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Information technology — High efficiency coding and media delivery in heterogeneous environments —

Part 1: MPEG media transport (MMT)

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Partie 1: Transport des médias MPEG

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Foreword

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ISO/IEC 23008-1:2023

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

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This third edition cancels and replaces the second edition (ISO/IEC 23008-1:2017), which has been technically revised. It also incorporates the Amendment ISO/IEC 23008-1:2017/Amd 1:2017.

The main changes are as follows:

— addition of signalling message for layout configuration;

— addition of signalling messages related to delivery over mobile networks;

— addition of signalling messages to support multipath delivery;

— addition of procedcure for session setup and control;

— addition of procedcure for using WebSockets.

A list of all parts in the ISO/IEC 23008 series can be found on the ISO and IEC websites.

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 and www.iec.ch/national-committees.

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Introduction

This document specifies the MPEG media transport (MMT) technologies for the transport and delivery of coded media data for multimedia services over heterogeneous packet-switched networks including internet protocol (IP) networks and digital broadcasting networks. In this document, "coded media data" includes both timed audiovisual media data and non-timed data.

MMT is designed under the assumption that the coded media data will be delivered over a packet-switched delivery network. Several characteristics of such delivery environment, such as non-constant end-to-end delay of each packet from the sending entity to the receiving entity, have been taken into consideration.

For efficient and effective delivery and consumption of coded media data over packet-switched delivery networks, this document provides the following elements:

— the logical model to construct contents composed of components from various sources, for example, components of mash-up applications;

— the formats to convey information about the coded media data, to enable delivery layer processing, such as packetization;

— the packetization method and the structure of the packet to deliver media content over packet-switched networks supporting media and coding independent hybrid delivery over multiple channels;

— the format of the signalling messages to manage delivery and consumption of media content.

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Information technology — High efficiency coding and media delivery in heterogeneous environments —

Part 1: MPEG media transport (MMT)

1 Scope

This document specifies MPEG media transport (MMT) technologies, which include a single encapsulation format, delivery protocols and signalling messages for transport and delivery of multimedia data over heterogeneous packet-switched networks for multimedia services. Types of packet-switched networks supported by this document include bidirectional networks such as Internet Protocol (IP) networks and unidirectional networks such as digital broadcast networks (which may or may not use the IP).

The technologies specified by this document belong to one of three functional areas of MMT: media processing unit (MPU) format, signalling messages and delivery protocol.

The MPU format specifies the "`mpuf`" branded ISO-based media file format (ISOBMFF) encapsulating both timed and non-timed media contents. The MPU format is a self-contained ISOBMFF structure enabling independent consumption of media data, which hides codec-specific details from the delivery function.

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The signalling functional area specifies the formats of signalling messages carrying information for managing media content delivery and consumption, e.g. specific media locations and delivery configuration of media contents.

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The delivery functional area specifies the payload formats that are independent of media and codec types, which allow fragmentation and aggregation of contents encapsulated as specified by this document for delivery using packet-switched oriented transport protocols. The delivery functional area also provides an application layer transport protocol that allows for advanced delivery of media contents.

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.

ISO/IEC 14496-12:2022, *Information technology — Coding of audio-visual objects — Part 12: ISO base media file format*

ISO/IEC 23000-19, *Information technology — Multimedia application format (MPEG-A) — Part 19: Common media application format (CMAF) for segmented media*

IETF RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax, January 2005*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electroped ia: available at https://www.electropedia.org/

3.1.1
access unit
AU
smallest media data entity to which timing information can be attributed

3.1.2
asset
any multimedia data entity that is associated with a unique identifier and that is used for building a multimedia presentation

3.1.3
dependent asset
asset (3.1.2) for which one or more other assets are necessary for decoding of the contained media content

3.1.4
encoding symbol
unit of data generated by the encoding process

3.1.5
encoding symbol block
set of *encoding symbols* (3.1.4)

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3.1.6
FEC code
algorithm for encoding data such that the encoded data flow is resilient to data loss

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3.1.7
FEC encoded flow
logical set of flows that consists of an *FEC source flow* (3.1.11) and one or more associated *FEC repair flows* (3.1.9)

3.1.8
FEC payload ID
identifier that identifies the contents of an *MMTP packet* (3.1.20) with respect to the *MMT FEC scheme* (3.1.16)

3.1.9
FEC repair flow
data flow carrying repair symbols to protect an *FEC source flow* (3.1.11)

3.1.10
FEC repair packet
MMTP packet (3.1.20) along with *repair FEC payload identifier* (3.1.27) to deliver one or more *repair symbols* (3.1.29) of a *repair symbol block* (3.1.30)

3.1.11
FEC source flow
flow of *MMTP packets* (3.1.20) protected by an *MMT FEC scheme* (3.1.16)

3.1.12
FEC source packet
MMTP packet (3.1.20) protected by an FEC encoding

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3.1.13
media fragment unit
MFU
fragment of a *media processing unit* (3.1.14)

3.1.14
media processing unit
MPU
generic container for independently decodable *timed* (3.1.35) or *non-timed data* (3.1.25) that is media codec agnostic

3.1.15
MMT entity
software and/or hardware implementation that is compliant to a profile of MMT

3.1.16
MMT FEC scheme
forward error correction procedure that defines the additional protocol aspects required to use an FEC scheme in MMT

3.1.17
MMT protocol
MMTP
application layer transport protocol for delivering *MMTP payload* (3.1.22) over IP networks

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3.1.18
MMT receiving entity
MMT entity (3.1.15) that receives and consumes media data

3.1.19
MMT sending entity
MMT entity (3.1.15) that sends media data to one or more *MMT receiving entities* (3.1.18)

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3.1.20
MMTP packet
formatted unit of the media data to be delivered using the *MMT protocol* (3.1.17)

3.1.21
MMTP packet flow
sequence of *MMTP packets* (3.1.20) with same *MMT sending entity* (3.1.19) and *MMT receiving entity* (3.1.18)

3.1.22
MMTP payload
formatted unit of media data to carry *Packages* (3.1.26) and/or signalling messages using either the *MMT protocol* (3.1.17) or an Internet application layer transport protocols (e.g. RTP).

3.1.23
MMTP session
single *MMTP transport flow* (3.1.24) that is used for certain period of time

3.1.24
MMTP transport flow
series of *MMTP packet flow* (3.1.21) delivered to the same destination

3.1.25
non-timed data
media data that do not have inherent timeline for the decoding and/or presenting of its media content

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3.1.26
package
logical collection of media data, delivered using MMT

3.1.27
repair FEC payload ID
FEC payload ID (3.1.8) for repair packets

3.1.28
repair packet block
segmented set of *FEC repair flow* (3.1.9) which can be used to recover lost source packets

3.1.29
repair symbol
encoding symbol that contains redundancy information for error correction

3.1.30
repair symbol block
set of *repair symbols* (3.1.29) which can be used to recover lost *source symbols* (3.1.33)

3.1.31
source FEC payload ID
FEC payload ID (3.1.8) for source packets

3.1.32
source packet block
segmented set of *FEC source flow* (3.1.11) that is to be protected as a single block

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3.1.33
source symbol
unit of data to be encoded by an FEC encoding process

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3.1.34
source symbol block
set of *source symbols* (3.1.33) generated from a single *source packet block* (3.1.32)

3.1.35
timed data
data that has inherent timeline information for the decoding and/or presentation of its media contents

3.1.36
asset delivery characteristics
ADC
description about required quality of service (QoS) for delivery of *assets* (3.1.2)

Note 1 to entry: ADC is represented by the parameters agnostic to a specific delivery environment.

3.1.37
network abstraction for media
parameter that is used for an interface between media application layer and underlying network layer

3.2 Abbreviated terms

ADC	asset delivery characteristics
AL-FEC	application layer forward error correction
ARQ	automatic repeat request
AU	access unit

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AVC	advanced video coding
CLI	cross layer interface
CRI	clock relation information
DCI	device capability information
EVC	essential video coding
GFD	generic file delivery
HRBM	hypothetical receiver buffer model
HTTP	hypertext transfer protocol
ISOBMFF	ISO base media file format
LA-FEC	layer aware forward error correction
LR	license revocation
LS	license signalling
MPI	media presentation information
MC	measurement configuration
MFU	media fragment unit
MMT	MPEG media transport
MMTP	MMT protocol
MP	MMT package
MPU	media processing unit
MTU	maximum transmission unit
MVC	multi-view video coding
NAM	network abstraction for media
NTP	network time protocol
PA	package access
PID	packet identifier
PTP	precision time protocol
RAP	random access point
RTP	real-time protocol
SDP	session description protocol
SI	security information
SSWR	security software request

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SVC	scalable video coding
TCP	transmission control protocol
TS	transport stream
UDP	user datagram protocol
URI	uniform resource identifier
URL	uniform resource locator
URN	uniform resource name
UUID	universally unique identifier
UTC	coordinated universal time
XML	extensible mark-up language

4 Conventions

The following convention applies in this document.

— The Big Endian number representation scheme is used.

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5 Overview

This document defines a set of tools to enable advanced media transport and delivery services. The tools spread over three different functional areas: media processing unit (MPU) format, delivery and signalling. Even though the tools are designed to be efficiently used together, they may also be used independently regardless of the use of tools from the other functional areas.

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The media processing unit (MPU) functional area defines the logical structure of media content, the Package and the format of the data units to be processed by an MMT entity and their instantiation with the ISO base media file format as specified in ISO/IEC 14496-12. The Package specifies the components comprising the media content and the relationship among them to provide necessary information for advanced delivery. The format of data units in this document is defined to encapsulate the encoded media data for either storage or delivery and to allow for easy conversion between data to be stored and data to be delivered (see Clause 7).

The delivery functional area defines an application layer transport protocol and a payload format. The application layer transport protocol defined in this document provides enhanced features for delivery of multimedia data when compared with conventional application layer transport protocols, e.g. multiplexing and support of mixed use of streaming and download delivery in a single packet flow (see 9.2). The payload format is defined to enable the carriage of encoded media data which is agnostic to media types and encoding methods (see 9.3).

The signalling functional area defines formats of signalling messages to manage delivery and consumption of media data. Signalling messages for consumption management are used to signal the structure of the Package (see 10.3) and signalling messages for delivery management are used to signal the structure of the payload format and protocol configuration (see 10.4).

A multimedia service may use any subset of the tools defined in this document according to its specific needs. Furthermore, interfaces between protocols and standards defined by this specification and those defined in other specifications can also be defined and used. Figure 1 illustrates the different functions and their relationships to existing protocols and standards.

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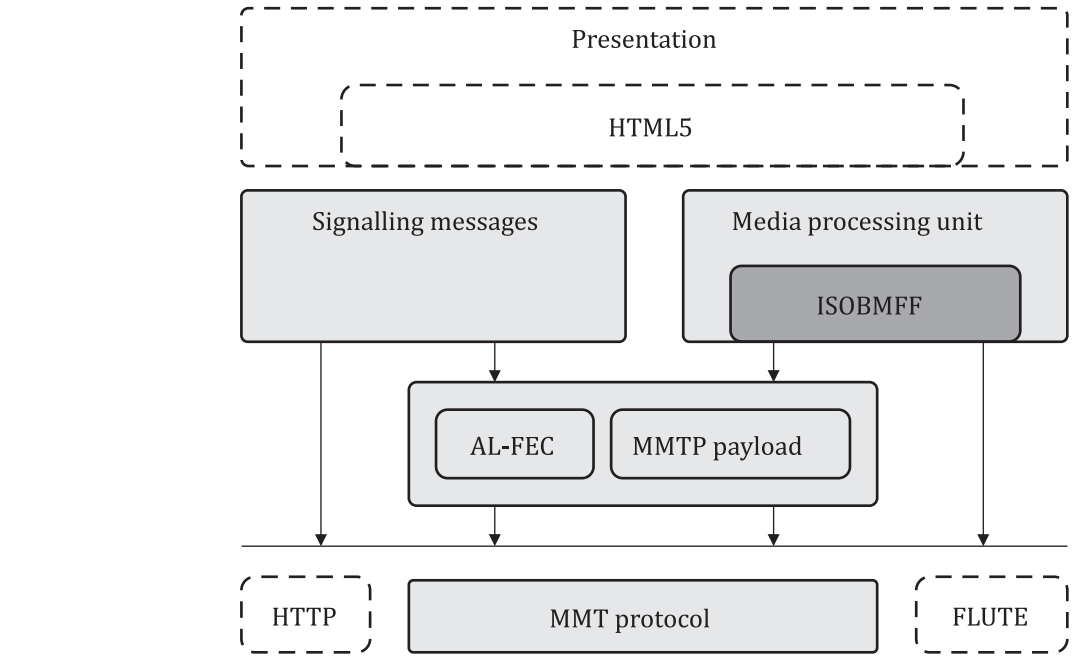

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Figure 1 — MMT functional areas, tools and interfaces

ISO/IEC 23008-1:2023
https://standards.iteh.ai/catalog/standards/sist/578f5a09-4c58-421b-b6a1-c8ad21006499/iso-iec-23008-1-2023

Figure 2 depicts the end-to-end architecture for this document. The MMT sending entity is responsible for sending the Packages to the MMT receiving entity as MMTP packet flows. The sending entity may be required to gather contents from content providers based on the presentation information of the Package that is provided by a Package provider.

A Package provider and content providers may be co-located. Media content is provided as an Asset that is segmented into a series of encapsulated MMT Processing Units that forms a MMTP packet flow.

The MMTP packet flow of such content is generated by using the associated transport characteristics information. Signalling messages may be used to manage the delivery and the consumption of Packages.

This document defines the interfaces between the MMT sending entity and the MMT receiving entity, as well as their operations. The MMT sending entity shall conform to the sender operations as defined in Clause 9.

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