INTERNATIONAL STANDARD

ISO 24103

First edition
2009-06-01

Intelligent transport systems — Communications access for land mobiles (CALM) — Media adapted interface layer (MAIL)

Systèmes intelligents de transport — Accès aux communications des services mobiles terrestres (CALM) — Couche d'interface adaptée au milieu (MAIL)

Reference number
ISO 24103:2009(E)

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Published in Switzerland

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Foreword

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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 24103 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

Introduction

This International Standard is part of a family of International Standards for CALM (communication access for land mobiles) which determine a common architecture, network protocols and air interface definitions for wireless communications using cellular second generation, cellular third generation, mobile wireless broadband, microwaves, millimetre waves, infra-red communications, and so on. Other air interfaces may be added at a later date. These air interfaces are designed for providing parameters and protocols for broadcast, point-point, vehicle-vehicle, and vehicle-point communications in the intelligent transport systems (ITS) sector.

This International Standard determines the media adapted interface layer (MAIL), which enables communication media such as dedicated short-range communication (DSRC) compliant with ISO 15628 (DSRC application layer) to be used as CALM media for internet protocol (IP)-based communications.

DSRC media with the following characteristics are available.

— Proven radio communication for ITS:

1) direct communication based on ISO 15628, e.g. for electronic fee collection (EFC) — in ARIB STD-T75, a 4 MB/s data rate and a communication zone of approximately 30 m, available for response during high-speed driving;

2) practical experiments for IP communication over the ISO 15628 application layer — a DSRC application sub-layer (ARIB STD-T88) that works on application ID 18 of ISO 15628.

— Communication in a comparatively small communication zone:

1) easy identification of a communication partner;

2) reuse frequency in every small zone and effective utilization of frequency resources;

3) less liable to be affected by shadowing.

Intelligent transport systems — Communications access for land mobiles (CALM) — Media adapted interface layer (MAIL)

1 Scope

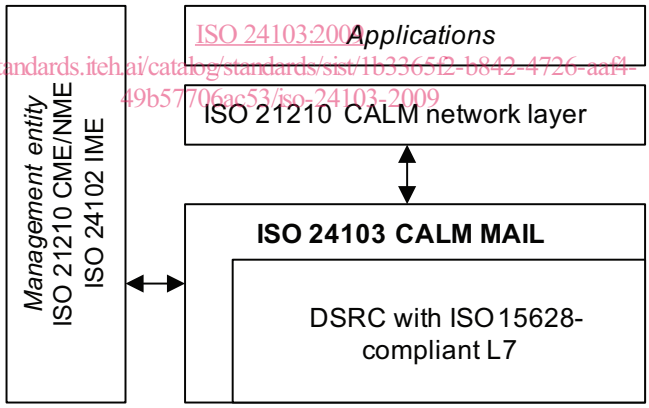
This International Standard determines the logical structure of using dedicated short-range communication (DSRC) with an OSI (open systems interconnection) application layer as a CALM medium for IP communications. DSRC to which MAIL is applicable are those with an application layer compliant with ISO 15628, and the standards of such DSRC include the following:

— ARIB STD-T75 DSRC (Japan);

— TTAS.KO-06.0025 DSRC in the 5,8 GHz band (Korea);

— EN 12253 DSRC physical layer using microwave in the 5,8 GHz band, EN 12795 DSRC data link layer and EN 12834 DSRC application layer (Europe).

Figure 1 shows the architecture of the MAIL, which can be considered as a specific extension of the communication adaptation layer (CAL) specified by ISO 21218.



NOTE In furnishing additional information on CALM MAIL, reference can be made to ARIB STD-T88 (DSRC application sub layer).

Figure 1 — CALM MAIL in CALM architecture

2 Conformance

In order for conformance to be claimed with this International Standard, communication shall be established in full compliance with the procedures and protocols given in ISO 15628, compliant with the appropriate national or regional standards, and shall be in accordance with ISO 21210, ISO 21217 and ISO 21218.

3 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 15628, *Road transport and traffic telematics — Dedicated short range communication (DSRC) — DSRC application layer*

ISO 21210, *Intelligent transport systems — Communications access for land mobiles (CALM) — Networking protocols*[1)]

ISO 21217, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*[1)]

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

ISO 24102, *Intelligent transport systems — Communications access for land mobiles (CALM) — CALM Management* [2)]

4 Terms and definitions

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

4.1
ISO 15628 DSRC
dedicated short-range communication system for ITS applications with an application layer as specified in ISO 15628

4.2
base station
fixed DSRC equipment on the roadside, which performs communications with multiple mobile stations

4.3
media adapted interface layer
MAIL
functional structure for using DSRC as a CALM medium

4.4
mobile station
mobile communication facility capable of receiving and transmitting information from/to the base stations

5 Symbols and abbreviated terms

A-PDU	application-layer protocol data unit
ARIB	association of radio industries and businesses
A-SDU	application-layer service data unit
ASN	abstract syntax notation

1) To be published.

2) Under preparation.

CAL	communication adaptation layer
CALM	communications access for land mobiles
CI	communication interface
CIMAE	communication interface management adaptation entity
C-SAP	communication SAP, as offered by the CAL to the CALM network layer
DHCP	dynamic host configuration protocol
DL	data link
DLL	data link layer
DSRC	dedicated short-range communication
EID	element identifier
ELCP	extended link control protocol
I-KE	initialization kernel element
ind	indication (service primitive type)
IP	internet protocol
ITS	intelligent transport systems
L7	layer 7 (application layer)
LAN	local area network
LANCP	LAN control protocol
LID	link identifier
LPCP	local port control protocol
L-PDU	lower layer protocol data unit
MAC	media access control
MAIL	media adapted interface layer
ME	management entity
MIB	management information base
M-PDU	media protocol data unit
MRU	maximum receive unit
NCP	network control protocol
OBU	on-board unit
PDU	protocol data unit
PHY-PDU	physical layer protocol data unit
req	request (service primitive type)
RSU	road side unit
SAP	service access point
SDU	service data unit
TCP	transmission control protocol
T-KE	transfer kernel element
TTAS	telecommunications technology association standard
U-PDU	upper layer protocol data unit

6 Requirements

6.1 Structure and operation

The MAIL interfaces ISO 15628 DSRC application layer protocol stacks and CALM network protocols to provide the DSRC with supplemental communications functions (see Figure 2).

The CALM MAIL communication interface (CI) shall be in accordance with

a) ISO 21218, for lower layer service access points,

b) ISO 24102, for interface management

c) ISO 21217, for global architecture, and

d) ISO 21210, for IP networking,

as restricted and/or amended by this International Standard.

This communication interface is a CALM wireless CI which shall

— support CI class CIC-wl5,

— support at least CI access class CIAC-1,

— provide a C-SAP, and

— provide an M-SAP,

all in accordance with ISO 21218.

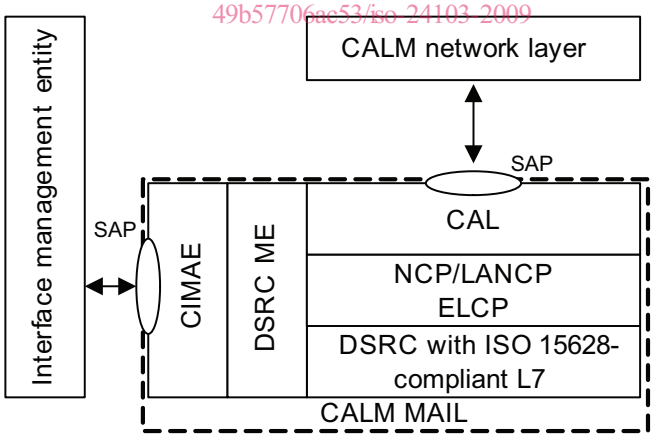


Figure 2 — Medium adaptation

Figure 3 shows the structure of the core part of MAIL. The MAIL provides IP communications via DSRC to CALM without requiring awareness of ISO 15628 protocol stacks. The functions that adapt the application layer of the ISO 15628 DSRC to CALM are defined below.

MAIL consists of the extended link control protocol (ELCP) and the network control protocol (NCP). The ELCP interfaces with the ISO 15628 protocol stacks, complements them, and provides management functions. The NCP provides encapsulation functions for upper layer protocols.

— The ELCP has the following functions:

1) transmission service control;

2) client/server communication control;

3) communication control management.

— The NCP has the following functions:

1) LAN control;

2) local port control (optional).

The NCP may consist of multiple communication control protocols for interfacing with various types of network protocols. The LAN control protocol is a communication control protocol which interfaces with the IP network protocol. The local port control protocol is an optional communication control protocol specified in ISO 29281, and is used for non-IP network applications. The present International Standard focuses on the LAN control protocol used to interface with the IPv6 CALM network layer.

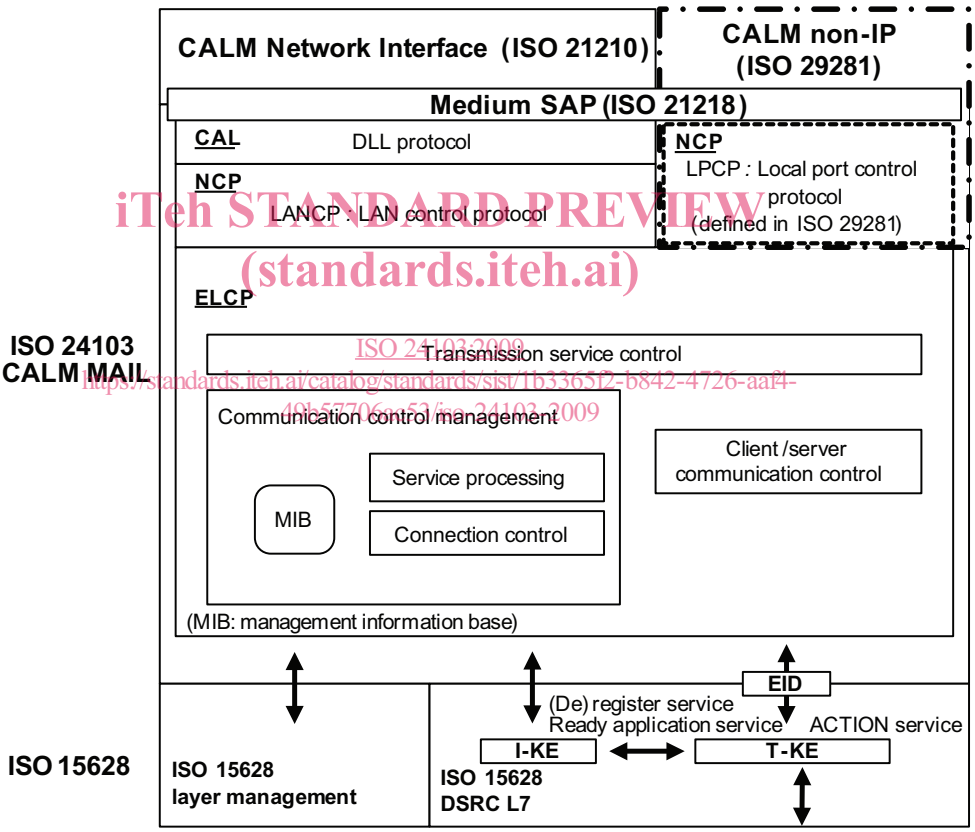


Figure 3 — Structure of MAIL core part

Figure 4 shows an outline of MAIL operation.

DSRC layer 7 establishes an ISO 15628 DSRC communication link. The ELCP shall be activated by a notification of a communication link establishment from DSRC L7. After the activation, the ELCP first shall compare its own MAIL profile with the peer MAIL profile passed through the established communication link and confirm the available functions in the ELCP. During this stage, the ELCP shall not conduct any settings related to the NCP.

After the confirmation of MAIL profiles, when an access management function is usable, a peer authentication may be conducted. In the case of successful authentication, the ELCP may activate the communication control protocol (e.g. LANCP) in the NCP and start the NCP process phase.

The activated NCP shall conduct the initial setting for each communication control protocol in the initial setting phase. Each network protocol shall be activated only after the completion of the initial setting for the corresponding communication control protocol in the NCP.

After completion of the above procedure, the communication phase may start to initiate communication using the network protocol.

Thus, the network protocol, such as IP, is activated.

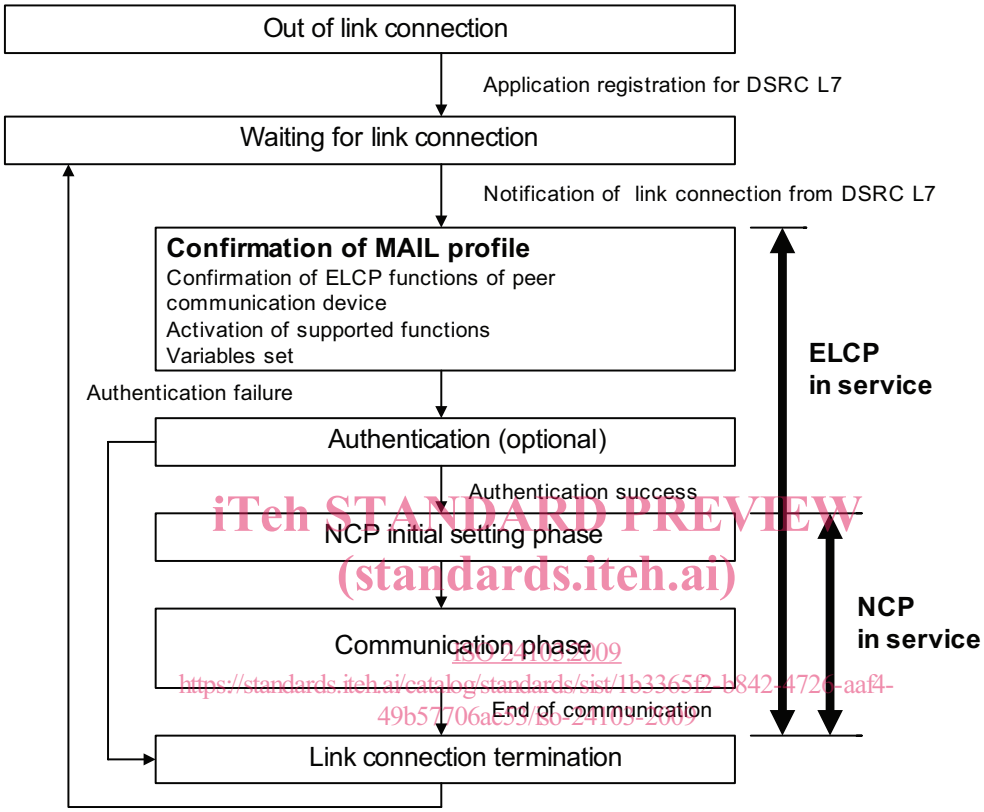


Figure 4 — Outline of MAIL operation

6.2 Communication control method

Figure 5 shows an overview of the service interfaces and the protocol stacks of DSRC and MAIL.

The ELCP exchanges the protocol data units (PDU) with the peer ELCP by using the service interface provided by DRSC L7 and conducts the communication procedures stipulated for the ELCP. The ELCP provides the service interface of the communication service for the data transmission and the management service for the management control to the NCP.

The NCP exchanges the PDU with the peer NCP by using the service interface provided by the ELCP and conducts the communication procedures stipulated for the NCP.