

# SVENSK STANDARD

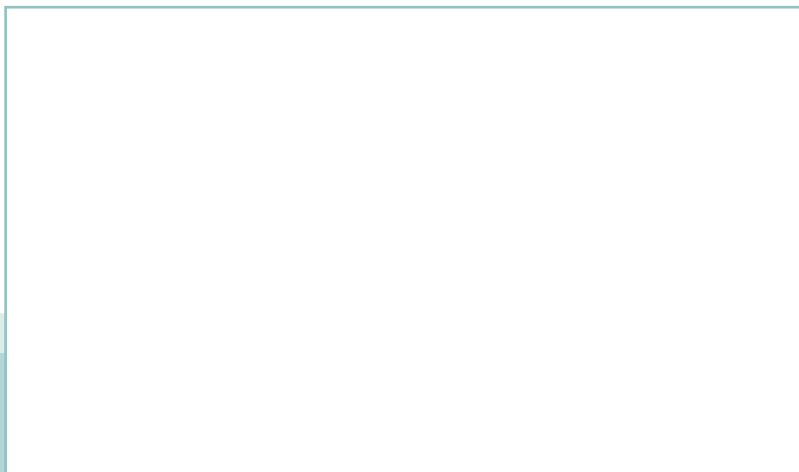
## SS-ISO 24102:2010

Fastställt/Approved: 2010-11-25  
Publicerad/Published: 2010-12-21  
Utgåva/Edition: 1  
Språk/Language: engelska/English  
ICS: 03.220.01; 35.240.60

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### **Intelligent transport systems – Communications access for land mobiles (CALM) – Management (ISO 24102:2010, IDT)**



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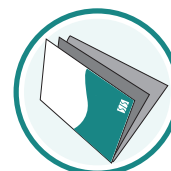
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## Foreword

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
PDU	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.

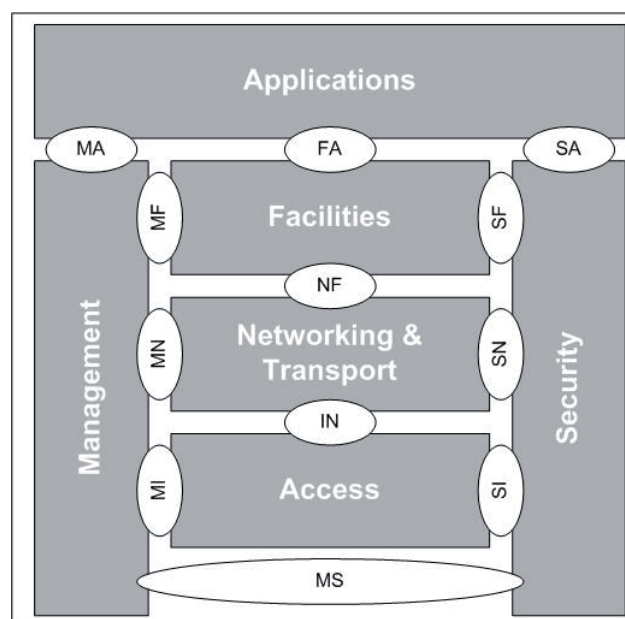


Figure 1 — ITS station reference architecture with named interfaces

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:

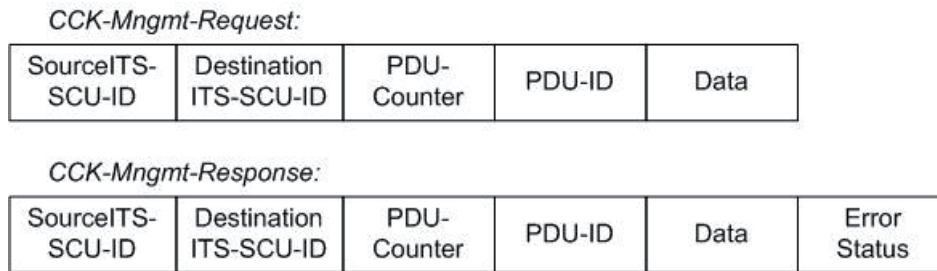
- ITS-SCU-Mngmt-Request;
- ITS-SCU-Mngmt-Response.

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
<b>SourceITS-SCU-ID</b>	ITS-SCU-ID of source ITS-SCU, which produces the request. See parameter 3 "ITS-sculd" specified in Annex A.	ITS-SCU-ID of ITS-SCU, which produces the response.
<b>DestinationITS-SCU-ID</b>	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.
<b>PDU-Counter</b>	Even number generated from a cyclic counter at the ITS-SCU, which produces the request.	PDU-Counter of related request incremented by one.
<b>PDU-ID</b>	Unique identifier of the content of the request.	Same as in ITS-SCU-Mngmt-Request.
<b>Data</b>	Octet string specific to the PDU-ID, carrying the request.	Octet string specific to the PDU-ID, carrying the response.
<b>ErrorStatus</b>	Not existent.	Existent. 0: No error happened >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.  Restart ITS-SCU-ID assignment process.	Nothing shall be done.
Message = alive	<b>IMPORTANT — This should never happen.</b>  Reset ITS-SCU and restart ITS-SCU-ID assignment process.	<b>IMPORTANT — This should never happen.</b>  Delete SourceITS-SCU-ID from local ITS-SCU-list.  Request deletion of related entries in forwarding tables.
Message = delete	<b>IMPORTANT — This should never happen.</b>  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.

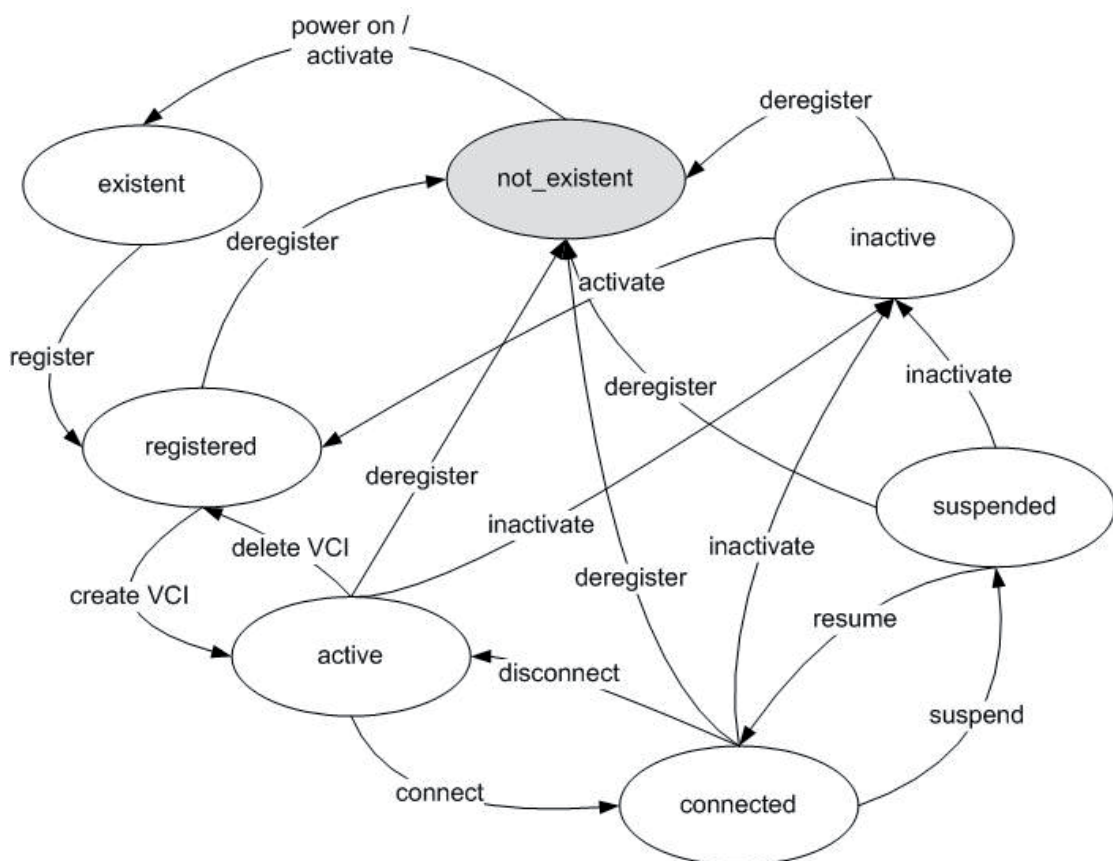


Figure 3 — CI state machine ISO 21218

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