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V2X Communications;
Multimedia Content Dissemination (MCD)
Basic Service specification;
Release 2**

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

Modal verbs terminology

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Introduction

ITS stations (ITS–Ss) exchange information with each other to satisfy a large diversity of customers' services.

Multimedia information provides enriched information to enhance the perception of the road users as well relatively to their mobility environment as to the products and services being locally available. Multimedia information may also be used to enhance the communication between individuals and communities during their mobility.

The exchange of multimedia information needs the specification of messages supporting multimedia such as pictures, video clips, audio associated with data elements enabling their use.

1 Scope

The present document specifies the basic service of the facilities layer supporting Multimedia Content Dissemination (MCD). It also specifies the Multimedia Content Dissemination Message (MCDM) being used for the multimedia content dissemination.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference/>.

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The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 302 637-3: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service".
- [2] ETSI EN 302 931: "Intelligent Transport Systems (ITS); Vehicular Communications; Geographical Area Definition".
- [3] ETSI TS 102 894-2: "Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary".
- [4] Recommendation ITU-T X.691/ISO/IEC 8825-2 (2015): "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".
- [5] ETSI TS 103 248: "Intelligent Transport Systems (ITS); GeoNetworking; Port Numbers for the Basic Transport Protocol (BTP)".
- [6] ETSI EN 302 636-4-1: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 1: Media-Independent Functionality".
- [7] ETSI EN 302 636-5-1: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 5: Transport Protocols; Sub-part 1: Basic Transport Protocol".
- [8] IETF RFC 2046: "Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types", November 1996.

NOTE: Available at <https://tools.ietf.org/html/rfc2046>.

- [9] ETSI EN 302 663 (V1.2.1): "Intelligent Transport Systems (ITS); Access layer specification for Intelligent Transport Systems operating in the 5 GHz frequency band".
- [10] ETSI TS 103 613: "Intelligent Transport Systems (ITS); Access layer specification for Intelligent Transport Systems using LTE Vehicle to everything communication in the 5,9 GHz frequency band".
- [11] IETF RFC 1738: "Uniform Resource Locators (URL)", December 1994.

NOTE: Available at <https://www.ietf.org/rfc/rfc1738.txt>.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ISO/TS 17419:2018: "Intelligent Transport Systems - Cooperative Systems - Classification and management of ITS applications in a global context".
- [i.2] ETSI EN 302 665: "Intelligent Transport Systems (ITS); Communications Architecture".
- [i.3] ETSI EN 302 636-3: " Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 3: Network Architecture".
- [i.4] ETSI TS 102 723-11: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 11: Interface between networking and transport layer and facilities layer".
- [i.5] ETSI TS 102 723-5: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 5: Interface between management entity and facilities layer".
- [i.6] ETSI TS 101 539-1: "Intelligent Transport Systems (ITS); V2X Applications; Part 1: Road Hazard Signalling (RHS) application requirements specification".
- [i.7] ETSI TS 101 556-1: "Intelligent Transport Systems (ITS); Infrastructure to Vehicle Communication; Electric Vehicle Charging Spot Notification Specification".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

event: object described by Multimedia Content Dissemination Message(s)

NOTE: E.g. road hazard, driving environment, traffic condition, or Point of Interest.

MCD protocol: facilities layer protocol to control the dissemination of multimedia data such as photos/pictures, video clips, audio

Multimedia Content Dissemination (MCD): facilities layer function that operates the MCD protocol

Multimedia Content Dissemination Message (MCDM): one or more facilities layer PDUs that contain multimedia content data

originator ITS-S: ITS-S that generates and transmits Multimedia Content Dissemination Messages

receiver ITS-S: ITS-S that receives and processes Multimedia Content Dissemination Messages

3.2 Symbols

For the purposes of the present document, the following symbols apply:

IF.Mng	Interface between MCD basic service and ITS management entity
IF.N&T	Interface between MCD basic service and ITS networking & transport layer
IF.SEC	Interface between MCD basic service and ITS security entity

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACK	ACKnowledgement
API	Application Program Interface
ASN.1	Abstract Syntax Notation 1
BTP	Basic Transport Protocol
DE	Data Element
DEN	Decentralized Environmental Notification
DENM	Decentralized Environmental Notification Message
DF	Data Frame
FA-SAP	Facilities/Applications Service Access Point
GN	GeoNetworking
HMI	Human Machine Interface
IANA	Internet Assigned Numbers Authority
ISO	International Organization for Standardization
ITS	Intelligent Transportation System
ITS-S	ITS Station
LDM	Local Dynamic Map
MCD	Multimedia Content Dissemination
MCDM	Multimedia Content Dissemination Message
MF-SAP	Management/Facilities Service Access Point
MTU	Maximum Transmit Unit
MTU_AL	Maximum Transmit Unit of Access Layer
NACK	Negative ACKnowledgement
NF-SAP	Networking & Transport/Facilities Service Access Point
OSI	Open System Interconnection
PCI	Protocol Control Information
PDU	Protocol Data Unit
PER	Packet Error Rate
POI	Point Of Interest
RFC	(IETF) Request For Comments
RT	Repetition Timer
SAP	Service Access Point
SF-SAP	Security/Facilities Service Access Point
UTF	Unicode (or Universal Coded Character Set) Transformation Format
V2X	Vehicle-to-Everything

4 MCD basic service introduction

4.1 Background

Multimedia Content Dissemination Messages (MCDMs) contain multimedia content describing events for various applications. MCDMs can be broadcasted to reach all users being in the coverage of the used communication technology. They can also be broadcasted in geographical area. MCDMs can be targeted to a particular user or to a community of users using multicast. Finally, MCDMs can be addressed to a particular user through an established peer to peer session. MCDMs may incorporate several multimedia containers including pictures, video clips, audio and data. They may constitute long messages requiring segmentation to ensure their complete consistent transfer respecting the order of transmitted segments in spite of some possible losses. Received MCDMs need to be filtered according to their use context and user preferences.

Multimedia Content Dissemination (MCD) is a facilities layer function which is mainly used by ITS applications to control the dissemination of pictures, video clips, audio and data using ITS communication technologies. Applications classes to be supported by MCD can be listed as follows:

- Road safety, e.g. signalling some obstacle on the road as specified in ETSI TS 101 539-1 [i.6] or some dangerous traffic situations using pictures or video clips.

- Traffic management, e.g. providing pictures or videos of the current traffic situations.
- Mobility e.g. providing some multimedia description of POI availability, e.g. parking, electric vehicle charging spots [i.7], rest areas, etc.
- National patrimony information, e.g. monuments, local specialties, arts, etc.
- Commercial information, e.g. products/services advertisement, special sales, open days, etc.
- Personal and Communities information, e.g. hitchhiking request, community concerted mobilities, etc.

The dissemination of MCDM among ITS-Ss is operated by the MCD protocol. Example processing procedures of an ITS use case that is supported by the MCD protocol are as follows:

- Applications activate the MCD basic service either on user request or automatically when detecting a particular situation.
- The application specifies the dissemination rules of the multimedia content which is provided at the same time.
- An MCDM is generated and transmitted according to the provided dissemination rules. In case of geo-addressing, the MCDM can be relayed by one or more relevant network forwarder ITS-Ss.
- An ITS-S that receives an MCDM processes the contained information and provides it or not to the user according to contextual constraints, e.g. driving state and preference criteria.

A general inter-layer and inter-ITS-Ss dataflow for the MCDM exchange is provided in Figure 1. The solid lines illustrate the dataflow that is mandatory for all ITS applications supported by MCD basic service.

An MCDM may be forwarded by intermediate ITS-Ss in order to disseminate it from the originating ITS-S to the receiver ITS-S, if the receiver ITS-S is not located in the direct communication range of the originating ITS-S. This forwarding is realized by the ITS networking and transport layer.

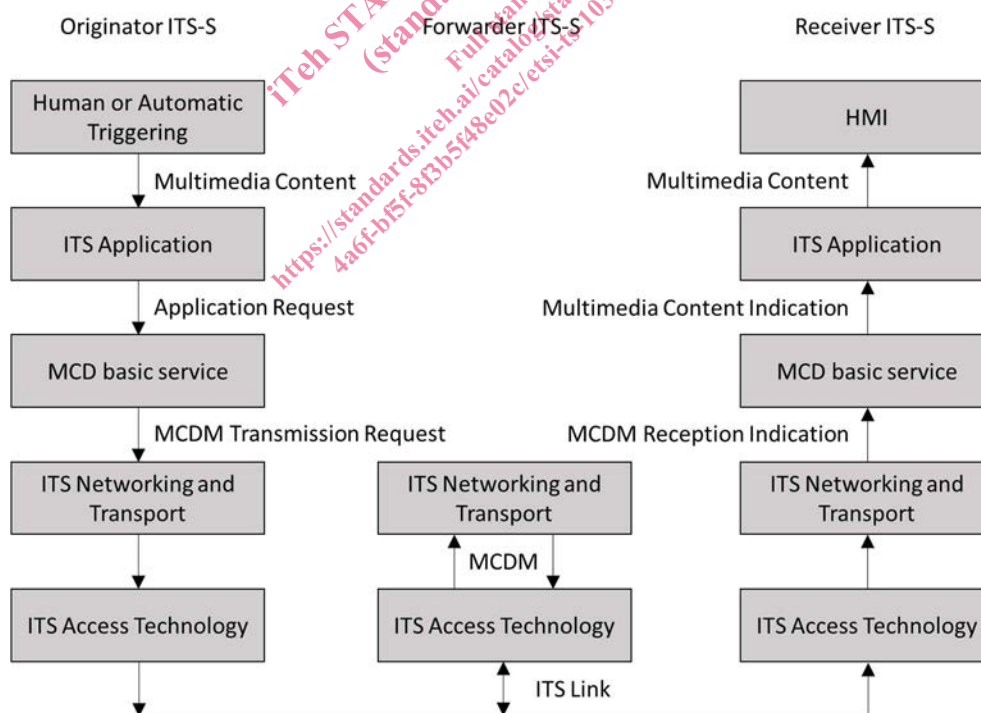


Figure 1: General data flow for ITS-S application supported by MCD basic service

4.2 Services provided by the MCD basic service

The MCD basic service is a facilities layer entity that operates the MCD protocol. It provides services to entities at the ITS applications layer. At the originator ITS-S, it triggers and maintains the transmission of MCDMs according to dissemination rules as set by the ITS-S application. At the receiver ITS-S, the MCD basic service processes the received MCDM and makes the content available for usage at ITS-S applications if relevant.

The MCD basic service uses the services provided by the protocol entities of the ITS networking and transport layer to disseminate the MCDM. Dissemination rules are provided by the requesting ITS-S application. It may be:

- Broadcast.
- Geographical broadcast.
- Multicast, using a group address, e.g. community name, or a personal logical name.
- Peer to Peer.

An MCDM contains management information, and one or several multimedia containers being characterized in the management field. Other information such as situation and/or location information may be added according to the application purpose.

An MCDM can be repeated by the originating ITS-S when using broadcast and/or multicast in order to increase the reception probability of at least one exemplary in spite of packet loss.

An MCDM can be split into several units by the MCD basic service when this service is not available at the network and/or transport layer level, e.g. BTP/GeoNetworking. In such case, the MCD basic service needs to ensure the integrity of received messages. If one unit is lost and it exists no possibility to recover it at the network and/or transport layer, the whole message may be discarded by the MCD basic service of the receiver that detected the message integrity loss.

An MCDM can be associated to a DENM, e.g. "obstacle on the road" or "hazardous location". In such case the receiver ITS-S application needs to ensure a consistent user interface.

The MCD basic service of the originator ITS-S shall construct the MCDM according to the application request.

An MCDM may contain several multimedia containers of different natures, e.g. pictures, video clips, audio, text.

5 MCD basic service functional specification

5.1 MCD basic service in the ITS architecture

The MCD basic service interfaces with ITS-S applications in order to receive the request for the MCDM dissemination and to provide the received multimedia content to the ITS-S applications. Furthermore, the MCD basic service may interact with other facilities layer entities, in particular the LDM which is a facilities layer database containing local dynamic data elements. At the receiver ITS-S, the LDM may be updated with a received MCD and ITS-S applications may retrieve information from the LDM database for further processing.

NOTE: The specification of the LDM is out of scope of the present document.

Figure 2 presents the MCD basic service in the ITS-S architecture defined in ETSI EN 302 665 [i.2] and ETSI EN 302 636-3 [i.3] as well as its logical interfaces with other entities and layers.