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Intelligent transport systems — Roadside modules SNMP data interface —

Part 1: Overview

iTeh STANDARD PREVIEW
*Systemes de transport intelligents — Interface de données SNMP pour
les modules en bord de route —
Partie 1: Vue d'ensemble*
(standards.iteh.ai)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

A list of all parts in the ISO 20684 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

0.1 Background

The need for standardized communication with ITS field devices is growing around the world. Several countries have adopted SNMP-based field device communication standards.

There is a growing view and empirical evidence that standardizing this activity will result in improved ITS performance, reduced cost, reduced deployment time, and improved maintainability. The ISO 20684 series extends ISO 15784-2 by defining the management information necessary to monitor, configure and control features of field devices. The data elements defined in all parts of the ISO 20684 series may be used with any relevant protocol, but were designed with an expectation that they would be used with one of the ISO 15784-2 protocols.

By using this approach, agencies can specify open procurements and systems can be expanded geographically in an open and non-proprietary manner, which reduces costs, speeds up deployment and simplifies integration.

0.2 Overview

SNMP is a collection of well thought-out and well-proven concepts and principles. SNMP employs the sound principles of abstraction and standardization. This has led to SNMP being widely accepted as the prime choice for communication between management systems and devices on the internet and other communications networks.

The original implementation of SNMP was used to manage network devices such as routers and switches. Since then, the use of SNMP has grown into many areas of application on the internet and has also been used successfully over various serial communications networks.

This document defines management information for ITS field devices following the SNMP conventions.

0.3 Document approach and layout

This document defines:

- a) How conformance is defined in subsequent parts of the ISO 20684 series ([Clause 5](#));
- b) Terminology and symbols used throughout the various parts of the ISO 20684 series ([Clause 3](#) and [Clause 4](#));
- c) Conventions used throughout the various parts of the ISO 20684 series ([Clause 6](#));
- d) The ITS architectural services defined in ISO 14813-1 that are addressed by the ISO 20684 series ([Clause 7](#));
- e) The rules used by other parts of the ISO 20684 series in defining the user needs that drive the definition of requirements ([Clause 8](#));
- f) The rules used by other parts of the ISO 20684 series in defining requirements and constraints ([Clause 9](#));
- g) A set of generic dialogues that are referenced by other parts of the ISO 20684 series ([Clause 10](#));
- h) A discussion of security that applies to all devices conforming to the ISO 20684 series ([Clause 11](#));
- i) The management information base (MIB) for the features defined by this document ([Annex A](#));
- j) A description of the requirements traceability matrix that is provided in each subsequent part of the ISO 20684 series that traces defined requirements to the required design elements ([Annex B](#)).

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Intelligent transport systems — Roadside modules SNMP data interface —

Part 1: Overview

1 Scope

1.1 General

Field devices are a key component in intelligent transport systems (ITS). Field devices include traffic signals, message signs, weather stations, traffic sensors, roadside equipment for connected ITS (C-ITS) environments, etc.

The ISO 20684 series defines data that can be used when field devices need to exchange information with other external entities (called “managers” in this document, even if they are other field devices). Field devices can be quite complex, necessitating the standardization of many data concepts for exchange. As such, the ISO 20684 series is divided into several individual parts. This document (Part 1) introduces the ISO 20684 series and provides normative content that applies to all subsequent parts.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IETF RFC 2578, *Structure of Management Information Version 2 (SMIv2)*, April 1999.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

agent

entity (3.2) that can respond to `get` and `set` requests

3.2

entity

device or “thing” that becomes part of an intelligent transport system

3.3

event

information captured when a *trigger* (3.13) *fires* (3.6) within an *agent* (3.1)

Note 1 to entry: Events are often transmitted in notifications or stored in logs.

3.4

exception

condition that creates an *event* (3.3) that a user can want to store in a *log* (3.7) or transmit in a *notification* (3.9)

3.5

field device

fixed or portable roadside module that includes an *agent* (3.1)

3.6

fire

to start a process when a *trigger* (3.13) value transitions from false to true

3.7

log

registry of *events* (3.3) within an *agent* (3.1) that can be retrieved by a *manager* (3.8)

3.8

manager

entity (3.2) that can generate *get* and *set* requests and/or can receive *report*, *trap*, and/or other *inform* messages

[SOURCE: ISO 15784-2:2015, 4.9 — modified]

3.9

notification

listing of one or more *events* (3.3) that the *agent* (3.1) can send to one or more *managers* (3.8)

3.10

response time

time from the receipt of the last byte of a *ConfirmedClassPduType* to the start of the transmission of the first byte of the response message (when access is allowed by lower layers)

3.11

target

entity (3.1) to which the *field device* (3.5) can need to send *requests* or *notifications*

Note 1 to entry: Field devices often need to send notifications to managers when triggers fire.

Note 2 to entry: Field devices can be configured to request data from other field devices to use in their expression or trigger logic.

Note 3 to entry: Field devices can be configured to control other field devices in response to a trigger firing.

3.12

trap

notification (3.9) sent from an *SNMP agent* (3.1) to a *SNMP manager* (3.8) without an immediately preceding request from the manager or any expectation of an acknowledgement

3.13

trigger

condition that evaluates to a Boolean value

4 Symbols and abbreviated terms

ASN.1 abstract syntax notation one

BER basic encoding rules

IAB Internet Architecture Board

IP	internet protocol
ITS	intelligent transport systems
MIB	management information base
OER	octet encoding rules
OID	object identifier
PDU	protocol data unit
RFC	request for comments
	NOTE Specifically, RFCs published by the Internet Engineering Task Force
RTM	requirements traceability matrix
SMIv2	structure of management information version 2
SNMP	simple network management protocol
STD	IAB standard
TLS	transport layer security
UDP	user datagram protocol
USM	user-based security model

5 Conformance

Conformance to each part of the ISO 20684 series is defined as per the conformance section of each part, which is written using the structure defined in this clause.

Conformance is driven by defined user needs. Each part of the ISO 20684 series may define user needs and the design to fulfil the user need. User needs are written from the perspective of a manager for the field device.

NOTE Some parts of the ISO 20684 series do not define any user needs, but only provide reusable design elements that can be referenced by other parts of the ISO 20684 series.

Table 1 of each part of the ISO 20684 series (other than this document) identifies the user needs associated with the part and indicates whether they are mandatory or optional for conformance to that part. Each user need is also traced to a set of features. A feature is a high-level, architectural concept that represents a coherent capability of the device that can support multiple user needs.

Table 2 of each part of the ISO 20684 series (other than this document) traces each feature to the requirements for that feature.

Each user need, feature and requirement is identified by name and a reference. The reference can be within the same part, a different part, or a different standard. When references are made to other documents, all details and remaining traceability shall be defined in the referenced document.

Both tables indicate conformance for an item using one of the following conformance codes:

- a) M – indicates the item is mandatory when an implementation claims conformance to its parent item.
- b) O – indicates the item is optional when an implementation claims conformance to its parent item and if no other parent item makes the item mandatory.

Parent items are defined as follows:

- a) The part is the parent item of each user need defined within it.
- b) Each user need is a parent item for one or more features as shown by the indentation in Table 1. A user need may trace to multiple features and a feature may trace from multiple user needs.
- c) Each feature is a parent item for one or more requirements as shown by the indentation in Table 2. A feature may trace to multiple requirements; a requirement may trace from multiple user needs but typically only traces from one feature.

Note that a feature defined in one part of the ISO 20684 series can have a parent defined in another part. Features should not be defined until at least one user need exists for the feature.

A qualifier may precede a conformance code. In such cases, the qualifier shall be a term followed by a colon. The term shall be defined in Table 3 of each part as a reference to a specific clause in a specific standard. The meaning of this notation is that the conformance code only applies when the referenced clause is supported by an implementation.

EXAMPLE The code “condition:M” means that the indicated row is “mandatory” if the clause referenced by the term “condition” is supported by the implementation.

An option group expression may follow the “O” conformance code. The option group expression is of the form “.<group> (<multiplicity>”, where group shall be a sequential number that groups a number of options together and <multiplicity> shall be a range of integers that indicate the number of options that may be supported by an implementation from the option group.

EXAMPLE The code “O.2 (1..*)” means that the indicated row is optional, but one or more options from option group 2 are to be supported.

The requirements referenced by Table 2 are written as “shall” statements. However, the “shall” only applies if the conformance table indicates that the feature is required.

NOTE This document defines the rules to be followed by subsequent parts of the ISO 20684 series; it does not define any user needs or features itself and therefore does not contain Tables 1-3.

Each requirement specifying a need for a data exchange shall trace to one dialogue and one or more data elements that an implementation claiming conformance to the requirement shall support. The traceability from requirements to dialogues and data elements shall be defined in a requirements traceability matrix (RTM) contained in [Annex B](#) of each part of the ISO 20684 series. The RTM may include references to dialogues and data elements defined in other documents; any locally defined dialogues shall be defined in the body of the standard while all locally defined data elements shall be defined in [Annex A](#) of the document using a management information base (MIB) conforming to the format defined in IETF RFC 2578. If the implementation supports SNMP, all supported data element instances (i.e. SNMP objects) shall be accessible via any dialogue that meets the requirements of SNMP and the data element definition.

NOTE The dialogues defined in the ISO 20684 series are specified to promote a common interface for testing purposes and are not intended to restrict otherwise allowable requests or notifications.

[Annex A](#) of this document defines a set of object identities (i.e. nodes on the OID tree) and textual conventions (i.e. useful data types) that should be imported as needed by other MIB modules contained in other parts of the ISO 20684 series.

As this document does not contain any user needs, the [Annex B](#) of this document does not contain an RTM; however, it does provide additional requirements that shall be applicable related to the RTMs contained in other parts of the ISO 20684 series.

6 Conventions

6.1 ASN.1

This document contains MIBs, which are written in the form of ASN.1. This document also contains references to and explanations of ASN.1 data concepts within its text. In all cases, the ASN.1 terms are presented in a fixed width font (e.g. `such as this`) to distinguish these terms from normal English.

6.2 SNMP terminology

Terminology between the different versions of SNMP is slightly different. For the purposes of the ISO 20684 series, the terminology of SNMPv3 is adopted.

7 Architecture

7.1 ITS services

The ISO 20684 series defines mechanisms by which ITS field devices can be monitored, configured and controlled. ITS field devices may be used to support almost any ITS service, defined in ISO 14813-1, with a roadside component.

7.2 Physical view

[Figure 1](#) depicts the physical view of this interface using the graphical conventions defined by the architecture reference for cooperative and intelligent transportation^[19] and also documented in ISO 14813-5:2020, Annex B.



Figure 1 — Physical view of interface

The manager of the field device is shown in grey indicating that it can be any type of physical object, such as a central system, another field device, a maintenance laptop or any other device that supports the defined interface.

The field device is shown in orange, indicating that it is located in the field (e.g. along the roadside). It shall have a connection to the manager and may have any number of connections to other ITS-S or external systems.

The figure indicates two information transfers between these physical objects. The first is the “configuration and commands” information flow from the manager to the field device. The second is the “status and notifications” information flow from the field device to the manager. Both flows are shown in green indicating that authentication is required and both are shown with a single arrowhead indicating a unicast transfer.

Subsequent parts of the ISO 20684 series define needs, requirements and design details for various field device capabilities.

NOTE This document is based on the use of SNMP, which implements a GET/SET paradigm where there is a manager and an agent. However, a single field device entity can act as both a manager (e.g. sending requests to other field devices) and as an agent (e.g. responding to requests from a centre or other field device) simultaneously.