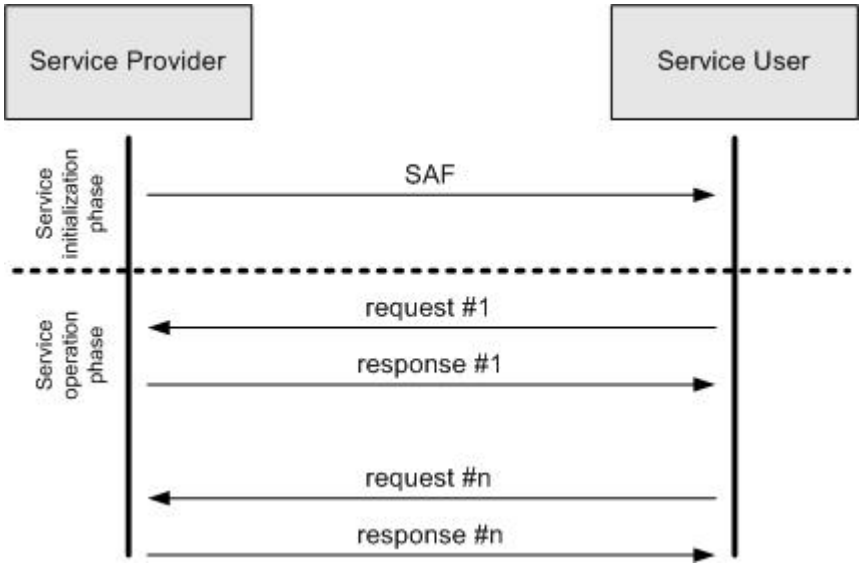


**Figure 5 —Service provision without SCF**

The frames presented in Figures 4 and 5 shall consist of a header and a body as presented in Figure 6. Such a header and body constitute the TPDU of the FAST networking protocol specified in ISO 29281. Details of the header and the body shall be as specified in Tables 11, 12, 13, 14, 16 and 17.

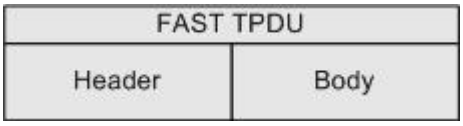


**Figure 6 — FAST service TPDU**

### 9.2.2 Service advertisement frame

A "Service Advertisement Frame" (SAF) shall be sent on request of the groupcast manager in the router. The "Service Table for Advertisement" (STA) represents the body contained in the SAF and shall be as specified in Table 11.

Either the serviceList or the ipServList shall be present.

The channelList shall be present only if the element serviceChannel is present in either serviceList or ipServList.

The iPprefixInfo shall be present only if the element ipServList is present.

**Table 11 — Service Table for Advertisement**

| Element | Type | Description |
|---|---|---|
| serviceList | SEQUENCE (SIZE (0..255)) OF SEQUENCE { serviceID INTEGER(0..127,...), serviceData OCTET STRING optional, serverNWref INTEGER(0..255) optional, serviceChannel INTEGER(0..255) optional } optional | serviceID: (registered) Unique SID<br><br>serviceData: Syntax and semantics depends on service.<br><br>serverNWref: NW header information for subsequent communication (pointer to location of local service for this service).<br><br>serviceChannel: Optional medium specific information on the logical channel to be used for subsequent communication. Present only if a channel different to the advertisement channel is to be used. Points to entry in channelList. Value only unique at this ITS station. |
| channelList | SEQUENCE (SIZE (0..255)) OF SEQUENCE { serviceChannel INTEGER(0..255), medium MedType schParams OCTET STRING } optional | serviceChannel: Those used in serviceList.<br><br>medium: Indicates type of CI.<br><br>schParams: Medium specific parameters of the referenced serviceChannel including MAC address. |
| ipServList | SEQUENCE (SIZE (0..255)) OF SEQUENCE { serviceID INTEGER(0..127,...), serviceData OCTET STRING optional, ipInfo SEQUENCE OF IpAddressInfo, serviceChannel INTEGER(0..255) optional } optional | serviceID: (registered) Unique SID<br><br>serviceData: Syntax and semantics depends on service.<br><br>ipInfo: Parameters of the IPv6 protocol of the service provider to be used during the service operation phase.<br><br>serviceChannel: Optional medium specific information on the logical channel to be used for subsequent communication. |
| ipPrefixInfo | SEQUENCE (SIZE (0..255)) OF IpPrefix optional | IpPrefix: Information on available IPv6 prefixes. |

How frequent the STA shall be updated is outside the scope of this International Standard.

How frequent a SAF shall be transmitted at a specific station depends on the priority of the registered services, and on the actual channel load.

The STA shall be preceded by a header specified in Table 12.

**Table 12 — Header for FAST services preceding STA**

| Element | Type | Description |
|---|---|---|
| messageType | INTEGER(0..7) | ServiceTableAdvertisement: 0 |
| serverID | OCTET STRING (SIZE(4)) | Unique identifier of a service provider station. See parameter 0 "StationID" specified in Annex A.<br>May be changed upon every power-on of the station, or on request of the ITS station management entity. |

### 9.2.3 Service context frame

The "Service Context Frame" (SCF) shall be sent by the service user groupcast manager, if applicable for this service, in order to notify details of a selected service. The "Service Table for Context" (STC) represents the body contained in the SCF and shall be as specified in Table 13.

Either the serviceContextList or the ipContext shall be present.

The iPprefixInfo shall be present only if the element ipContext is present.

**Table 13 — Service table for context**

| Element | Type | Description |
|---|---|---|
| serviceContext List | SEQUENCE (SIZE (0..255)) OF<br>SEQUENCE {<br>serviceID INTEGER(0..127,...),<br>serviceContext OCTET STRING,<br>userNWref INTEGER(0..255)<br>} optional | serviceID: (registered) Unique SID<br>serviceContext: Supported context of the related service. Syntax and semantics depends on serviceID.<br>userNWref: NW header information for subsequent communication (pointer to location of local service for this service context) |
| ipContext | SEQUENCE (SIZE (0..255)) OF<br>SEQUENCE {<br>serviceID INTEGER(0..127,...),<br>serviceContext OCTET STRING,<br>ipInfo SEQUENCE OF IpAddressInfo<br>} optional | Parameters of the IPv6 protocol of the service user to be used during the service operation phase. |
| ipPrefixInfo | SEQUENCE (SIZE (0..255)) OF IpPrefix optional | IpPrefix: Information on available IPv6 prefixes. |

The serviceContext provides information to the service provider needed to run the service. The userNWref is a pointer used in the FAST networking protocol.

The STC shall be preceded by a header specified in Table 14.

**Table 14 — Header for FAST services preceding STC**

| Element | Type | Description |
|---|---|---|
| messageType | INTEGER(0..7) | ServiceTableContext: 1 |
| clientID | OCTET STRING (SIZE(4)) | Unique identifier of a client station, i.e. an ITS station containing the service user application. See parameter 0 "StationID" specified in Annex A.<br>May be changed upon every power-on of the station, or on request of the ITS station management entity. |

### 9.2.4 Service identifier

Services shall be either defined in this International Standard, or shall be assigned by registration. Table 15 shows serviceIDs defined in this International Standard.

**Table 15 — Assignment of serviceID values**

| serviceID (SID) | Size in octets | Service description |
|---|---|---|
| 0 - 31 | 1 | Meaning of values shall be the same as specified in ISO 15628:2007 for DSRCApplicationEntityID. However the presentation in ASN.1 shall be INTEGER(0..127,…).<br>Usage of these numbers shall require FAST services built on STA and STC. ServiceData shall be prohibited in STA. serviceContext as present in STC may contain the optional elements ApplicationContextMark specified in ISO 15628:2007, ObeConfiguration specified in ISO 15628:2007, and FastContext as specified in this International Standard and as refined by the FAST applications.[ab] |
| 32 - 127 | 1 | Reserved for CALM.[c] |
| 128 – 2.097.151 | 2 / 3 | |
| 2.097.152 - 268.435.455 | 4 | Reserved for assignment of values by IEEE.[d] |

[a] ApplicationContextMark is defined in [6] and [7].

[b] The functionality provided by the element eid in ApplicationList specified in ISO 15628:2007 is given by the CALM FAST element userNWref. However the element eid is used in the original context in addition to the element userNWref.

[c] Registration of SID values is outside the scope of this International Standard.

[d] See ProviderServiceIdentifier in [8].

### 9.2.5 Service operation phase

During service operation phase, data packets are exchanged. Header and body shall be as specified in Tables 16 and 17.

**Table 16 — Data exchange - header**

| Element | Type | Description |
|---|---|---|
| messageType | INTEGER(0..7) | Request without response by application: 5<br>Request with response by application, i.e. transmission of response is expected: 6<br>Response: 7 |
| messageCounter | INTEGER(0..31) | Cyclic message counter.<br>Value set in request. Same value used in response. In the first request of a service session messageCounter shall be set to zero. |

**Table 17 — Data exchange - body**

| Element | Type | Description |
|---|---|---|
| data | OCTET STRING | Data dedicated to service |

The response message carries either user data requested by the related request or an error code only as defined by the application.

## 9.3 FAST service initialization phase

### 9.3.1 Service provider

A FAST service provider application (ITS-S application) shall register its offered service at the service provider groupcast manager. This registration shall include the ITS-SCU-ID of the host, the NWref generated by the process of creation of a socket, a service reference number being unique at the host ITS-SCU, the single required medium / the supported media, the globally unique serviceID, timeout information, the time period for transmission of service advertisement frames and optionally the serviceData, see Table 11.

NOTE 1 Whether serviceData are needed or not is a property of the service provider application.

NOTE 2 The optional information on serviceChannel is provided by the groupcast manager.

The groupcast scheduler of a service provider of the FAST networking protocol shall be in charge to request transmission of STA in a SAF in the selected groupcast mode. Requests for different services shall be performed in the same SAF, if applicable. The sourceAddress and destinationAddress in the FAST network header shall be set both to zero.

Upon reception of a SCF from the service user, the service provider groupcast manager shall update the entry in the FAST forwarding table, i.e. with values for CI-ID and peer Link NWref = userNWref, and shall notify the service provider application.

Upon reception of request #1 from the service user instead of SCF, the FAST network protocol shall update the FAST forwarding table.

### 9.3.2 Service user

A FAST service user application (ITS-S application) shall register its supported services at the service user groupcast manager without creating a socket. This registration shall include a service reference number being unique at the host ITS-SCU, the serviceID, timeout information, and optionally the serviceContext information, see Table 13.

NOTE 1 Whether serviceContext information is needed is a property of the service provider application.

NOTE 2 The groupcast manager interacts with the groupcast schedulers of the same ITS-SCU via MN-SAP.

The service user groupcast scheduler of the FAST networking protocol shall forward STA received from the service provider station to the service user groupcast manager.

Upon successful evaluation of the STA, if appropriate, the service user groupcast manager shall request creation of a socket for the service user application which includes assignment of the userNWref, subsequently shall notify the available service to the related service user application. The userNWref shall be uniquely mapped to the service reference number.

The service user, either the service user application or the groupcast manager, shall respond to a SAF with either a privately addressed SCF containing the STC, see Figure 4, or with a privately addressed request #1, see Figure 5, dependent on the necessity of the serviceContext information.

— The groupcast manager shall request transmission of the SCF with sourceAddress and destinationAddress in the FAST network header set both equal to zero.

— The service user application shall request transmission of request #1 with sourceAddress set equal to userNWref and destinationAddress set equal to serverNWref.

## 9.4 FAST service operation phase

Communications between the service provider and the service user within the service operation phase are based on MAC unicast frames and network address information, i.e. NWref, exchanged during the service initialization phase.

In the wireless link, the requested serviceChannel shall be used, if applicable.

## 9.5 FAST initialization of IPv6 based services

Details will be provided in a future edition of this International Standard.

## 9.6 Service termination

There is no frame specified to indicate service termination in the wireless link. Service termination shall be recognized by the service or by timeout.

Upon termination of a service operation phase, the service user application shall release its NWref and delete the socket.

Upon deregistration of a service, the service provider application shall release its NWref and shall delete the socket.

## 9.7 Duplicate services

Detection and handling of duplicate service announcements are outside the scope of this International Standard.

## 10 Congestion control

In simple radio communication systems, congestion control is handled at the MAC sub-layer. In CALM, especially in the context of vehicle-to-vehicle communications and considering very limited available bandwidth, this approach is not sufficient. Thus congestion control is extended to the complete OSI protocol stack including the related management, taking into consideration all available information on potential traffic in the communication channels.

Congestion control is a set of functions implemented in an ITS station that are used to address congestion in wireless links. Congestion control is distributed in a sense, such that ITS stations exchange as little information as possible in the wireless links, and control decisions are taken locally inside ITS stations.

Additional background information is provided in [5].

Figure 7 shows the basic architecture of congestion control.

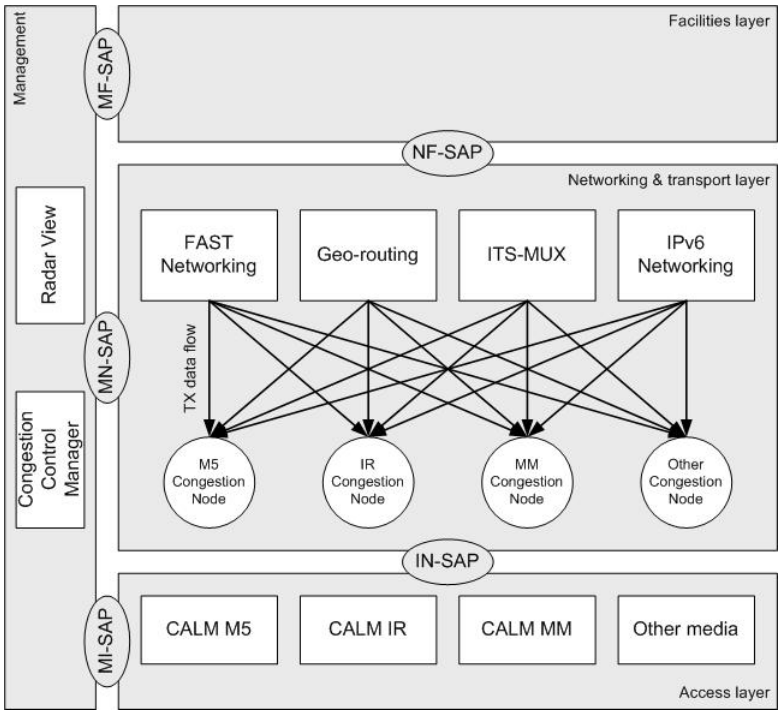


**Figure 7 — Congestion control architecture**

There are internal congestion nodes in the transmit path of each CI presented in Figure 7. External congestion nodes are the physically available channels.

NOTE 1 Congestion in the receive path of a CI is not considered in this International Standard.

The wireless medium shared by all neighbouring ITS stations constitutes the essential congestion node. Thus congestion control shall take care of the actual communication channel load observed at the external congestion node and at the internal congestion node.

Whereas the external congestion load can not be influenced directly, the internal congestion load can be adjusted. This adjustment also has impact on the external congestion load.

Congestion control management may be based on

a) QoS management based on user priority as specified in ISO 21218,

b) MI-parameters accessible via MI-SAP as specified in ISO 21218,

c) CIP management via IF-SAP on a packet per packet basis as specified in ISO 29281,

d) networking information accessible via MN-SAP, e.g. contained in the "Radar View", as specified in ISO 21210 and ISO 29281, and

e) application information accessible via MF-SAP, e.g. provided at time of registration at the ITS station management entity for the purpose of CI selection, as specified in this International Standard.

The part of the congestion control algorithm running autonomously in a station is a pure performance matter and may be subject to continuous improvements.

NOTE 2 The part of the congestion control algorithm running co-operatively together with peer stations will be specified by a future ETSI TC ITS WG3 standard, which will be a normative reference in future editions of this International Standard.

## 11 Radar view

The ITS station management entity may maintain the "Radar View", i.e. a list of all known neighbouring stations. This list shall contain:

— "ITSSI Data" information specified in ISO 29281, received via MN-SAP with MN-REQUEST 5 specified in Annex G,

— forwarding table information of networking protocols received via MN-SAP with MN-REQUESTS 1, 2 and 3 specified in Annex G.

The "Radar View" information shall be made available to the LDM application via the MF-SAP using MF-COMMAND 4 "LDMnotify", if applicable. This command only supports acknowledgement upon error.

NOTE 1 The LDM applicaton is considered to be a service made available to the ITS station and the ITS-S applications.

The "Radar View" process shall not send updates to the LDM application prior to registration of the LDM application at the "Radar View". Registration of the LDM application is made by means of the MF-SAP request MF-REQUEST 7. This request shall be acknowledged.

NOTE 2 The LDM application is being developed in the CVIS project [1] of the European Union.

## 12 CI selection management

Link set-up shall be based on the CI selection manager. In order to decide upon which is the most appropriate communication interface (CI) to provide a communication service, the CI selection manager needs to know what the communication needs of the ITS-S applications are, what kind of CIs are available, what the properties and statuses of these CIs are, and what the applicable rules are.

NOTE This process is not always applicable, as in some cases the type of CI is already pre-determined by the application, i.e. then the applicable rule is to require a pre-defined CI.

CI selection management shall be available in every ITS-SCU, i.e. it shall be functionally distributed over the whole ITS station. Selection decisions shall be done in hosts. Routers shall apply these decisions. There shall always be a default CI for IPv6 communications.

Figure 8 shows the building blocks and data flows in the ITS station management entity required to dynamically select the optimum CI for a specific ITS-S application.

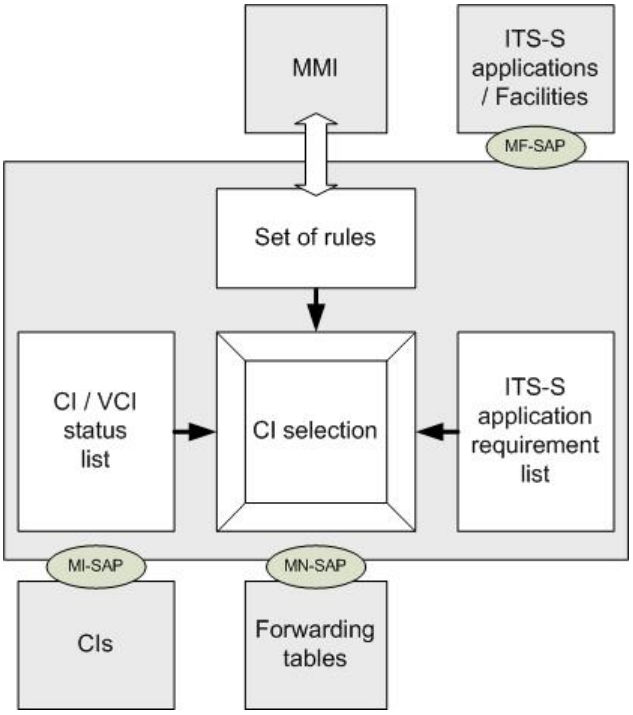


**Figure 8 — CI selection management**

The CI / VCI status list, i.e. as a minimum the VCI list presented in Table 19, extended by the VCI property list presented in Table 20, shall contain the properties, statuses and performance parameters of all CIs and virtual communication interfaces (VCI) in an ITS station. The CI / VCI status list shall be frequently updated via MI-SAP. An ITS-S router may advertise its properties to all ITS-S hosts, or an ITS-S host may perform a scan of all CIs attached to the local network.

ITS-S applications shall register via MF-SAP using MF-REQUEST 0 specified in Annex E, and shall present their requirements for communication. This information shall be stored in an ITS-S application requirement list. The ITS-S application requirement list shall be frequently updated.

The CI / VCI status list and the ITS-S application requirement list shall be matched in order to assign the best VCI to any one application. In order to do this the best way, a set of rules shall be used. There may be user interaction to set rules and / or to get status information from the ITS station. Existence of an MMI (Man Machine Interface) is determined by the implementation, and not required as part of CALM International Standards. The set of rules, see also [1], may involve the following.

— Back seat screens shall get access only to low cost links.

— Emergency messages shall always be delivered on any / all available media or a specific medium or a choice of media.

— Video transfer shall use high throughput media.

— Public safety messages shall use high QoS-performance media.

— Internet applications shall only use media costing less than a given limit.

When a CI has been decided by the CI selection manager, the forwarding tables in the routers shall be set or updated to the new values via MN-SAP using MN-COMMANDs 1 and 2 specified in Annex F, and communication shall be initialised. Likewise when a service is finished or when a medium becomes unavailable the routes shall be removed via MN-SAP using MN-COMMAND 3 specified in Annex F.

Update of CI / VCI status list, ITS-S application requirement list and forwarding tables may require "Inter-ITS-SCU Communications".

NOTE Details on how to determine the best CI are outside the scope of this International Standard, allowing for implementation specific solutions.

# 13 Legacy CI

## 13.1 Registration

Upon successful activation of a "Legacy CI" at the ITS station management entity as specified in ISO 21218, the CI management shall retrieve the CI MI-parameter "LegacyOption". The CI management shall notify presence of a "Legacy CI" to the "Legacy CI Port Manager" with MF-COMMAND 5 "LegacyCI" indicating the CI-ID of the CI, the CI class and the type within this CI class as given in "LegacyOption".

— Upon successful confirmation of the MF-COMMAND 5 "LegacyCI", which shall provide the ServiceNWref information of the FAST networking and transport layer protocol pointing to the "Legacy CI Port Manager", the CI management shall set the CI MI-parameter "NWrefPM" in the "Legacy CI" to the value received in the MF-COMMAND.confirmation service primitive. The ITS station management entity shall create the required entries in the CALM FAST networking tables with "Link NWref" of the remote application set to 255 in order to enable communications between the "Legacy CI" and the "Legacy CI Port Manager" using MN-COMMAND 1 "FWTset".

— Upon successless confirmation of the MF-COMMAND 5 "LegacyCI", indicated by "ErrStatus" = 1 and "ServiceNWref" = {255, 255} in the MF-COMMAND.confirmation service primitive, the CI management shall set the CI MI-parameter "NWrefPM" in the "Legacy CI" to the value 255, indicating failure of registration. Subsequently the "Legacy CI" shall enter the CI state "registered" specified in ISO 21218. Dependent on the implementation, the "Legacy CI" then may try again to get a NWrefPM number by creating a new VCI and entering again the CI state "active".

NOTE The specification above so far assumes that the legacy service entity registers at the Legacy CI Port Manager before the Legacy CI becomes active. However, the procedure has to be successful also in case the Legacy CI becomes active before the legacy service entity registers. Formally this can be achieved by a procedure triggered by the legacy service entity.

The procedure may require "Inter-ITS-SCU Communication" as specified in this International Standard.

## 13.2 CI states

Possible states of a CI are specified in ISO 21218.

All state changes shall be notified to the "Legacy CI Port Manager" with MF-COMMAND 6 "StateCInotify".

# 14 Management data elements

## 14.1 ITS-SCU list

The ITS station management entity shall maintain information on all ITS-SCUs of its station with details as shown in Table 18. The ITS-SCU list shall be represented in parameter 7 "ITS-scuList" specified in Annex A.

**Table 18 — Local ITS-SCU-list**

| ITS-SCU-ID | ITS-SCU type | Time of last update of this information | Unique-ID |
|---|---|---|---|
| Unique identifier of an ITS-SCU of the same ITS station. | "ITS-S Host"<br>"ITS-S Router" or<br>"ITS-S Host and ITS-S Router". | Usage may depend on implementation. | Text string to be defined by manufacturer of ITS-SCU, indicating type and serial number of hardware, and version of firmware/software. |

## 14.2 VCI list

The ITS station management entity shall maintain information on the status of media with a minimum of details as shown in Table 19. The VCI list shall be represented in parameter 4 "VciList" specified in Annex A.

**Table 19 — VCI List (medium status list)**

| CI-ID | Medium | CI Status | Connect Mode | NWsupport | Peer MAC address |
|---|---|---|---|---|---|
| Unique reference number of the CI/VCI. See ISO 21218. Ctrl-CI bits C1 … C7 shall be ignored. | Set equal to MI-parameter 22 "Medium". See ISO 21218. | Set equal to MI-parameter 42 CIstatus. See ISO 21218. | Equal to MI-parameter 51 "Connect", see ISO 21218. | Set equal to MI-parameter 23 "NWsupport". See ISO 21218. | Set equal to VMI-parameter 46 "PeerMAC". See ISO 21218. |

There shall be one entry in the VCI list for every CI/VCI being existent in the whole ITS station, i.e. having a CI state different to "not_existent", see ISO 21218.

## 14.3 VCI performance parameter list

The ITS station management entity shall maintain information on the actual values of performance parameters of VCIs. There shall be a list as presented in Table 20 for every active VCI and every active CI, identified by the CI-ID. The lists shall contain the actual values of at least the following MI-parameters specified in ISO 21218. The VCI performance parameter list shall be represented in parameter 10 "VCIperformList" specified in Table 20.

**Table 20 — VCI performance parameter list**

| MI-parameter | | Comment |
|---|---|---|
| n.a. | CI-ID | CI-ID of VCI |
| n.a. | ChannelType | Indicates whether a VCI acts as a CCH, SCH or ACH. |
| n.a. | ChannelNo | Channel number as used in MI-parameters 0, 1 and 2. |
| 6 | DataRateNW | Estimate of average data rate available at the IF-SAP in 100 bit/s. Alternatively this value could be estimated in the network layer. |
| 7 | DataRatesNW | Minimum and maximum possible values of DataRateNW. |
| 9 | Directivity | Indicates the direction of communication possible due to the given antenna pattern. Preferably only pre-defined directivities are used. |
| 11 | MinimumUserPriority | Minimum value of user priority needed to use the VCI. |
| 16 | CommRangeRef | Estimate of the communication distance to a reference peer station in 1/10 meter. |
| 17 | Cost | Information on cost of the link-usage in terms of money. |
| 18 | Reliability | Percentage value indicating estimate of reliability. |

NOTE 1 MI-parameters 6 and 17 are requested in ISO 21210 as mandatory parameters.

Further performance parameters are specified in ISO 21210 in order to allow the CI selection manager to decide on an optimum CI. Values of these parameters are not provided by the CIs, but have to be estimated at the networking layer, or made available by other means not specified in this International Standard.

NOTE 2 Performance parameters required in ISO 21210, at least partly, can be calculated based on other available parameters.

NOTE 3 In a real implementation, further parameters can be added to this list.

## 14.4 Cross-CI prioritization list

If cross-CI prioritization is supported by the ITS station management entity, the ITS station management entity in an ITS-SCU shall maintain information on a cross-CI prioritization list for every requesting CI of the same ITS-SCU and for every related request with details as specified in Table 21. The cross-CI prioritization list shall be presented in parameter 5 "CrossCiPrioList" specified in Annex A.

**Table 21 — Cross-CI prioritization list**

| CI-ID | Timeout | | |
|---|---|---|---|
| CI-ID of CI requesting cross-CI prioritization. | Maximum prioritization time in milliseconds. Used in interferer to set T_DummyAckGrant. The value is given by PrioReg.timeout of the related CI, see ISO 21218. | | |
| **Request number** | **Priority** | **Status** | **Timer** |
| Reference number of this request.<br><br>MI-REQUEST RTSreq.seqNo | User priority of packet to be prioritized.<br><br>Provided in MI-REQUEST RTSreq.priority, see ISO 21218. | TX status of CI requesting cross-CI prioritization.<br><br>0: release. Provided in MI-REQUEST RTSreq.status.<br><br>16: request. Provided in MI-REQUEST RTSreq.status.<br><br>64: ignored. Provided in MI-REQUEST RTSackReq.<br><br>128: granted. Provided in MI-REQUEST RTSackReq.<br><br>See ISO 21218. | T_prioritization |
| **Interferer ID** | **Status interferer** | | |
| Unique reference number of interferer #1 (CI-ID with SerialNumber set to zero).<br><br>Derived from MedTyp as provided in PrioReg.interferers, see ISO 21218 by checking the VCI list. | 0: released.<br>Set upon transmission of MI-COMMAND RTScmd with status="release" to this interferer.<br><br>16: prioritization request sent.<br>Set upon transmission of MI-COMMAND RTSreq with status="request" to this interferer.<br><br>64: request ignored.<br>Set upon reception of acknowledgement from this interferer with MI-REQUEST RTSackReq.status = "ignored".<br><br>128: prioritization granted.<br>Set upon reception of acknowledgement from this interferer with MI-REQUEST RTSackReq.status = "granted". | | |
| Unique reference number of interferer #2 | | | |
| … | | | |
| **Request number** | **Priority** | **Status** | **Timer** |
| … further request | | | |
| **Interferer MedID** | **Status Interferer** | | |
| … | | | |

### 14.5 Application requirement list

The ITS station management entity shall maintain information as shown in Table 22 for every application being registered at the CI selection manager. The application requirement list shall be represented in parameter 9 "ApplReqList" specified in Annex A.

**Table 22 — ITS-S application requirement list**

| | |
|---|---|
| **Application ID** | Unique identifier of an ITS-S application/service in an ITS station.<br><br>See ASN.1 parameter ApplicationID. |
| **Data rate** | Minimum average data rate requested at the IF-SAP in 100 bit/s. Corresponds with MI-parameter 6 in Table 20. |
| **Cost** | Maximum acceptable cost of the link-usage in terms of money. Corresponds with MI-parameter 17 in Table 20. |
| **Network support** | Network protocols needed. Corresponds with MI-parameter 23 NWsupport specified in ISO 21218. |
| **Medium support** | Types of CIs. Corresponds with MI-parameter 22 MedType specified in ISO 21218. |

Further ITS-S application requirement parameters are specified as optional parameters, e.g. in ISO 21210 in order to allow the CI selection manager to decide on an optimum CI.

NOTE In a real implementation, further parameters can be added to this list.

## 15 MN-SAP

### 15.1 General

Basically there shall be the following different types of services that facilitate

a) sending a command to the networking and transport layer, and

b) receiving a request (command) from the networking and transport layer.

Issuing of commands to the networking and transport layer shall be built on the service MN-COMMAND.

Receiving requests from the networking and transport layer shall be built on the service MN-REQUEST.

Annex B presents ASN.1 definitions of the management service primitives.

Management communications with the networking and transport layer in other ITS-SCUs shall be with Inter-ITS-SCU communication PDUs 3 "MN-rcmd" and 4 "MN-rreq" as specified in this International Standard.

NOTE SAPs and the related service primitives can not be tested and are not mandatory. However in the context of this International Standard, the elements of the service primitives can be an integral part of PDUs exchanged between physical entities in an ITS station using "Inter-ITS-SCU Communications". As PDUs are testable, those elements of service primitives being part of a PDU become testable.

## 15.2 MN-COMMAND

### 15.2.1 MN-COMMANDs

A command to the networking and transport layer is referred to as MN-COMMAND in this International Standard.

Annex F provides an overview and coding details on MN-COMMANDs that may be sent by the ITS station management entity to the networking and transport layer.

MN-COMMANDs shall be enabled by means of the service primitives MN-COMMAND.request and MN-COMMAND.confirm.

### 15.2.2 MN-COMMAND.request

The management service primitive MN-COMMAND.request allows the ITS station management entity to trigger an action at the networking and transport layer.

The parameters of the management service primitive MN-COMMAND.request shall be as follows:

```
MN-COMMAND.request      (
                        CommandRef,
                        MN-Command
                        )
```

**Table 23 — MN-COMMAND.request Parameter description**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CommandRef | Integer | 0 … 255 | Unique cyclic reference number of command. |
| MN-Command.No | One octet Integer | 0 … 255 | Reference number of command. |
| MN-Command.Value | — | Dependent on MN-Command.No | Value of command. |

See ASN.1 definitions in Annex B.

The management service primitive MN-COMMAND.request is generated by the ITS station management entity when the networking and transport layer shall perform an action.

On receipt of the management service primitive MN-COMMAND.request the requested action shall be performed.

### 15.2.3 MN-COMMAND.confirm

The management service primitive MN-COMMAND.confirm reports the result of a previous MN-COMMAND.request.

The parameters of the management service primitive MN-COMMAND.confirm shall be as follows:

```
MN-COMMAND.confirm      (
                        CommandRef,
                        MN-CmdConfirm,
                        ErrStatus
                        )
```

**Table 24 — MN-COMMAND.confirm Parameter description**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CommandRef | Integer | 0 … 255 | Unique cyclic reference number of command. Same value as in related MN-COMMAND.request. |
| MN-CmdConfirm.No | One octet Integer | 0 … 255 | Reference number of command. Same value as MN-Command.No in related MN-COMMAND.request. |
| MN-CmdConfirm.Value | — | Dependent on related MN-CmdConfirm.No. | Carries optional confirm data. |
| ErrStatus | One octet integer | See ISO 21218. | Error/return code. |

See ASN.1 definitions in Annex B.

The management service primitive MN-COMMAND.confirm shall be generated by the networking and transport layer upon performance of a previous MN-COMMAND.request in case ErrStatus indicates error or MN-CmdConfirm is present. It may be generated in case ErrStatus indicates success and MN-CmdConfirm is not present.

On receipt of this primitive, ErrStatus and MN-CmdConfirm shall be evaluated and a possible action shall be performed properly.

## 15.3 MN-REQUEST

### 15.3.1 MN-REQUESTs

A command to the ITS station management entity is referred to as MN-REQUEST in this International Standard.

Annex G provides an overview and coding details on MN-REQUESTs.

MN-REQUESTs shall be enabled by means of the service primitives MN-REQUEST.request and MN-REQUEST.confirm.

### 15.3.2 MN-REQUEST.request

The management service primitive MN-REQUEST.request allows the networking and transport layer to trigger an action at the ITS station management entity.

The parameters of the management service primitive MN-REQUEST.request shall be as follows:

```
MN-REQUEST.request      (
                        CommandRef,
                        MN-Request
                        )
```

**Table 25 — MN-REQUEST.request Parameter description**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CommandRef | Integer | 0 … 255 | Unique cyclic reference number of command. |
| MN-Request.No | One octet Integer | 0 … 255 | Reference number of the request. |
| MN-Request.Value | — | Dependent on MN-Request.No. | Value of the request. |

See ASN.1 definitions in Annex B.

The management service primitive MN-REQUEST.request is generated by the networking and transport layer when the ITS station management entity shall perform an action.

On receipt of the management service primitive MN-REQUEST.request, the required action shall be performed.

### 15.3.3 MN-REQUEST.confirm

The management service primitive MN-REQUEST.confirm reports the result of a previous MN-REQUEST.request.

The parameters of the management service primitive MN-REQUEST.confirm shall be as follows:

MN-REQUEST.confirm (
CommandRef,
MN-ReqConfirm,
ErrStatus
)

**Table 26 — MN-REQUEST.confirm Parameter description**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CommandRef | Integer | 0 … 255 | Unique cyclic reference number of command. Same value as in related MN-REQUEST.request. |
| MN-ReqConfirm.No | One octet Integer | 0 … 255 | Reference number of command. Same value as MN-Request.No in related MN-REQUEST.request. |
| MN-ReqConfirm.Value | — | Dependent on related MN-ReqConfirm.No. | Carries optional confirm data. |
| ErrStatus | One octet integer | See ISO 21218. | Error/return code. |

See ASN.1 definitions in Annex B.

The management service primitive MN-REQUEST.confirm shall be generated by the ITS station management entity upon performance of a previous MN-REQUEST.request in case ErrStatus indicates error or MN-ReqConfirm is present. It may be generated in case ErrStatus indicates success and MN-ReqConfirm is not present.

On receipt of this primitive, ErrStatus and MN-ReqConfirm shall be evaluated and a possible action shall be performed properly. Details are outside the scope of this International Standard.

# 16 MF-SAP

## 16.1 General

Basically there shall be the following different types of services that facilitate

a) sending a command to the facilities layer, and

b) receiving a request (command) from the facilities layer.

Issuing of commands to the facilities layer shall be built on the service MF-COMMAND.

Receiving of requests from the facilities layer shall be built on the service MF-REQUEST.

Annex B presents ASN.1 definitions of the management service primitives.

Management communications with other ITS-SCUs shall be with Inter-ITS-SCU communication PDUs 1 "MF-rcmd" and 2 "MF-rreq" as specified in this International Standard.

NOTE SAPs and the related service primitives can not be tested and are not mandatory. However in the context of this International Standard, the elements of the service primitives can be an integral part of PDUs exchanged between physical entities in an ITS station using "Inter-ITS-SCU Communications". As PDUs are testable, those elements of service primitives being part of a PDU become testable.

## 16.2 MF-COMMAND

### 16.2.1 MF-COMMANDs

A command to the facilities layer is referred to as MF-COMMAND in this International Standard.

Annex D provides an overview and coding details on MF-COMMANDs that may be sent by the ITS station management entity to the facilities layer.

MF-COMMANDs shall be enabled by means of the service primitives MF-COMMAND.request and MF-COMMAND.confirm.

### 16.2.2 MF-COMMAND.request

The management service primitive MF-COMMAND.request allows the ITS station management entity to trigger an action at the facilities layer.

The parameters of the management service primitive MF-COMMAND.request shall be as follows:

```
MF-COMMAND.request      (
                        CommandRef,
                        MF-Command
                        )
```

**Table 27 — MF-COMMAND.request Parameter description**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CommandRef | Integer | 0 … 255 | Unique cyclic reference number of command. |
| MF-Command.No | One octet Integer | 0 … 255 | Reference number of command |
| MF-Command.Value | — | Dependent on MF-Command.No. | Value of command |

See ASN.1 definitions in Annex B.

The management service primitive MF-COMMAND.request is generated by the ITS station management entity when the facilities layer shall perform an action.

On receipt of the management service primitive MF-COMMAND.request the requested action shall be performed.

### 16.2.3 MF-COMMAND.confirm

The management service primitive MF-COMMAND.confirm reports the result of a previous MF-COMMAND.request.

The parameters of the management service primitive MF-COMMAND.confirm shall be as follows:

```
MF-COMMAND.confirm      (
                        CommandRef,
                        MF-CmdConfirm,
                        ErrStatus
                        )
```

**Table 28 — MF-COMMAND.confirm Parameter description**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CommandRef | Integer | 0 … 255 | Unique cyclic reference number of command. Same value as in related MF-COMMAND.request. |
| MF-CmdConfirm.No | One octet Integer | 0 … 255 | Reference number of command. Same value as MF-Command.No in related MF-COMMAND.request. |
| MF-CmdConfirm.Value | — | Dependent on related MF-CmdConfirm.No. | Carries optional confirm data. |
| ErrStatus | One octet integer | See ISO 21218. | Error/return code. |

See ASN.1 definitions in Annex B.

The management service primitive MF-COMMAND.confirm shall be generated by the facilities layer upon performance of a previous MF-COMMAND.request in case ErrStatus indicates error or MF-CmdConfirm is present. It may be generated in case ErrStatus indicates success and MF-CmdConfirm is not present.

On receipt of this primitive, ErrStatus and MF-CmdConfirm shall be evaluated and a possible action shall be performed properly.

## 16.3 MF-REQUEST

### 16.3.1 MF-REQUESTs

A command to the ITS station management entity is referred to as MF-REQUEST in this International Standard.

Annex E provides an overview and coding details on MF-REQUESTs.

MF-REQUESTs shall be enabled by means of the service primitives MF-REQUEST.request and MF-REQUEST.confirm.

### 16.3.2 MF-REQUEST.request

The management service primitive MF-REQUEST.request allows the facilities layer to trigger an action at the ITS station management entity.

The parameters of the management service primitive MF-REQUEST.request shall be as follows:

MF-REQUEST.request (
CommandRef,
MN-Request
)

**Table 29 — MF-REQUEST.request Parameter description**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CommandRef | Integer | 0 … 255 | Unique cyclic reference number of command. |
| MF-Request.No | One octet Integer | 0 … 255 | Reference number of the request. |
| MF-Request.Value | — | Dependent on MF-Request.No. | Value of the request. |

See ASN.1 definitions in Annex B.

The management service primitive MF-REQUEST.request is generated by the facilities layer when the ITS station management entity shall perform an action.

On receipt of the management service primitive MF-REQUEST.request the required action shall be performed.

#### 16.3.3 MF-REQUEST.confirm

The management service primitive MF-REQUEST.confirm reports the result of a previous MF-REQUEST.request.

The parameters of the management service primitive MF-REQUEST.confirm shall be as follows:

```
MF-REQUEST.confirm      (
                        CommandRef,
                        MF-ReqConfirm,
                        ErrStatus
                        )
```

**Table 30 — MF-REQUEST.confirm Parameter description**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CommandRef | Integer | 0 … 255 | Unique cyclic reference number of command. Same value as in related MF-REQUEST.request. |
| MF-ReqConfirm.No | One octet Integer | 0 … 255 | Reference number of command. Same value as MF-Request.No in related MF-REQUEST.request. |
| MF-ReqConfirm.Value | — | Dependent on related MF-ReqConfirm.No. | Carries optional confirm data. |
| ErrStatus | One octet integer | See ISO 21218. | Error/return code. |

See ASN.1 definitions in Annex B.

The management service primitive MF-REQUEST.confirm shall be generated by the ITS station management entity upon performance of a previous MF-REQUEST.request in case ErrStatus indicates error or MF-ReqConfirm is present. It may be generated in case ErrStatus indicates success and MF-ReqConfirm is not present.

On receipt of this primitive, ErrStatus and MF-ReqConfirm shall be evaluated and a possible action shall be performed properly. Details are outside the scope of this International Standard.

## 17 Conformance

Protocol Implementation Conformance Statement proformas are being developed at ETSI [2]. As soon as this ETSI specification will be publicly available, this clause will be revised to include a normative reference to this ETSI specification.

## 18 Test methods

Conformance tests are being developed at ETSI [3]. As soon as this ETSI specification will be publicly available, this clause will be revised to include a mandatory reference to this ETSI specification.

# Annex A
(normative)

# Management parameters

## A.1 Overview

Table A.1 presents the relation between parameter number and parameter name of the parameters defined in this International Standard.

The following clause in this annex presents details of the parameters.

The ASN.1 coding of the parameters is presented in Annex B.

**Table A.1 — Management parameters**

| Parameter number | Parameter name | Description |
|---|---|---|
| 0 | StationID | Identifier of ITS station. Preferably globally unique. |
| 1 | MinPrioCrossCI | Minimum user priority required for cross-CI prioritization. |
| 2 | StationPosition | Actual kinematics vector of station.<br>Timestamp, latitude, longitude, altitude, speed, heading. |
| 3 | ITS-scuId | ITS-SCU-ID. |
| 4 | VciList | List containing information on all CIs and VCIs. Specified in Table 19. |
| 5 | CrossCiPrioList | Cross-CI prioritization list specified in Table 21. |
| 6 | TimerITSSI | Target period for transmission of a "ITSSI Data". Subject to temporary modifications by the congestion control. |
| 7 | ITS-scuList | ITS-SCU list specified in Table 18. |
| 8 | ITSSI | "ITSSI Data" of own station. |
| 9 | ApplReqList | Application requirement list specified in Table 22. |
| 10 | VCIperformList | VCI performance parameter list specified in Table 20. |
| 11 | Talive | Period of transmission of the "alive-signal" of an ITS-SCU. |
| … 255 | | Reserved for future use. |

## A.2 Description

### A.2.1 StationID (Parameter 0)

Table A.2 specifies details of parameter 0 "StationID".

**Table A.2 — StationID**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**stationID** | OCTET STRING | Unique identifier of an ITS station. Used also as server ID. |

NOTE Due to privacy requirements it might be that a unique station / server ID is prohibited. In this case, the StationID shall be generated randomly. It is expected that roadside installations will be allowed to use a globally unique number.

### A.2.2 MinPrioCrossCI (Parameter 1)

Table A.3 specifies details of parameter 1 "MinPrioCrossCI".

**Table A.3 — Parameter MinPrioCrossCI**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**minPrioCrossCI** | 0 … 255 | Minimum user priority needed to request cross-CI protection. |

### A.2.3 StationPosition (Parameter 2)

Table A.4 specifies details of parameter 2 "StationPosition".

**Table A.4 — Parameter StationPosition**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**stationPosition** | KineVectOut | Specified in ISO 21218. |

### A.2.4 ITS-scuId (Parameter 3)

Table A.5 specifies details of parameter 3 "ITS-SCU-ID".

**Table A.5 — Parameter ITS-SCU-ID**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**ITS-scuId** | 0 … 255 | ITS-SCU-ID uniquely identifying an ITS-SCU in an ITS station. |

### A.2.5 VciList (Parameter 4)

Table A.6 specifies details of parameter 4 "VCIlist".

**Table A.6 — Parameter VCIlist**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**vciList** | SEQUENCE | Information for every CI / VCI. |
| VciList.**vciListEntry** | SEQUENCE | Contains a sequence of the following attributes of a CI / VCI. |
| VciListEntry.**ciid** | See ISO 21218. | CI-ID of VCI / CI. |
| VciListEntry.**medType** | See ISO 21218. | Medium type of CI / VCI.<br>Set equal to MI-parameter 22 "Medium". See ISO 21218. |
| VciListEntry.**status** | See ISO 21218. | Status of the CI.<br>Set equal to MI-parameter 42 CIstatus. See ISO 21218. |
| VciListEntry.**connect** | See ISO 21218. | Connect mode of CI.<br>Set equal to MI-parameter 51 "Connect". See ISO 21218. |
| VciListEntry.**nwSupport** | See ISO 21218. | Supported networking protocol.<br>Set equal to MI-parameter 23 "NwSupport". See ISO 21218. |
| VciListEntry.**macAddress** | See ISO 21218. | MAC address of peer station.<br>Set equal to MI-parameter 46 "PeerMAC", if applicable. |

### A.2.6 CrossCiPrioList (Parameter 5)

Table A.7 specifies details of parameter 5 "CrossCiPrioList".

**Table A.7 — Parameter CrossCiprioList**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**crCiPrioList** | SEQUENCE | See Table 21. |
| CrCiPrioReq.**crCiPrioList** | SEQUENCE | |
| CrCiPrioReq.**ciid** | See ISO 21218. | CI-ID of requesting CI. |
| CrCiPrioReq.**timeout** | 0 … 255 | Maximum prioritization time in milliseconds. Used with timer T_prioritization. |
| CrCiPrioReq.**request** | SEQUENCE | Sequence of requests. |
| .request.**reqNo** | See ISO 21218. | Unique reference number of this request. |
| .request.**priority** | See ISO 21218. | User priority of packet for which prioritization is requested. |
| .request.**status** | 0, 16, 64, 128 | Request status. See Table 21. |
| CrCiPrioReq.**interferer** | SEQUENCE | Sequence of interferers. |
| .interferer.**medID** | See ISO 21218. | MedID of interferer. |
| .interferer.**status** | 0, 16, 64, 128 | Status of interferer. See Table 21. |

### A.2.7 TimerITSSI (Parameter 6)

Table A.8 specifies details of parameter 6 "TimerITSSI".

**Table A.8 — Parameter TimerITSSI**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**timerITSSI** | 0, 1 … 65.535 | Target period for periodic transmission of ITSSI in multiples of 1 ms.<br><br>0: never send ITSSI<br>>0: time in ms<br><br>NOTE A reasonable minimum value depends on the size of the frame, the characteristics of the CI and the actual channel load. |

### A.2.8 ITS-scuList (Parameter 7)

Table A.9 specifies details of parameter 7 "ITS-scuList".

**Table A.9 — Parameter ITS-scuList**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**ITS-scuList** | SEQUENCE | Local ITS-SCU list. |
| ITS-scuList.**ITS-scuId** | 3 - 254 | Unique identifier of an ITS-SCU of the same ITS station. |
| ITS-scuList.**its-scuType** | "Host" "Router" or "Host and Router". | Type of ITS-SCU. |
| ITS-scuList.**time** | GeneralizedTime | Time of last update of this information. |
| ITS-scuList.**uniqueID** | PrintableString | Text string to be defined by manufacturer of ITS-SCU, indicating type and serial number of hardware, and version of firmware/software. |

### A.2.9 ITSSI (Parameter 8)

Table A.10 specifies details of parameter 8 "ITSSI".

**Table A.10 — Parameter ITSSI**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**itssi** | | "ITSSI Data". |
| CM.**stationType** | "mobile", "fixed", "infrastructure", "unknown" | Specifying the type of station. "infrastructure" indicates possible access to fixed networks, e.g. Internet. |
| ITSSI.**stationID** | OCTET STRING | Identifier of ITS station, preferably globally unique. |
| ITSSI.**stationPosition** | KineVectOut | Kinemtics vector of station including timestamp specified in ISO 21218. |

### A.2.10 ApplReqList (Parameter 9)

Table A.11 specifies details of parameter 9 "ApplReqList".

**Table A.11 — Parameter ApplReqList**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**applReqList** | | Application requirement list used by CI selection manager. |
| ApplReqList.**applicationID** | | Unique identifier of an ITS-S application / service in an ITS station. |
| ApplReqList.**requirements** | | |
| .requirements.**dataRate** | See MI-parameter DataRateNW in ISO 21218. | Minimum average data rate requested at the IF-SAP in 100 bit/s. Corresponds with MI-parameter 6 in Table 20. |
| .requirements.**cost** | See MI-parameter Cost in ISO 21218. | Maximum acceptable cost of the link-usage in terms of money. Corresponds with MI-parameter 17 in Table 20. |
| .requirements.**nWsupport** | See MI-parameter NWsupport in ISO 21218. | Network protocol required. |
| .requirements.**medType** | See MI-parameter NedType in ISO 21218. | Type of CI required. |

### A.2.11 VCIperformList (Parameter 10)

Table A.12 specifies details of parameter 10 "VCIperformList".

**Table A.12 — Parameter VCIperformList**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**vCIperformList** | SEQUENCE | VCI performance parameter list. |
| VCIperformList.**performance** | SEQUENCE | For every CI / VCI. |
| Performance.**ciid** | As specified in ISO 21218. | CI-ID of VCI characterized by the following performance parameters. |
| Performance.**ChannelType** | CCH, SCH, ACH, unknown | Indicates whether a VCI acts as a CCH, SCH or ACH. |
| Performance.**channelNo** | 1 - 255 | Channel number as used in MI-parameters 0, 1 and 2. |
| Performance.**minUserPrio** | 0 - 255 | Minimum user priority needed to access this VCI. |
| Performance.**dataRateNW** | MI-parameter 6 specified in ISO 21218. | Estimate of average data rate available at the IF-SAP in 100 bit/s. Alternatively this value could be estimated in the network layer. |
| Performance.**dataRatesNW** | MI-parameter 7 specified in ISO 21218. | Minimum and maximum possible values of DataRateNW. |
| Performance.**directivity** | MI-parameter 9 specified in ISO 21218. | Indicates the direction of communication possible due to the given antenna pattern. Preferably only pre-defined directivities are used. |
| Performance.**commRangeRef** | MI-parameter 16 specified in ISO 21218. | Estimate of the communication distance to a reference peer station in 1/10 meter. |
| Performance.**cost** | MI-parameter 17 specified in ISO 21218. | Information on cost of the link-usage in terms of money. |
| Performance.**reliability** | MI-parameter 18 specified in ISO 21218. | Percentage value indicating estimate of reliability. |

### A.2.12 Talive (Parameter 11)

Table A.13 specifies details of parameter 11 "Talive".

**Table A.13 — Parameter Talive**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| Param24102.**talive** | INTEGER(0..65535) | Period of transmission of "alive-signal" of an ITS-SCU in milliseconds. |

# Annex B
(normative)

# ASN.1 definitions

## B.1 Use of modules

The ASN.1 modules specified in the following subclause shall be used. ASN.1 BASIC-PER, UNALIGNED as specified in ISO/IEC 8825-2 shall apply. The definitions are made such that every ASN.1 element has a length of an integer multiple of a byte.

## B.2 ASN.1 modules

```
CALMmanagement {iso(1) standard(0) calm-management(24102)} DEFINITIONS::=BEGIN

   IMPORTS

   SetIPv6, SetConfIPv6, SetNotIPv6, UpdateIPv6, UpdateNotIPv6, DeleteIPv6,
   DeleteNotIPv6 FROM CALMipv6 {iso(1) standard(0) calm-ipv6(21210)}

   -- NOTE: The following import from ISO21218 is based on the new terminology
   -- agreed upon during the process of harmonizing the whole set of CALM
   -- standards
   CI-ID, CIclass, CIaClass, CIstatus, DL-Unitdata-indication, DL-Unitdata-
   request, MI-Command-request, MI-Command-confirm, MI-Request-request, MI-
   Request-confirm, MI-Setparam-request, MI-Setparam-confirm, MI-Getparam-
   request, MI-Getparam-confirm, Connect, Directivity, DataRate, DataRatesNW,
   Dut, Errors, ErrStatus, KineVectOut, LLserviceAddr, MACaddress, MedID,
   MediumCost, MedType, MI-Request, NwSupport, UserPriority FROM CALMllsap
   {iso(1) standard(0) calm-ll-sap(21218)}

   ContextData, FastService, FASTtimeout, IpContext, IpService, FastContext,
   ServiceID, ServiceData, NWref, IpServiceID, IpServiceData, IpInfo, Param15628,
   ServiceChannel, ServiceNWref, SetFAST, SetConfFAST, SetNotFAST, UpdateFAST,
   UpdateNotFAST, DeleteFAST, DeleteNotFAST FROM CALM-fast {iso(1) standard(0)
   calm-fast(29281)};

   -- End of IMPORTS

   MF-CmdConfirm::=CHOICE
      {
      --              [0] ,
      gCsafscf        [1] NULL,
      gCsaf           [2] NULL,
      gCscf           [3] NULL,
      lDMnotify       [4] NULL,
      legacyCI        [5] ServiceNWref,
      --              [6-255]
      ...
      }
```

```
MF-Command::=CHOICE
    {
    --              [0] ,
    gCsafscf        [1] GCsafscf,
    gCsaf           [2] GCsaf,
    gCscf           [3] GCscf,
    lDMnotify       [4] LDMnotify,
    legacyCI        [5] LegacyCIreq,
    stateCInotify   [6] StateCInotify,
    --              [7-224] reserved
    --              [225-255] for private use
    ...
    }

MF-Command-confirm::=SEQUENCE
    {
    fill            BIT STRING (SIZE(3)),
    commandRef      CommandRef,
    mf-CmdConfirm   MF-CmdConfirm OPTIONAL,
    errStatus       ErrStatus
    }

MF-Command-request::=SEQUENCE
    {
    fill            BIT STRING (SIZE(4)),
    commandRef      CommandRef,
    command-param   MF-Command
    }

MF-ReqConfirm::=CHOICE
    {
    iTS-S-Appl-Reg      [0] NULL,
    gCregServer         [1] NULL,
    gCupdateServer      [2] NULL,
    gCderegServer       [3] NULL,
    gCregClient         [4] NULL,
    gCupdateClient      [5] NULL,
    gCderegClient       [6] NULL,
    lDMregister         [7] ITS-scuId,
    ...
    }

MF-Request::=CHOICE
    {
    iTS-S-Appl-Reg      [0] ITS-S-Appl-Reg,
    gCregServer         [1] GCregServer,
    gCupdateServer      [2] GCupdateServer,
    gCderegServer       [3] GCderegServer,
    gCregClient         [4] GCregClient,
    gCupdateClient      [5] GCupdateClient,
    gCderegClient       [6] GCderegClient,
    lDMregister         [7] LDMregister,
    ...
    }

ITS-S-Appl-Reg::=SEQUENCE
    {               -- to be defined in a later edition of this
    ...             -- International Standard
    }
```

```
MF-Request-confirm::=SEQUENCE
    {
    fill             BIT STRING (SIZE(3)),
    commandRef       CommandRef,
    mf-ReqConfirm    MF-ReqConfirm OPTIONAL,
    errStatus        ErrStatus
    }

MF-Request-request::=SEQUENCE
    {
    fill             BIT STRING (SIZE(4)),
    commandRef       CommandRef,
    request-param    MF-Request
    }

AliveMessage::= ENUMERATED
    {
    alive            (0),
    delete           (128),
    new              (255)
    }

ApplicationID::=SEQUENCE
    {
    hostITS-scuId    ITS-scuId,
    seqNumber        INTEGER(0..65535) -- unique in the ITS-SCU (host)
    }

ApplReqList::=SEQUENCE
    {
    applicationID    ApplicationID,
    requirements     ApplRequirements
    }

ApplRequirements::=SEQUENCE
    {
    dataRate         DataRate,
    cost             MediumCost,
    nwSupport        NwSupport,            -- zero: any networking protocol
    medSupport       SEQUENCE OF MedType,  -- zero: any wireless
    ...
    }

ItssiPeerNot::=SEQUENCE
    {
    sap              INTEGER(0..255),
    mACaddress       MACaddress,
    ciid             CI-ID,
    itssiData        ITSSI
    }

ITSSI::=SEQUENCE
    {
    stationType      StationType,
    stationID        StationID,
    stationPosition  KineVectOut
    }
```

```
ITS-SCU-Mngmt-Request::=SEQUENCE
    {
    sourceITS-scuId  ITS-scuId,
    destinationITS-scuId ITS-scuId,
    pduCounter       PduCounter,
    pduRequest       PduRequest
    }

ITS-SCU-Mngmt-Response::=SEQUENCE
    {
    sourceITS-scuId  ITS-scuId,
    destinationITS-scuId ITS-scuId,
    pduCounter       PduCounter,
    pduResponse      PduResponse,
    errorStatus      PduErrStatus
    }

ITS-SCUalive::=SEQUENCE
    {
    message          AliveMessage,
    its-scuType      ITS-SCUtype
    }

ITS-scuId::=INTEGER(0..255)

ITS-scuList::=SEQUENCE
    {
    iTS-scuId        ITS-scuId,
    its-scuType      ITS-SCUtype,
    time             GeneralizedTime,
    uniqueID         PrintableString
    }

ITS-SCUtype::= ENUMERATED
    {
    host             (0),
    router           (1),
    any              (255)
    }

ChannelList::=SEQUENCE(SIZE(0..255)) OF ServiceChannel

ChannelType::=ENUMERATED
    {
    cCH              (0),
    sCH              (1),
    aCH              (2),
    --               (3-254),                    reserved for CALM
    unknown (255),
    ...
    }

LegacyCIreq::=SEQUENCE
    {
    cIclass          CIclass,
    legacyOption     INTEGER(0..255),
    ciid             CI-ID
    }

CommandRef::=INTEGER(0..65535)
```

```
CrCiPrioList::=SEQUENCE OF CrCiPrioReq

CrCiPrioReq::=SEQUENCE
   {
   ciid             CI-ID,                        -- requesting CI
   timeout          INTEGER(0..255),
   request          SEQUENCE OF SEQUENCE
      {
      reqNo         INTEGER(0..255),
      priority      UserPriority,
      status        ENUMERATED
                    {
                    release (0),
                    request (16),
                    granted (64),
                    ignored (128)
                    }
      },
   interferer       SEQUENCE OF SEQUENCE        -- potential interferers
      {
      medID         MedID,                        -- interferer
      status        ENUMERATED
                    {
                    released (0),
                    requested (16),
                    ignored (64),
                    granted (128)
                    }
      }
   }

FastServiceReg::=SEQUENCE
   {
   fill             BIT STRING (SIZE(6)),
   serviceID        ServiceID,
   timeout          FASTtimeout,
   serviceData      ServiceData OPTIONAL,
   serverNWref      NWref OPTIONAL
   }

FastSTA::=SEQUENCE
   {
   serviceID        ServiceID,
   serviceData      ServiceData,
   serverNWref      NWref -- shall be set to 255 if not contained in STA
   }

FastSTAstc::=SEQUENCE
   {
   serviceID        ServiceID,
   serverNWref      NWref
   }
```

```
FWTdelete::=CHOICE
    {
    --              [0],
    ipv6            [182] DeleteIPv6,
    fast            [186] DeleteFAST,
    -- geo          [190] DeleteGeo,
    -- oem          [242] DeleteOEM,
    -- itsmux       [250] DeleteITS-MUX,
    ...
    }

FWTdeleteNot::=CHOICE
    {
    --              [0],
    ipv6            [182] DeleteNotIPv6,
    fast            [186] DeleteNotFAST,
    -- geo          [190] DeleteNotGeo,
    -- oem          [242] DeleteNotOEM,
    -- itsmux       [250] DeleteNotITS-MUX,
    ...
    }

FWTset::=CHOICE
    {
    --              [0],
    ipv6            [182] SetIPv6,
    fast            [186] SetFAST,
    -- geo          [190] SetGeo,
    -- oem          [242] SetOEM,
    -- itsmux       [250] SetITS-MUX,
    ...
    }

FWTsetConf::=CHOICE
    {
    --              [0],
    ipv6            [182] SetConfIPv6,
    fast            [186] SetConfFAST,
    -- geo          [190] SetConfGeo,
    -- oem          [242] SetConfOEM,
    -- itsmux       [250] SetConfITS-MUX,
    ...
    }

FWTsetNot::=CHOICE
    {
    --              [0],
    ipv6            [182] SetNotIPv6,
    fast            [186] SetNotFAST,
    -- geo          [190] SetNotGeo,
    -- oem          [242] SetNotOEM,
    -- itsmux       [250] SetNotITS-MUX,
    ...
    }
```

```
FWTupdate::=CHOICE
    {
    --              [0],
    ipv6            [182] UpdateIPv6,
    fast            [186] UpdateFAST,
    -- geo          [190] UpdateGeo,
    -- oem          [242] UpdateOEM,
    -- itsmux       [250] UpdateITS-MUX,
    ...
    }

FWTupdateNot::=CHOICE
    {
    --              [0],
    ipv6            [182] UpdateNotIPv6,
    fast            [186] UpdateNotFAST,
    -- geo          [190] UpdateNotGeo,
    -- oem          [242] UpdateNotOEM,
    -- itsmux       [250] UpdateNotITS-MUX,
    ...
    }

GCderegClient::= SEQUENCE
    {
    applicationID   ApplicationID               -- unique in the host
    }

GCderegServer::= SEQUENCE
    {
    applicationID   ApplicationID               -- unique in the host
    }

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

GCperiodCmd::=SEQUENCE
    {
    applicationID   ApplicationID,              -- which user
    bcVCIs          SEQUENCE OF CI-ID,          -- BC-VCIs
    gcInterval      GcInterval,                 -- repetition interval
    priority        UserPriority,               -- of advertisement
    serviceDataReg  ServiceDataReg              -- advertisement details
    }

GCregClient::= SEQUENCE
    {
    fill            BIT STRING (SIZE(7)),
    applicationID   ApplicationID,              -- unique in the host
    priority        UserPriority,
    serviceID       ServiceID,
    contextData     ContextData OPTIONAL
    }

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

```
GCsaf::= SEQUENCE
    {
    applicationID    ApplicationID,              -- unique in the host
    serverID         StationID,                  -- peer station
    serviceData      CHOICE
          {
          fastService    [0] FastSTA,
          ipService      [1] IpSTA
          }
    }

GCsafscf::= SEQUENCE
    {
    applicationID    ApplicationID,              -- unique in the host
    serverID         StationID,                  -- of peer station
    serviceData      CHOICE
          {
          fastService    [0] FastSTAstc,
          ipService      [1] IpSTAstc
          }
    }

GCscf::= SEQUENCE
    {
    applicationID    ApplicationID,              -- unique in the host
    clientID         StationID,                  -- peer station
    serviceContext   CHOICE
          {
          fastContext    [0] FastContext,
          ipContext      [1] IpContext
          }
    }

GCschedule::= SEQUENCE OF GCsched

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

GCstcTxCmd::=SEQUENCE
    {
    ciid             CI-ID,                      -- UC-VCI,
    stc              Stc
    }

GCupdateClient::= SEQUENCE
    {
    applicationID    ApplicationID,              -- unique in the host
    serviceID        ServiceID,
    contextData      ContextData
    }
```

```
GCupdateServer::= SEQUENCE
    {
    fill             BIT STRING (SIZE(6)),
    applicationID    ApplicationID,              -- unique in the host
    gCschedule       GCschedule OPTIONAL,
    serviceDataReg   ServiceDataReg OPTIONAL
    }

IpContextList::= SEQUENCE(SIZE(0..255)) OF IpContext

IpServiceReg::=SEQUENCE
    {
    fill             [0] BIT STRING (SIZE(7)),
    serviceID        [1] IpServiceID,
    serviceData      [2] IpServiceData OPTIONAL,
    ipInfo           [3] IpInfo
    }

IpServList::=SEQUENCE(SIZE(0..255)) OF IpService

IpSTA::=SEQUENCE
    {
    serviceID        IpServiceID,
    serviceData      IpServiceData,
    ipInfo           IpInfo
    }

IpSTAstc::=SEQUENCE
    {
    serviceID        IpServiceID,
    ipInfo           IpInfo
    }

LDMnotify::=SEQUENCE OF RadarView

LDMregister::=SEQUENCE
    {
    iTS-scuId        ITS-scuId,
    reference        OCTET STRING
    }

MessageType::=ENUMERATED{
    sta              (0),
    stc              (1),
    req              (254),
    res              (255)
    }
```

```
MngmtSAPs::=CHOICE
    {
    mf-command-req   [0] MF-Command-request,
    mf-command-conf  [1] MF-Command-confirm,
    mf-request-req   [2] MF-Request-request,
    mf-request-conf  [3] MF-Request-confirm,
    mn-command-req   [4] MN-Command-request,
    mn-command-conf  [5] MN-Command-confirm,
    mn-request-req   [6] MN-Request-request,
    mn-request-conf  [7] MN-Request-confirm,
    mi-command-req   [8] MI-Command-request, -- ISO 21218
    mi-command-conf  [9] MI-Command-confirm, -- ISO 21218
    mi-request-req   [10] MI-Request-request, -- ISO 21218
    mi-request-conf  [11] MI-Request-confirm, -- ISO 21218
    mi-setparam-req  [12] MI-Setparam-request, -- ISO 21218
    mi-setparam-conf [13] MI-Setparam-confirm, -- ISO 21218
    mi-getparam-req  [14] MI-Getparam-request, -- ISO 21218
    mi-getparam-conf [15] MI-Getparam-confirm -- ISO 21218
    }                -- coded in four bits

MN-CmdConfirm::=CHOICE
    {
    --               [0]
    fWTsetConf       [1] FWTsetConf,
    fWTupdateConf    [2] NULL,
    fWTdeletConf     [3] NULL,
    gCperiodCmdConf  [4] NULL,
    gCstcTxCmdConf   [5] NULL,
    ...
    }

MN-Command::=CHOICE
    {
    --               [0] ,
    fWTset           [1] FWTset,
    fWTupdate        [2] FWTupdate,
    fWTdelet         [3] FWTdelete,
    gCperiodCmd      [4] GCperiodCmd,
    gCstcTxCmd       [5] GCstcTxCmd,
    ...
    }

MN-Command-confirm::=SEQUENCE
    {
    fill             BIT STRING (SIZE(3)),
    commandRef       CommandRef,
    n-CmdConfirm     MN-CmdConfirm OPTIONAL,
    errStatus        ErrStatus
    }

MN-Command-request::=SEQUENCE
    {
    fill             BIT STRING (SIZE(4)),
    commandRef       CommandRef,
    command-param    MN-Request
    }

MN-ReqConfirm::=CHOICE
```

```
    {
    --                [0] ,
    fWTsetNot         [1] NULL,
    fWTupdateNot      [2] NULL,
    fWTdeletNot       [3] NULL,
    vCIcreatePeerMAC  [4] VCIPeerMAC,
    itssiPeerNot      [5] NULL,
    sTArxNot          [6] NULL,
    sTCrxNot          [7] NULL,
    ...
    }

MN-Request::=CHOICE
    {
    --                [0] ,
    fWTsetNot         [1] FWTsetNot,
    fWTupdateNot      [2] FWTupdateNot,
    fWTdeletNot       [3] FWTdeleteNot,
    vCIcreatePeerMAC  [4] VCIcreatePeerMAC,
    itssiPeerNot      [5] ITssiPeerNot,
    sTArxNot          [6] STArxNot,
    sTCrxNot          [7] STCrxNot,
    ...
    }

MN-Request-confirm::=SEQUENCE
    {
    fill              BIT STRING (SIZE(3)),
    commandRef        CommandRef,
    mn-ReqConfirm     MN-ReqConfirm OPTIONAL,
    errStatus         ErrStatus
    }

MN-Request-request::=SEQUENCE
    {
    fill              BIT STRING (SIZE(4)),
    commandRef        CommandRef,
    request-param     MN-Request
    }

Param24102::=CHOICE
    {
    stationID         [0] StationID,
    minPrioCrossCI    [1] UserPriority,
    stationPosition   [2] KineVectOut,
    iTS-scuId         [3] ITS-scuId,
    vciList           [4] VciList,
    crCiPrioList      [5] CrCiPrioList,
    timerITSSI        [6] INTEGER(0..65535),
    itssi             [7] ITSSI,
    applReqList       [8] ApplReqList,
    vCIperformList    [9] VCIperformList,
    talive            [10] Talive,
    iTS-scuList       [11] ITS-scuList,
    --                [6-255]
    ...
    }

PduCounter::=INTEGER(0..255)
```

```
PduErrStatus::=ENUMERATED
    {
    success          (0),
    pduUnknown       (1),
    duplicateITS-scuId                  (2),
    --               (3-254),           reserved for CALM
    unspecFailure (255),
    ...
    }

PduRequest::=CHOICE
    {
    alive            [0] ITS-SCUalive,
    mf-rcmd          [1] MF-Command-request,
    mf-rreq          [2] MF-Request-request,
    mn-rcmd          [3] MN-Command-request,
    mn-rreq          [4] MN-Request-request,
    mi-rcmd          [5] MI-Command-request,
    mi-rreq          [6] MI-Request-request,
    mi-rget          [7] MI-Getparam-request,
    mi-rset          [8] MI-Setparam-request,
    vCI-info         [9] VCI-info-req,
    vCI-update       [10] VCI-update-req,
    dL-UI-REQ        [64] DL-Unitdata-request,
    dL-UI-IND        [65] LLserviceAddr,
    ...
    }

PduResponse::=CHOICE
    {
    alive            [0] ITS-SCUalive,
    mf-rcmd          [1] MF-Command-confirm,
    mf-rreq          [2] MF-Request-confirm,
    mn-rcmd          [3] MN-Command-confirm,
    mn-rreq          [4] MN-Request-confirm,
    mi-rcmd          [5] MI-Command-confirm,
    mi-rreq          [6] MI-Request-confirm,
    mi-rget          [7] MI-Getparam-confirm,
    mi-rset          [8] MI-Setparam-confirm,
    vCI-info         [9] VCI-info-res,
    vCI-update       [10] NULL,
    dL-UI-REQ        [64] NULL,
    dL-UI-IND        [65] DL-Unitdata-indication,
    ...
    }

RadarView::=SEQUENCE
    {
    peerITSSI        ITSSI,
    ...
    }

ServiceDataReg::= CHOICE
    {
    fastData         [0] FastServiceReg,
    ipData           [1] IpServiceReg
    }

ServContextList::= SEQUENCE(SIZE(0..255)) OF FastContext
```

```
ServiceList::= SEQUENCE(SIZE(0..255)) OF FastService

STArxNot::=SEQUENCE
    {
    ciid            CI-ID,
    sta             Sta
    }

StateCInotify::=SEQUENCE
    {
    ciid            CI-ID,
    cIstatus        CIstatus
    }

StationID::=OCTET STRING (SIZE(4))

StationType::= ENUMERATED
    {
    mobile          (0),
    fixed           (1),
    infrastructure  (254),
    unknown         (255)
    }

Sta::= SEQUENCE
    {
    fill            [0] BIT STRING (SIZE(5)),
    messageType     [1] MessageType, -- sta
    serverID        [2] StationID,
    serviceList     [3] ServiceList OPTIONAL,
    channelList     [4] ChannelList OPTIONAL,
    ipServList      [5] IpServList OPTIONAL
    }

Stc::= SEQUENCE
    {
    fill            [0] BIT STRING (SIZE(6)),
    messageType     [1] MessageType, -- stc
    clientID        [2] StationID,
    servContextList [3] ServContextList OPTIONAL,
    ipContextList   [4] IpContextList OPTIONAL
    }

STCrxNot::=SEQUENCE
    {
    ciid            CI-ID,
    stc             Stc
    }

Talive::=INTEGER(0..65535)                    -- time in ms

VCI-info-req::=SEQUENCE
    {
    medType         MedType,
    ciaClass        CIaClass,
    ciClass         CIclass
    }

VCI-Info::=SEQUENCE
    {
```

```
    ciid            CI-ID,
    medType         MedType,
    ciaClass        CIaClass,
    ciClass         CIclass,
    status          CIstatus,
    peerMac         MACaddress
    }

VCI-info-res::=SEQUENCE (SIZE(0..255)) OF VCI-Info

VCIcreatePeerMAC::=SEQUENCE
    {
    reference       INTEGER(0..255),
    ciid            CI-ID,
    sap             INTEGER(0..255),
    peerMac         MACaddress
    }

VciList::=SEQUENCE (SIZE(0..255)) OF VciListEntry

VciListEntry::=SEQUENCE
    {
    ciid            CI-ID,
    medType         MedType,
    status          CIstatus,
    connect         Connect,
    nWsupport       NwSupport,
    macAddress      MACaddress
    }

VCIPeerMAC::=SEQUENCE
    {
    reference       INTEGER(0..255),
    ciid            CI-ID
    }

VCIperformList::=SEQUENCE (SIZE(0..255)) OF VCIperformance

VCIperformance::=SEQUENCE
    {
    ciid                CI-ID,
    channelType         ChannelType,
    channelNo           INTEGER(0..255),
    minUserPrio         UserPriority,
    dataRateNW          DataRate,
    dataRatesNW         DataRatesNW,
    directivity         Directivity,
    commRangeRef        INTEGER(0..65535),      -- in 1/10 m
    cost                MediumCost,
    reliability         INTEGER(0..255),
    ...
    }

VCI-update-req::=SEQUENCE (SIZE(0..255)) OF VCI-Info
```

**END**

# Annex C
(normative)

# Inter-ITS-SCU communication

## C.1 List of PDUs

Table C.1 shows the mapping of PDU-ID values to type of PDU. The data details for all types listed here are specified in the next subclauses of this annex. The column "Response" indicates, whether a response PDU is mandatory (yes), prohibited (no) or optional (optional). See also Table 1.

**Table C.1 — PDU-ID**

| PDU-ID | Type of PDU | Response | Comment |
|---|---|---|---|
| 0 | ITS-SCU-id | yes | Used to assign, maintain and delete unique ITS-SCU-ID values in a station. |
| 1 | MF-rcmd | yes | A management command MF-COMMAND issued by the ITS station management entity of the local ITS-SCU, to be forwarded to the MF-SAP of one or several remote ITS-SCU. |
| 2 | MF-rreq | yes | A command MF-REQUEST issued by the local facilities layer, to be forwarded to the ITS station management entity in one or several remote ITS-SCU. |
| 3 | MN-rcmd | yes | A management command MN-COMMAND issued by the ITS station management entity of the local ITS-SCU, to be forwarded to the MN-SAP of one or several remote ITS-SCU. |
| 4 | MN-rreq | yes | A command MN-REQUEST issued by the local networking and transport layer, to be forwarded to the ITS station management entity in one or several remote ITS-SCU. |
| 5 | MI-rcmd | yes | A management command MI-COMMAND issued by the ITS station management entity of the local ITS-SCU, to be forwarded to the MI-SAP of a remote ITS-SCU. |
| 6 | MI-rreq | yes | A command MI-REQUEST issued by the local access layer, to be forwarded to the ITS station management entity in one or several remote ITS-SCU. |
| 7 | MI-rget | yes | A command MI-GETPARAM issued by the ITS station management entity, to be forwarded to the MI-SAP of a remote ITS-SCU. |

| | | | |
|---|---|---|---|
| 8 | MI-rset | yes | A command MI-SETPARAM issued by the ITS station management entity, to be forwarded to the MI-SAP of a remote ITS-SCU. |
| 9 | VCI-info | yes | Request to all ITS-SCUs containing a router, to report about existing VCIs. Information to be stored in VCI list. |
| 10 | VCI-update | no | Information on change of VCI information to be stored in VCI list. Broadcasted to all ITS-SCUs. |
| 11 - 63 | — | — | Reserved for ISO. |
| 64 | IN-request | no | Remote access to DL-UNITDATA.request service primitive. |
| 65 | IN-indication | yes | Remote access to DL-UNITDATA.indication service primitive. |
| 66 - 95 | — | – | Reserved for test purposes. |
| 96 - 127 | — | — | For private usage. |

## C.2 PDU details

### C.2.1 ASN.1

ASN.1 details of all PDUs are presented in Annex B.

### C.2.2 ITS-SCU-id (0)

Table C.2 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=0.

**Table C.2 — ITS-SCU-id request PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| Message | Enumeration | 0, 255 | Indicates type of alive message:<br>0: "alive"<br>128: "delete"<br>255: "new" |
| ITS-SCUtype | Enumeration | 0, 1, 255 | Indicates type of ITS-SCU:<br>0: Host<br>1: Router<br>255: Host and router |

This request shall always be transmitted to all ITS-SCUIs.

Table C.3 shows details of the "Data" element in the ITS-SCU-Mngmt-Response PDU for PDU-ID=0.

**Table C.3 — ITS-SCU-id response PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| Message | Enumeratin | 0, 255 | Same as in related request |
| ITS-SCUtype | Enumeration | 0, 1, 255 | Indicates type of ITS-SCU:<br>0: Host<br>1: Router<br>255: Host and router |

### C.2.3 MF-rcmd (1)

Table 27 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=1.

Before the receiving, ITS-SCU forwards the command to the facilities layer, it shall temporarily store "CommandRef", and shall replace "CommandRef" by its locally generated value. The locally stored value of "CommandRef" shall be used in the ITS-SCU-Mngmt-Response PDU related to this command.

Table 28 shows details of the "Data" element in the ITS-SCU-Mngmt-Response PDU for PDU-ID=1.

### C.2.4 MF-rreq (2)

Table 29 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=2.

Before the receiving, ITS-SCU forwards the command to the facilities layer, it shall temporarily store "CommandRef", and shall replace "CommandRef" by its locally generated value. The locally stored value of "CommandRef" shall be used in the ITS-SCU-Mngmt-Response PDU related to this command.

Table 30 shows details of the "Data" element in the ITS-SCU-Mngmt-Response PDU for PDU-ID=2.

### C.2.5 MN-rcmd (3)

Table 23 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=3.

Before the receiving, ITS-SCU forwards the command to the networking and transport layer, it shall temporarily store "CommandRef", and shall replace "CommandRef" by its locally generated value. The locally stored value of "CommandRef" shall be used in the ITS-SCU-Mngmt-Response PDU related to this command.

Table 24 shows details of the "Data" element in the ITS-SCU-Mngmt-Response PDU for PDU-ID=3.

### C.2.6 MN-rreq (4)

Table 25 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=4.

Before the receiving, ITS-SCU forwards the command to the networking and transport layer, it shall temporarily store "CommandRef", and shall replace "CommandRef" by its locally generated value. The locally stored value of "CommandRef" shall be used in the ITS-SCU-Mngmt-Response PDU related to this command.

Table 26 shows details of the "Data" element in the ITS-SCU-Mngmt-Response PDU for PDU-ID=4.

### C.2.7 MI-rcmd (5)

Table C.4 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=5.

**Table C.4 — MI-rcmd request PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CI-ID | CI-ID | As specified in ISO 21218. | |
| CommandRef | Integer | As specified in ISO 21218. | |
| M-Command.No | One octet Integer | As specified in ISO 21218. | |
| M-Command.Value | — | | |

Before the receiving, ITS-SCU forwards the command to the selected VCI, it shall temporarily store "CommandRef", and shall replace "CommandRef" by its locally generated value. The locally stored value of "CommandRef" shall be used in the ITS-SCU-Mngmt-Response PDU related to this command.

Table C.5 shows details of the "Data" element in the ITS-SCU-Mngmt-Response PDU for PDU-ID=5.

**Table C.5 — MI-rcmd response PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CI-ID | CI-ID | As specified in ISO 21218. | |
| CommandRef | Integer | As specified in ISO 21218. | |
| ErrStatus | One octet integer | As specified in ISO 21218. | |

### C.2.8 MI-rreq (6)

Table C.6 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=6.

**Table C.6 — MI-rreq request PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CI-ID | CI-ID | As specified in ISO 21218. | |
| CommandRef | Integer | As specified in ISO 21218. | |
| MI-Request.No | One octet Integer | As specified in ISO 21218. | |
| MI-Request.Value | — | | |

Before the receiving, ITS-SCU forwards the command to the selected VCI, it shall temporarily store "CommandRef", and shall replace "CommandRef" by its locally generated value. The locally stored value of "CommandRef" shall be used in the ITS-SCU-Mngmt-Response PDU related to this command.

Table C.7 shows details of the "Data" element in the ITS-SCU-Mngmt-Response PDU for PDU-ID=6.

**Table C.7 — MI-rreq response PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CI-ID | CI-ID | As specified in ISO 21218. | |
| CommandRef | Integer | As specified in ISO 21218. | |
| ErrStatus | One octet integer | As specified in ISO 21218. | |

### C.2.9 MI-rget (7)

Table C.8 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=7.

**Table C.8 — MI-rget request PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CI-ID | CI-ID | As specified in ISO 21218. | |
| CommandRef | Integer | As specified in ISO 21218. | |
| M-Param.No | Once octet Integer | As specified in ISO 21218. | |

Before the receiving, ITS-SCU forwards the command to the selected VCI, it shall temporarily store "CommandRef", and shall replace "CommandRef" by its locally generated value. The locally stored value of "CommandRef" shall be used in the ITS-SCU-Mngmt-Response PDU related to this command.

Table C.9 shows details of the "Data" element in the ITS-SCU-Mngmt-Response PDU for PDU-ID=7.

**Table C.9 — MI-rget response PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CI-ID | CI-ID | As specified in ISO 21218. | |
| CommandRef | Integer | As specified in ISO 21218. | |
| M-Param.No | One octet Integer | As specified in ISO 21218. | |
| M-Param.Value | — | | |

### C.2.10 MI-rset (8)

Table C.10 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=8.

**Table C.10 — MI-rset request PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CI-ID | CI-ID | As specified in ISO 21218. | |
| CommandRef | Integer | As specified in ISO 21218. | |
| M-Param.No | One octet Integer | As specified in ISO 21218. | |
| M-Param.Value | — | | |

Before the receiving, ITS-SCU forwards the command to the selected VCI, it shall temporarily store "CommandRef", and shall replace "CommandRef" by its locally generated value. The locally stored value of "CommandRef" shall be used in the ITS-SCU-Mngmt-Response PDU related to this command.

Table C.11 shows details of the "Data" element in the ITS-SCU-Mngmt-Response PDU for PDU-ID=8.

**Table C.11 — MI-rset response PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CI-ID | CI-ID | As specified in ISO 21218. | |
| CommandRef | Integer | As specified in ISO 21218. | |
| Errors.M-paramNo | One octet Integer | As specified in ISO 21218. | |
| Errors.errStatus | One octet integer | | |

### C.2.11 VCI-info (9)

Table C.12 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=9.

**Table C.12 — VCI-info request PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| MedType | MedType | 0 - 255 | Indicates requested type of medium:<br>0: all types<br>>0: as specified in ISO 21218 |
| ClaClass | ClaClass | 0 - 255 | Indicates requested CI access class:<br>0: all access classes<br>>0: as specified in ISO 21218 |
| CIclass | CIclass | 0 - 255 | Indicates requested CI class:<br>0: all types<br>>0: as specified in ISO 21218 |

Upon reception of this command, an ITS-SCU shall check the required properties of existing CIs/VCIs, and shall report the information in the ITS-SCU-Mngmt-Response PDU related to this command. The three requirements shall simultaneously be fulfilled for all information reported in the related ITS-SCU-Mngmt-Response.

Table C.13 shows details of the "Data" element in the ITS-SCU-Mngmt-Response PDU for PDU-ID=9 reported for every CI/VCI.

**Table C.13 — VCI-info response PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CI-ID | CI-ID | As specified in ISO 21218. | |
| MedType | MedType | As specified in ISO 21218. | |
| CIaClass | CIaClass | As specified in ISO 21218. | |
| CIclass | CIclass | As specified in ISO 21218. | |
| CIstatus | CIstatus | As specified in ISO 21218. | |
| PeerMac | MACaddress | As specified in ISO 21218. | |

In case a VCI has no relation to a peer station, the element "PeerMac" shall be set to zero.

### C.2.12 VCI-update (10)

Table C.14 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=10. This PDU shall be sent in broadcast mode to all ITS-SCUs.

**Table C.14 — VCI-update request PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| CI-ID | CI-ID | As specified in ISO 21218. | |
| MedType | MedType | As specified in ISO 21218. | |
| CIaClass | CIaClass | As specified in ISO 21218. | |
| CIclass | CIclass | As specified in ISO 21218. | |
| CIstatus | CIstatus | As specified in ISO 21218. | |
| PeerMac | MACaddress | As specified in ISO 21218. | |

In case a VCI has no relation to a peer station, the element "PeerMac" shall be set to zero.

### C.2.13 IN-request (64)

Table C.15 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=64.

**Table C.15 — IN-request request PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| DL-UNITDATA-REQUEST | DL-Unitdata-request | As specified in ISO 21218 | This PDU allows to send a DL-UNITDATA.request service primitive to the remote IN-SAP of the selected CI. The address of the CI is given by the destination_address in the DL-Unitdata-request. |

Upon reception of this command, an ITS-SCU shall forward this transmission request to the local IN-SAP.

### C.2.14 IN-indication (65)

Table C.16 shows details of the "Data" element in the ITS-SCU-Mngmt-Request PDU for PDU-ID=65.

**Table C.16 — IN-indication request PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| DL-UNITDATA-INDICATION | LLserviceAddr | As specified in ISO 21218. | This PDU requests to receive a DL-UNITDATA.indication service primitive from the remote IN-SAP of the selected CI. |

Upon reception of this command, an ITS-SCU shall forward all packets received from its local IN-SAP selected in this request to the remote ITS-SCU.

Table C.17 shows details of the "Data" element in the ITS-SCU-Mngmt-Response PDU for PDU-ID=65 reported for every CI/VCI.

**Table C.17 — IN-indication response PDU**

| Name | Type | Valid Range | Description |
|---|---|---|---|
| DL-UNITDATA-INDICATION | DL-Unitdata-indication | As specified in ISO 21218. | This PDU delivers a DL-UNITDATA.indication service primitive from the remote IN-SAP of the selected CI. |

# Annex D
(normative)

# MF-COMMANDs

## D.1 Overview

The following table presents the relation between MF-COMMAND reference number "MF-Command.No" and MF-COMMAND name as used in the service MF-COMMAND, and provides a short description of the MF-COMMANDs. A more detailed description is provided in the next subclause.

"MF-Command.No" is equal to the ASN.1 CHOICE tag of MF-Command, see Annex B.

**Table D.1 — MF-COMMANDs**

| MF-Command.No | COMMAND name | Description |
|---|---|---|
| 0 | | Reserved for future use. |
| 1 | GCsafscf | Notifies to a service ITS-S application, which is registered for groupcasting, reception of a service advertisement frame (SAF) and acknowledgment of the expected service with a service context frame (SCF). |
| 2 | GCsaf | Notifies to a service ITS-S application, which is registered for groupcasting, reception of a service advertisement frame (SAF) without acknowledgment of the expected service with a service context frame (SCF). |
| 3 | GCscf | Notifies to a server ITS-S application, which is registered for groupcasting, that a SCF requesting a specific context of the service was received. |
| 4 | LDMnotify | Notifies the LDM application about an update of the "Radar View". |
| 5 | LegacyCI | Notifies to the "Legacy CI Port Manager" the presence of a "Legacy CI". |
| 6 | StateCInotify | Notifies the state of a CI. |
| 7 … 224 | | Reserved for future use. |
| 225 … 255 | | For private non-standardized use. |

### D.1.1 Description

### D.1.2 Basics

This subclause defines the detailed structure of MF-COMMANDs. The ASN.1 coding of the MF-COMMANDs is presented in Annex B.

### D.1.3 GCsafscf (MF-Command.No=1)

Table D.2 shows details of MF-COMMAND.request for MF-Command.No=1.

**Table D.2 — MF-COMMAND.request for MF-Command.No=1**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Command.**gCsafscf** | | Notification of reception of SAF and subsequent transmission of SCF to service user application. |
| GCsafscf.**applicationID** | | Reference number of service application, unique in an ITS station. |
| .ApplicationID.**hostITS-scuId** | ITS-scuId | ITS-SCU-ID of ITS-S host which contains service application. |
| .ApplicationID.**seqNumber** | 0 - 65535 | Sequential service application reference number, unique at ITS-SCU. |
| GCsafscf.**serverID** | See StationID in ISO 29281. | Identifier of server station. |
| GCsafscf.**serviceData** | CHOICE | Globally unique identifier of service (ASN.1 tag number = serviceID). |
| .ServiceData.**fastService** | See FastService in ISO 29281. | Mutually exclusive service information. |
| .ServiceData.**ipService** | See IpService in ISO 29281. | |

Optionally the MF-COMMAND.request may be confirmed with an MF-COMMAND.confirm carrying only an ErrStatus.

### D.1.4 GCsaf (MF-Command.No=2)

Table D.3 shows details of MF-COMMAND.request for MF-Command.No=2.

**Table D.3 — MF-COMMAND.request for MF-Command.No=2**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Command.**gCsaf** | | Notification of reception of SAF without subsequent transmission of SCF to service user application. |
| GCsaf.**applicationID** | | Reference number of service application, unique in an ITS station. |
| .ApplicationID.**hostITS-scuId** | ITS-scuId | ITS-SCU-ID of ITS-S host which contains service application. |
| .ApplicationID.**seqNumber** | 0 - 65535 | Sequential service application reference number, unique at ITS-SCU. |
| GCsaf.**serverID** | See StationID in ISO 29281. | Identifier of server station. |
| GCsaf.**serviceData** | CHOICE | Globally unique identifier of service (ASN.1 tag number = serviceID). |
| .ServiceData.**fastService** | See FastService in ISO 29281. | Mutually exclusive service information. |
| .ServiceData.**ipService** | See IpService in ISO 29281. | |

This MF-COMMAND.request shall not be confirmed with an MF-COMMAND.confirm carrying only an ErrStatus.

### D.1.5 GCscf (MF-Command.No=3)

Table D.4 shows details of MF-COMMAND.request for MF-Command.No=3.

**Table D.4 — MF-COMMAND.request for MF-Command.No=3**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Command.**gCscf** | | Notification of reception of SCF to server application. |
| GCscf.**applicationID** | | Reference number of service application, unique in an ITS station. |
| .ApplicationID.**hostITS-scuId** | ITS-scuId | ITS-SCU-ID of ITS-S host which contains service application. |
| .ApplicationID.**seqNumber** | 0 - 65535 | Sequential service application reference number, unique at ITS-SCU. |
| GCscf.**clientID** | See StationID in ISO 29281. | Identifier of client station. |
| GCscf.**serviceContext** | CHOICE | Globally unique identifier of service (ASN.1 tag number = serviceID). |
| .ServiceContext.**fastContext** | See FastContext in ISO 29281. | Mutually exclusive context information. |
| .ServiceContext.**iPContext** | See IpContext in ISO 29281. | |

This MF-COMMAND.request shall not be confirmed with an MF-COMMAND.confirm carrying only an ErrStatus.

### D.1.6 LDMnotify (MF-Command.No=4)

Table D.5 shows details of MF-COMMAND.request for MF-Command.No=4.

**Table D.5 — MF-COMMAND.request for MF-Command.No=4**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Command.**lDMnotify** | | Notification of an update of the "Radar View" to the LDM application. |
| LDMnotify.**radarView** | SEQUENCE OF | Update of "Radar View". |
| RadarView.**peerStation** | OCTET STRING | Details to be defined by the LDM application. |

Optionally the MF-COMMAND.request may be confirmed with an MF-COMMAND.confirm carrying only an ErrStatus.

### D.1.7 LegacyCI (MF-Command.No=5)

Table D.6 shows details of MF-COMMAND.request for MF-Command.No=5.

**Table D.6 — MF-COMMAND.request for MF-Command.No=5**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Command.**legacyCI** | | Notification of presence of an active "15628 CI". |
| LegacyCI.**ciClass** | legacy CIs | CI class of legacy CI as specified in ISO 21218. |
| LegacyCI.**legacyOption** | 0, 255 | Type of "Legacy CI". |
| LegacyCI.**ciid** | As specified in ISO 21218. | CI-ID of UC-VCI of the "Legacy CI". |

The MF-COMMAND.request shall be confirmed with an MF-COMMAND.confirm as specified in Table D.7.

**Table D.7 — MF-COMMAND.confirm for MF-Command.No=5**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-CmdConfirm.**legacyCI** | | |
| LegacyCI.**serviceNWref** | As specified in ISO 29281. | ServiceNWref of "Legacy CI Port Manager". |
| ServiceNWref.**nWref** | As specified in ISO 29281. | NWref pointing to "Legacy CI Port Manager". |
| ServiceNWref.**ITS-scuId** | As specified in ISO 29281. | ITS-SCU-ID of "Legacy CI Port Manager". |

### D.1.8 StateCInotify (MF-Command.No=6)

Table D.8 shows details of MF-COMMAND.request for MF-Command.No=6.

**Table D.8 — MF-COMMAND.request for MF-Command.No=6**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Command.**stateCInotify** | | Notification of the state of a CI. |
| StateCInotify.**ciid** | CI-ID | CI-ID of CI. |
| StateCInotify.**clstatus** | CIstatus as specified in ISO 29281. | Actual state of the CI. |

The MF-COMMAND.request shall not be acknowledged with an MF-COMMAND.confirm.

# Annex E
(normative)

# MF-REQUESTs

## E.1 Overview

Table E.1 presents the relation between the MF-REQUEST reference number "MF-Request.No" and the MF-REQUEST name as used in the service MF-REQUEST, and provides a short description of the MF-REQUESTs. A more detailed description is provided in the next subclause.

"MF-Request.No" is equal to the ASN.1 CHOICE tag of MF-Request, see Annex B.

**Table E.1 — MF-REQUESTs**

| MF-Request.No | REQUEST name | Description |
|---|---|---|
| 0 | ITS-S-Appl-Reg | Allows an ITS-S application to announce its communication needs to the CI selection manager.<br>NOTE Details will be provided in a future edition of ISO 24102. |
| 1 | GCregServer | Allows a server application to register for groupcasting providing serviceData. |
| 2 | GCupdateServer | Allows a server application to update groupcast information providing serviceData. |
| 3 | GCderegServer | Allows a server application to deregister from groupcasting. |
| 4 | GCregClient | Allows a service user application to register for groupcasting. |
| 5 | GCupdateClient | Allows a service user application to update groupcast information. |
| 6 | GCderegClient | Allows a service user application to deregister from groupcasting. |
| 7 | LDMregister | Allows the LDM application to register at the ITS station management entity in order to receive updates of the "Radar View". |
| 8 … 224 | | Reserved for future use. |
| 225 … 255 | | For private non-standardized use. |

## E.2 Description

### E.2.1 Basics

This subclause defines the detailed structure of MF-REQUESTs. The ASN.1 coding of the MF-REQUESTs is presented in Annex B.

### E.2.2 ITS-S-Appl-Reg (MF-Request.No=0)

Details of the MF-Request 0 will be provided in a future edition of ISO 24102.

Table E.2 shows a preliminary informative example of MF-REQUEST.request for MF-Request.No=0.

**Table E.2 — MF-REQUEST.request for MF-Request.No=0**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Request.**iTS-S-Appl-Reg** | | Registration of a ITS-S application at the CI selection manager. |
| ITS-S-Appl-Reg.**applicationID** | | Reference number of service application, unique in an ITS station. |
| .ApplicationID.**hostITS-scuId** | ITS-scuId | ITS-SCU-ID of ITS-S host which contains service application. |
| .ApplicationID.**seqNumber** | 0 - 65535 | Sequential service application reference number, unique at ITS-SCU. |
| ITS-S-Appl-Reg.**requirements** | ApplRequirements | Requirements of the applications. |
| ITS-S-Appl-Reg.**socketID** | SocketID | Socket identifier containing IPv6 address and port number. |
| ITS-S-Appl-Reg.**physicalInfo** | PhysicalInfo | Properties of a CI. |

This MF-REQUEST shall be processed by the CI selection manager in the ITS-SCU for local usage, and shall be forwarded to all other ITS-SCUs in the same ITS station.

In case the MF-REQUEST was not properly processed, MF-REQUEST.confirm shall indicate the error. Otherwise there shall not be an acknowledgement of the MF-REQUEST.

### E.2.3 GCregServer (MF-Request.No=1)

Table E.3 shows details of MF-REQUEST.request for MF-Request.No=1.

**Table E.3 — MF-REQUEST.request for MF-Request.No=1**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Request.**gCregServer** | | Service registration for groupcasting at server station. |
| GCregServer.**applicationID** | SEQUENCE OF | Reference number of service application, unique in an ITS station. |
| .ApplicationID.**hostITS-scuId** | ITS-scuId | ITS-SCU-ID of ITS-S host which contains service application. |
| .ApplicationID.**seqNumber** | 0 - 65535 | Sequential service application reference number, unique at ITS-SCU. |
| GCregServer.**gCschedule** | SEQUENCE OF | Information on required CIs. |
| .GCschedule.**medium** | See MedType in ISO 21218. | Type of medium. |
| .GCschedule.**directivity** | See Directivity in ISO 21218. | Direction of communication. |
| .GCschedule.**gCInterval** | 0 – 65.535 ms | Average period. |
| GCregServer.**priority** | See UserPriority in ISO 21218. | User priority of service application. |
| GCregServer.**serviceDataReg** | CHOICE | |
| serviceDataReg.**fastService** | See FastService in ISO 29281. | Mutually exclusive information on a single service. |
| serviceDataReg.**ipService** | See IpService in ISO 29281. | |

In case of failure to process the MF-REQUEST.request it shall be confirmed with an MF-REQUEST.confirm carrying only an ErrStatus.

### E.2.4 GCupdateServer (MF-Request.No=2)

Table E.4 shows details of MF-REQUEST.request for MF-Request.No=2.

**Table E.4 — MF-REQUEST.request for MF-Request.No=2**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Request.**gCupdateServer** | | Update of service groupcast information at server station. |
| GCupdateServer.**applicationID** | SEQUENCE OF | Reference number of service application, unique in an ITS station. |
| .ApplicationID.**hostITS-scuId** | ITS-scuId | ITS-SCU-ID of ITS-S host which contains service application. |
| .ApplicationID.**seqNumber** | 0 - 65535 | Sequential service application reference number, unique at ITS-SCU. |
| GCupdateServer.**gCschedule** | SEQUENCE OF | Information on required CIs. Present only, if change of value required. |
| .GCschedule.**medium** | See MedType in ISO 21218. | Type of medium. |
| .GCschedule.**directivity** | See Directivity in ISO 21218. | Direction of communication. |
| .GCschedule.**gCInterval** | 0 – 65.535 ms | Average period. |
| GCupdateServer.**serviceDataReg** | CHOICE | Service data information. Present only, if change of value required. |
| .serviceDataReg.**fastService** | See FastService in ISO 29281. | Mutually exclusive information on service.<br><br>For FAST services, the serverNWref shall never be updated. |
| .serviceDataReg.**ipService** | See IpService in ISO 29281. | |

In case of failure to process the MF-REQUEST.request it shall be confirmed with an MF-REQUEST.confirm carrying only an ErrStatus.

### E.2.5 GCderegServer (MF-Request.No=3)

Table E.5 shows details of MF-REQUEST.request for MF-Request.No=3.

**Table E.5 — MF-REQUEST.request for MF-Request.No=3**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Request.**gCderegServer** | | Service deregistration from groupcasting at server station. |
| GCderegServer.**applicationID** | SEQUENCE OF | Reference number of service application, unique in an ITS station. |
| .ApplicationID.**hostITS-scuId** | ITS-scuId | ITS-SCU-ID of ITS-S host which contains service application. |
| .ApplicationID.**seqNumber** | 0 - 65535 | Sequential service application reference number, unique at ITS-SCU. |

In case of failure to process the MF-REQUEST.request it shall be confirmed with an MF-REQUEST.confirm carrying only an ErrStatus.

### E.2.6 GCregClient (MF-Request.No=4)

Table E.6 shows details of MF-REQUEST.request for MF-Request.No=4.

**Table E.6 — MF-REQUEST.request for MF-Request.No=4**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Request.**gCregClient** | | Service registration for groupcasting at client station. |
| GCregClient.**applicationID** | SEQUENCE OF | Reference number of service application, unique in an ITS station. |
| .ApplicationID.**hostITS-scuId** | ITS-scuId | ITS-SCU-ID of ITS-S host which contains service application. |
| .ApplicationID.**seqNumber** | 0 - 65535 | Sequential service application reference number, unique at ITS-SCU. |
| GCregClient.**Priority** | See UserPriority in ISO 21218. | User priority of service user application. |
| GCregClient.**ServiceID** | See ServiceID in ISO 29281. | ServiceID supported. |
| GCregClient.**ContextData** | See ServiceContext in ISO 29281. | Optional service context data information. |

In case of failure to process the MF-REQUEST.request it shall be confirmed with an MF-REQUEST.confirm carrying only an ErrStatus.

### E.2.7 GCupdateClient (MF-Request.No=5)

Table E.7 shows details of MF-REQUEST.request for MF-Request.No=5.

**Table E.7 — MF-REQUEST.request for MF-Request.No=5**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Request.**gCupdateClient** | | Update of service information for groupcasting at client station. |
| GCupdateClient.**applicationID** | SEQUENCE OF | Reference number of service application, unique in an ITS station. Used to identify the proper groupcast request to be updated. |
| .ApplicationID.**hostITS-scuId** | ITS-scuId | ITS-SCU-ID of ITS-S host which contains service application. |
| .ApplicationID.**seqNumber** | 0 - 65535 | Sequential service application reference number, unique at ITS-SCU. |
| GCupdateClient.**ServiceID** | See ServiceContext in ISO 29281. | ServiceID supported. Used to identify the proper groupcast request to be updated. |
| GCupdateClient.**ContextData** | See ServiceContext in ISO 29281. | Service context data information to be updated. |

In case of failure to process the MF-REQUEST.request it shall be confirmed with an MF-REQUEST.confirm carrying only an ErrStatus.

### E.2.8 GCderegClient (MF-Request.No=6)

Table E.8 shows details of MF-REQUEST.request for MF-Request.No=6.

**Table E.8 — MF-REQUEST.request for MF-Request.No=6**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Request.**gCderegClient** | | Service deregistration from groupcasting at client station. |
| GCderegClient.**applicationID** | SEQUENCE OF | |
| .ApplicationID.**hostITS-scuId** | ITS-scuId | ITS-SCU-ID of ITS-S host which contains service application. |
| .ApplicationID.**seqNumber** | 0 - 65535 | Sequential service application reference number, unique at ITS-SCU. |

In case of failure to process the MF-REQUEST.request it shall be confirmed with an MF-REQUEST.confirm carrying only an ErrStatus.

### E.2.9 LDMregister (MF-Request.No=7)

Table E.9 shows details of MF-REQUEST.request for MF-Request.No=7.

**Table E.9 — MF-REQUEST.request for MF-Request.No=7**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Request.**IDMregister** | SEQUENCE | Allows the LDM application to register at the ITS station management entity in order to receive updates of the "Radar View". |
| LDMregister.**ITS-scuId** | ITS-scuId | ITS-SCU-ID of host where LDM application resides. |
| LDMregister.reference | OCTET STRING | Defined by LDM application. |

The MF-REQUEST.request shall be confirmed with an MF-REQUEST.confirm as specified in Table E.10.

**Table E.10 — MF-REQUEST.confirm for MF-Request.No=7**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MF-Request.**IDMregister** | ITS-scuId | ITS-SCU-ID of router where "Radar View" data are produced. |

# Annex F
(normative)

# MN-COMMANDs

## F.1 Overview

The following table presents the relation between MN-COMMAND reference number "MN-Command.No" and MN-COMMAND name as used in the service MN-COMMAND, and provides a short description of the MN-COMMANDs. A more detailed description is provided in the next subclause.

"MN-Command.No" is equal to the ASN.1 CHOICE tag of MN-Command, see Annex B.

**Table F.1 — MN-COMMANDs**

| MN-Command.No | COMMAND name | Description |
|---|---|---|
| 0 | | Reserved for future use. |
| 1 | FWTset | Sets an entry in the forwarding table of a networking protocol. |
| 2 | FWTupdate | Updates an entry in the forwarding table of a networking protocol. |
| 3 | FWTdelete | Deletes an entry in the forwarding table of a networking protocol. |
| 4 | GCperiodCmd | Send groupcast request to FAST networking protocol in order to trigger subsequent periodic groupcast transmissions to be performed by the FAST networking protocol. |
| 5 | GCstcTxCmd | Send "Service Table Context" (STC) to FAST networking protocol for the purpose of unicast delivery to the selected peer station. |
| 6 … 224 | | Reserved for future use. |
| 225 … 255 | | For private non-standardized use. |

## F.2 Description

### F.2.1 Basics

This subclause defines the detailed structure of MN-COMMANDs. The ASN.1 coding of MN-COMMANDs is presented in Annex B.

### F.2.2 FWTset (MN-Command.No=1)

Table F.2 shows details of MN-COMMAND.request for MN-Command.No=1.

**Table F.2 — MN-COMMAND.request for MN-Command.No=1**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Command.**fWTset** | CHOICE | Create a new entry in a forwarding table. |

Table F.3 shows details of MN-COMMAND.confirm related to MN-Command.No=1.

**Table F.3 — MN-COMMAND.confirm for MN-Command.No=1**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-CmdConfirm.**fWTsetConf** | CHOICE | Confirm creation of a new entry in a forwarding table. |

### F.2.3 FWTupdate (MN-Command.No=2)

Table F.4 shows details of MN-COMMAND.request for MN-Command.No=2.

**Table F.4 — MN-COMMAND.request for MN-Command.No=2**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Command.**fWTupdate** | CHOICE | Update an entry in a forwarding table. |

### F.2.4 FWTdelete (MN-Command.No=3)

Table F.5 shows details of MN-COMMAND.request for MN-Command.No=3.

**Table F.5 — MN-COMMAND.request for MN-Command.No=3**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Command.**fWTdelete** | CHOICE | Delete an entry in a forwarding table. |

### F.2.5 GCperiodCmd (MN-Command.No=4)

Table F.6 shows details of MN-COMMAND.request for MN-Command.No=4.

**Table F.6 — MN-COMMAND.request for MN-Command.No=4**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Command.**gCperiodCmd** | SEQUENCE | Send groupcast request to FAST networking protocol in order to trigger subsequent periodic groupcast transmissions to be performed by the FAST networking protocol. |
| GCperiodCmd | | |

### F.2.6 GCstcTxCmd (MN-Command.No=5)

Table F.7 shows details of MN-COMMAND.request for MN-Command.No=5.

**Table F.7 — MN-COMMAND.request for MN-Command.No=5**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Command.**gCstcTxCmd** | SEQUENCE | Send "Service Table Context" (STC) to FAST networking protocol for the purpose of unicast delivery to the selected peer station. |
| GCstcTxCmd.**ciid** | UC-VCI CI-ID | UC-VCI to be used for transmission of STC. |
| GCstcTxCmd.**stc** | STC | STC to be transmitted. |

# Annex G
(normative)

# MN-REQUESTs

## G.1 Overview

Table G.1 presents the relation between REQUEST reference number "MN-Request.No" and REQUEST name as used in the service MN-REQUEST, and provides a short description of the MN-REQUESTs. A more detailed description is provided in the next subclause.

"MN-Request.No" is equal to the ASN.1 CHOICE tag of MN-Request, see Annex B.

**Table G.1 — MN-REQUESTs**

| MN-Request.No | REQUEST name | Description |
|---|---|---|
| 0 | | Reserved for future use. |
| 1 | FWTsetNot | Notification of creation of an entry in a forwarding table. |
| 2 | FWTupdateNot | Notification of an update of an entry in a forwarding table. |
| 3 | FWTdeleteNot | Notification of deletion of an entry in a forwarding table. |
| 4 | VCIcreatePeerMAC | Request to create a VCI in a specific CI with a given relation to a peer station expressed by the MAC address of the peer station. |
| 5 | ItssiPeerNot | Notification of "ITSSI Data" from a peer station. |
| 6 | STArxNot | Notify reception of STA. |
| 7 | STCrxNot | Notify reception of STC. |
| 8 … 224 | | Reserved for future use. |
| 225 … 255 | | For private non-standardized use. |

## G.2 Description

### G.2.1 Basics

This subclause defines the detailed structure of MN-REQUESTs. The ASN.1 coding of MN-REQUESTs is presented in Annex B.

### G.2.2 FWTsetNot (MN-Request.No=1)

Table G.2 shows details of MN-REQUEST.request for MN-Request.No=1.

**Table G.2 — MN-REQUEST.request for MN-Request.No=1**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Request.**fWTsetNot** | CHOICE | Notification of creation of an entry in a forwarding table. |

This request shall not be acknowledged with MN-REQUEST.confirm.

### G.2.3 FWTupdateNot (MN-Request.No=2)

Table G.3 shows details of MN-REQUEST.request for MN-Request.No=2.

**Table G.3 — MN-REQUEST.request for MN-Request.No=2**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Request.**fWTupdateNot** | CHOICE | Notification of an update of an entry in a forwarding table. |

This request shall not be acknowledged with MN-REQUEST.confirm.

### G.2.4 FWTdeleteNot (MN-Request.No=3)

Table G.4 shows details of MN-REQUEST.request for MN-Request.No=3.

**Table G.4 — MN-REQUEST.request for MN-Request.No=3**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Request.**fWTdeleteNot** | CHOICE | Notification of deletion of an entry in a forwarding table. |

This request shall not be acknowledged with MN-REQUEST.confirm.

### G.2.5 VCIcreatePeerMAC (MN-Request.No=4)

Table G.5 shows details of MN-REQUEST.request for MN-Request.No=4.

**Table G.5 — MN-REQUEST.request for MN-Request.No=4**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Request.**vCIcreatePeerMAC** | | Request to create a VCI in a specific CI with a given relation to a peer station expressed by the MAC address of the peer station. |
| VCIcreatePeerMAC.**reference** | 0 - 255 | Cyclic reference number. To be incremented with every next request. |
| VCIcreatePeerMAC.**ciid** | CI-ID of CI | CI-ID of CI, in which the VCI shall be created. |
| VCIcreatePeerMAC.**sap** | SAP address as specified in ISO 21218. | SAP address indicating type of networking protocol. |
| VCIcreatePeerMAC.**mACaddress** | MAC address | MAC address of an ITS station which likely is in an existing communication zone of the own station. |

This request shall be acknowledged with MN-REQUEST.confirm as specified in Table G.6.

**Table G.6 — MN-REQUEST.confirm for MN-Request.No=4**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-ReqConfirm.**vCIPeerMAC** | | Comfirms creation of the requested VCI. |
| VCIPeerMAC.**reference** | 0 - 255 | Same value as in related request. |
| VCIPeerMAC.**ciid** | CI-ID of CI | CI-ID of new VCI. |

### G.2.6 ItssiPeerNot (MN-Request.No=5)

Table G.7 shows details of MN-REQUEST.request for MN-Request.No=5.

**Table G.7 — MN-REQUEST.request for MN-Request.No=5**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Request.**itssiPeerNot** | | Notification of "ITSSI Data" from a peer station. |
| ItssiPeerNot.**sap** | SAP address as specified in ISO 21218. | SAP address indicating type of networking protocol. |
| ItssiPeerNot.**mACaddress** | MAC address | MAC address of peer station which provided the "ITSSI Data". |
| ItssiPeerNot.**ciid** | CI-ID as specified in ISO 21218. | CI-ID related to peer station. |
| ItssiPeerNot.**itssiData** | ITSSI | Kinematics vector and station type and ID of peer station. |

### G.2.7 STArxNot (MN-Request.No=6)

Table G.8 shows details of MN-REQUEST.request for MN-Request.No=6.

**Table G.8 — MN-REQUEST.request for MN-Request.No=6**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Request.**sTArxNot** | | Notify reception of STA. |
| STArxNot.**ciid** | CI-ID as specified in ISO 21218. | CI-ID related to peer station. |
| STArxNot.**sTA** | STA | "Service Table for Advertisement" (STA). |

### G.2.8 STCrxNot (MN-Request.No=7)

Table G.9 shows details of MN-REQUEST.request for MN-Request.No=7.

**Table G.9 — MN-REQUEST.request for MN-Request.No=7**

| ASN.1 Type | Valid Range | Description |
|---|---|---|
| MN-Request.**sTArxNot** | | Notify reception of STC. |
| STArxNot.**ciid** | CI-ID as specified in ISO 21218. | CI-ID related to peer station. |
| STArxNot.**sTC** | STC | "Service Table Context" (STC). |

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