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ITS CALM Mobile Wireless Broadband applications using Communications in accordance with IEEE 802.20

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The UK participation in its preparation was entrusted to Technical Committee EPL/278, Road transport informatics.

A list of organizations represented on this committee can be obtained on request to its secretary.

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INTERNATIONAL STANDARD

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ITS CALM Mobile Wireless Broadband applications using Communications in accordance with IEEE 802.20

Applications ITS CALM mobiles sans fil à large bande utilisant les communications conformes à l'IEEE 802.20

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Foreword

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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 29283 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 (Communications Access for Land Mobiles) which specify a common architecture, network protocols and a set of air interface definitions for wireless communications using a number of wireless media, including cellular second generation, cellular third generation, 5 GHz, millimetre, infra-red communications, and mobile wireless broadband (MWB), over packet-based networks. The CALM architecture is also designed to include short range, short duration, low latency communication systems such as European Dedicated Short-Range Communications (DSRC) and North American Wireless Access in Vehicular Environments (WAVE) based on IEEE 802.11. It is anticipated that other air interfaces will be added in the future. Generally speaking, the CALM architecture is designed to include air interfaces that provide some subset of point-to-point, vehicle-to-vehicle, and vehicle-to-point communications over packet-based networks in the ITS Sector. In particular, this International Standard provides additional specifications which wireless devices adhering to the mobile wireless broadband IEEE 802.20 techniques standard must also meet to be CALM compliant.

Large volumes of data are required for purposes such as safety, traffic information and management; video downloads to vehicles for tourist information and entertainment and navigation-system-updates, etc. In order to support such services, mobile units need to be able to communicate over longer ranges with access points/base stations, and the system must be able to hand over sessions from one access point/base station to another. CALM standards are explicitly designed to enable quasi-continuous data communications as well as data communications of protracted duration between vehicles and service providers, and between vehicles. It is important to note that the CALM architecture is specifically designed to support packet-based communications; support for circuit-switched communications is not included.

The fundamental advantage of the CALM concept over traditional systems is the ability to support media-independent handover (MIH), also referred to as heterogeneous handover, between the various media that can be included in a CALM system. Selection policies are supported that include user preferences and media capabilities in making decisions as to which media to use for a particular session, and when to hand over between media or between service providers on the same medium. These handover mechanisms are defined within the CALM architecture International Standard (ISO 21217), the CALM IPv6 Networking for internet connectivity International Standard (ISO 21210), the CALM medium service access points International Standard (ISO 21218) and the CALM communication and station management International Standard (ISO 24102). Handovers between access points using the same technology and service provider use mechanisms that are defined within the particular medium specific CALM Standard.

ITS applications that can be enhanced or are enabled by the CALM architecture include car-to-car and point-to-multipoint safety messaging, collision avoidance, update of roadside telemetry and messaging, probe data collection, general internet access, image and video transfer, infotainment, multimedia multicast, traffic management, monitoring and enforcement in mobile situations, and route guidance, just to mention a few.

For a general introduction to CALM architecture, see ISO 21217.

This International Standard provides definitions and procedures for the establishment and maintenance of an ITS communications session within a CALM system environment using a medium communication in accordance with the IEEE 802.20 protocol specification.

INTERNATIONAL STANDARD ISO 29283:2011(E)

ITS CALM Mobile Wireless Broadband applications using Communications in accordance with IEEE 802.20

1 Scope

This International Standard specifies the options appropriate for CALM using mobile wireless broadband (MWB) techniques conforming to the IEEE 802.20 air interface and protocol specification recommended by ITU-R M.1801 and specifies the management interface requirements.

CALM links are required for quasi-continuous, prolonged and short duration communications between vehicles and the roadside, between vehicles, and between mobile equipment and fixed infrastructure points, over medium and long ranges.

Wherever practicable, this International Standard has been developed by reference to suitable extant standards, adopted by selection. Required regional variations are provided.

Application specific upper layers are not included in this International Standard, but will be driven by application standards.

2 Conformance

In order to claim conformance with this International Standard, mobile wireless broadband techniques standardized using the IEEE 802.20 protocol specification shall be established in full compliance with local telecommunications procedures and protocols for IEEE 802.20 in accordance with IEEE standards, and shall also conform to the requirements of ISO 21217, ISO 21210, ISO 21218, ISO 24102 and ISO 25111.

3 Normative reference

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

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

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) — Management*

ISO 25111:2009, *Intelligent transport systems — Communications access for land mobiles (CALM) — General requirements for using public networks*

IEEE 802.20, *Part 20: Air Interface for Mobile Broadband Wireless Access Systems Supporting Vehicular Mobility — Physical and Media Access Control Layer Specification*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21217 and ISO 25111 apply.

5 Abbreviated terms

For the purposes of this document, the symbols and abbreviations given in ISO 21217 and the following apply.

CALM communications access for land mobiles

DSRC dedicated short-range communication

IME input method editor

MMAE medium management adaptation entity

6 Requirements

6.1 Adoption of other standards and internationally adopted practices

Equipment and systems complying to this International Standard shall operate in the environment of, and to the parameters defined within, IEEE 802.20. This standard specifies two modes of operation, the wideband mode is designed with wide bandwidth to operate for all Frequency Division Duplex (FDD) and Time Division Duplex (TDD), and The 625k-MC mode is designed with 625 kHz carrier bandwidth supporting aggregation of multiple carriers for TDD operation only.

6.2 CALM Architecture

Equipment and systems conforming to this International Standard shall operate in the ITS domain of, and to the parameters defined within, ISO 21217.

6.3 CALM IPv6 Networking for internet connectivity

Equipment and systems conforming to this International Standard shall operate in the environment of, and to the parameters defined within, ISO 21210.

6.4 CALM Medium service access points

Equipment and systems conforming to this International Standard shall operate in the environment of, and to the parameters defined within, ISO 21218.

6.5 CALM Interface manager

Equipment and systems conforming to this International Standard shall operate in the environment of, and to the parameters defined within, ISO 24102.

6.6 CALM using public wireless networks

Equipment and systems conforming to this International Standard shall operate in the environment of, and to the parameters defined within, ISO 25111.

6.7 Establishment of a medium specific session

6.7.1 "User Controlled" sessions

Equipment and systems conforming to this International Standard shall utilize procedures determined in ISO 25111:2009, 6.1.3.

6.7.2 Establishment and termination of a "Continuous" session

Equipment and systems conforming to this International Standard shall utilize procedures determined in ISO 25111:2009, 6.1.4.

6.7.3 Establishment and termination of a "Time Controlled" session

Equipment and systems conforming to this International Standard shall utilize procedures determined in ISO 25111:2009, 6.1.5.

6.7.4 Establishment and termination of a "User Controlled" session

Equipment and systems conforming to this International Standard shall utilize procedures determined in ISO 25111:2009, 6.1.6.

6.8 Interface medium management

The interface medium management shall be conducted in conformance with the specifications of ISO 25111:2009, 6.1.

7 Medium access control (MAC)

7.1 General

The medium access control (MAC) shall be conducted in conformance with the specifications of ISO 25111:2009, Clause 7.

7.2 CALM IEEE 802.20 MMAE service primitives

The service primitives given in 7.2.1 to 7.2.5 shall be supported by IEEE 802.20 MMAE.

7.2.1 MMAE SetParam.request

- MMAE-SetParam.request
  int interfaceId,
  uchar paramNumber, // 128
  uchar paramValue; // 1: connect, 2: disconnect

7.2.2 MMAE SetParam.confirm

- MMAE-SetParam.confirm
  int interfaceId, uchar paramNumber, uchar paramValue, uchar result;

7.2.3 MMAE GetParam.request

- MMAE-GetParam.request
  int interfaceId, uchar paramNumber;

7.2.4 MMAE GetParam.confirm

- MMAE-GetParam.confirm
  int interfaceId, uchar paramNumber, uchar ifStatus, struct ifChar, uchar result;

7.2.5 MMAE Notify.indication

- MMAE-Notify.indication
  int interfaceId
  uchar status; // 1: disconnected, 2: connected

7.3 Identification of the IEEE 802.20 MMAE

7.3.1 MMAE-GetParam.request=1

On receipt of *MMAE-GetParam.request* (int interfaceId, uchar paramNumber = 1), the IEEE 802.20 MMAE on mobile station side shall inquire to MAC on MS the status of the interface.

7.3.2 MMAE-GetParam.request=2

On receipt of *MMAE-GetParam.request* (int interfaceId, uchar paramNumber = 2), the IEEE 802.20 MMAE on mobile station side shall inquire to MAC on mobile station the interface characteristics.

- MMAE-GetParam.req
  - int interfaceId;
  - uchar paramNumber
    - 1: Request for interface status
    - 2: Request for interface characteristics

7.3.3 MMAE-GetParam.confirm

Once the parameter value is received, the IEEE 802.20 MMAE shall send to IME the MMAE-GetParam.confirm primitive.

- MMAE-GetParam.confirm
  - int interfaceId;
  - uchar paramNumber
  - uchar ifStatus
    - valid if ParameterNumber is 1
    - 1: connected, 2: disconnected
  - struct ifChar
    - valid if ParameterNumber is 2
    - int DataRate, int Cost, uchar ServiceType, uchar Security
  - uchar result

7.3.4 Result

The parameter “result” in MMAE-GetParam.confirm represents the processing result of the request service.

1: OK - successful reply
2: Error - no such media
3: Unknown error

7.3.5 Further procedures

The further procedures described in IEEE 802.20 shall be followed.

— Typically, in accordance with IEEE 802.20, an example of the connection establishment procedures for the IEEE 802.20 625k-MC mode medium is as follows:

  a) BCH acquisition, selection, and configuration (Req: Automatically start after power on/ Rsp: L3MmcUtNewBestBs.ind)

  b) Proactive Registration and Session Start (Req: L3cmUtStart.req/ Rsp: L3cmUtStart.conf)

— Typically, in accordance with IEEE 802.20, an example of the connection establishment procedures for the IEEE 802.20 wideband mode medium is as follows:

  a) Access network acquisition and configuration setup (Req: Automatically start after initial power on/ Rsp: NetworkAcquired)

  b) Registration, Access Grant, and Session Start (Req: OpenConnection, SendRegistration/ Rsp: RegistrationSucceeded, ASMP.ConnectionOpened)

7.4 CALM Session connection

7.4.1 Session connection sequence

The sequence of session initiation shall be as determined in 7.3.

In order to establish a session, CALM IEEE 802.20 MMAE shall perform the following procedure.

On receipt of *MMAE-SetParam.request* (int interfaceId, uchar paramNumber = 128, uchar paramValue = 1) service, the IEEE 802.20 MMAE on mobile station side shall attempt to connect to the IEEE 802.20 base station.

Subsequently, CALM IEEE 802.20 MMAE shall send to IME the IEEE 802.20 *MMAE-SetParam.confirm* (ok) primitive.

The parameter “result” in *MMAE-SetParam.confirm* represents the processing result of the connection request service and shall be as follows:

1: OK, - the IEEE 802.20 MMAE shall attempt to connect
2: Fail - try later
3: System error

7.4.2 Successful CALM session establishment

Once the IEEE 802.20 connection is established, the IEEE 802.20 MMAE shall notify to IME the changed status of the medium using the *MMAE-Notify.indication* service.

7.5 CALM session disconnection

On receipt of the *MMAE-SetParam.request* (int interfaceId, uchar paramNumber = 128, uchar paramValue = 2) service, the IEEE 802.20 MMAE on mobile station side shall try to disconnect from the IEEE 802.20 base station. The IEEE 802.20 MMAE shall then send to IME the *MMAE-SetParam.confirm* primitive.

The parameter “result” in *MMAE-SetParam.confirm* represents the processing result of the connection request service:

1: OK - the IEEE 802.20 MMAE has completed disconnection
2: Fail - try later
3: System error

and on receipt of *MMAE-SetParam.request* (int interfaceId, uchar paramNumber = 128, uchar paramValue = 1) service, the EEE802.20 MMAE on mobile station side shall attempt to connect to the IEEE 802.20 base station.

7.6 Change of IEEE 802.20 connection state

If the IEEE 802.20 connection state changes during the session, the IEEE 802.20 MMAE in the mobile station shall immediately notify this to the IME using the *MMAE-Notify.indication* primitive.

7.7 Retrieval of the medium status

The IME can check the status of a specific medium. On receipt of *MMAE-GetParam.request* (int interfaceId, uchar paramNumber), the IEEE 802.20 MMAE on mobile station side shall inquire with the MAC on mobile station about the status of the medium.

7.7.1 MMAE GetParam.req

- MMAE-GetParam.req
  - int interfaceId;
  - uchar paramNumber
    - 1: Request for interface status
    - 2: Request for interface characteristics

7.7.2 MMAE GetParam.confirm

- MMAE-GetParam.confirm
  - int interfaceId;
  - uchar paramNumber
  - uchar ifStatus
  - struct ifChar
  - uchar result

The parameter “result” in *MMAE-GetParam.confirm* represents the processing result of the request service.

1: OK - successful reply
2: Error - no such media
3: Unknown error

7.8 IEEE 802.20 session disconnection

In accordance with IEEE 802.20, the IEEE 802.20 connection is closed through one of the M-SAP/C-SAP services listed below.

— The state for the IEEE 802.20 625k-MC mode data transmission can be changed through one of the following services:

  a) Deregistration and Session Stop (Req: L3CmUtstop.req/ Rsp:L3CmUtstop.ind)

  b) BCH acquisition, selection continuously unless power off

— The IEEE 802.20 wideband mode connection state can be closed on the following events:

  a) Deregistration and Session Stop (Req: RegistrationFailed, ConnectionState.ConnectionClosed, or SupervisionFailed)

Once the procedures defined in IEEE 802.20 to close the connection are completed, the IEEE 802.20 MMAE shall be notified through *MMAE-Notify.indication* service to IME.

8 Test and conformance requirements

8.1 General

Test and conformance requirements shall be as specified in ISO 25111:2009, Clause 10.

8.2 Marking, labelling and packaging

All transmitting equipment shall be clearly and permanently marked stating with which national regulation it complies.

All transmitting equipment shall be provided with clear instructions for tuning and adjustments to meet the regulations of the country in which it is to be used.

All transmitting equipment shall be clearly and permanently marked to indicate which CALM interfaces it supports.

All transmitting equipment shall be clearly and permanently marked with instructions indicating that it shall only be used when adjusted to meet national radio regulations pertaining to the frequencies at which it operates.

9 Declaration of patents and intellectual property

Patents and intellectual property used in mobile wireless broadband can be obtained from the standards provided in Clause 6, and their subsidiary and associated standards, specifically IEEE 802.20.

Patents and intellectual property associated with CALM Architecture can be found in ISO 21217.

Patents and intellectual property associated with CALM IPv6 Networking can be found in ISO 21210.

Patents and intellectual property associated with CALM Medium service access protocols can be found in ISO 21218.

Patents and intellectual property used in mobile wireless broadband can be obtained from the national and International Standards provided in Clause 6, and their subsidiary and associated national and International Standards and IP access issues are maintained by IEEE 802.20.

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