MPEG Media Transport Protocol (MMTP)

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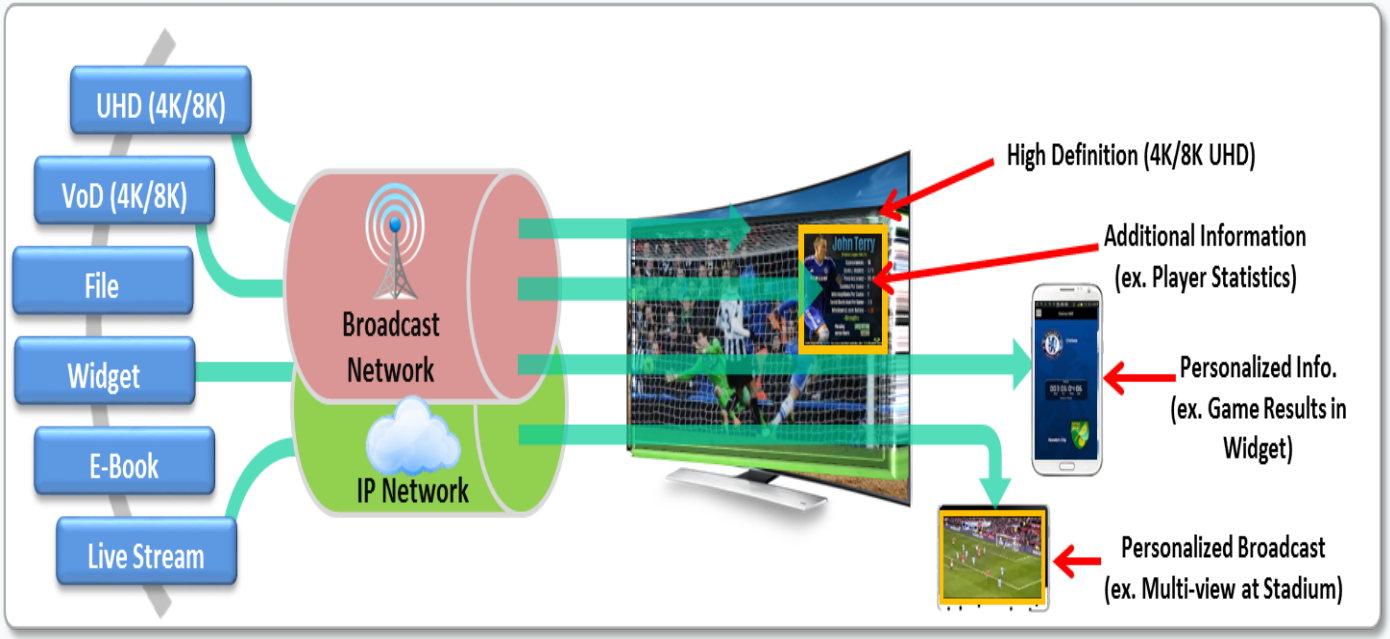
MMTP



- Developed by the MPEG as a replacement of MPEG-2 TS
- MMT contains several functions
  - transport protocol (MMTP)
  - Signaling layer
  - FEC Framework
- MMT is published as ISO/IEC International Standard 23008-1

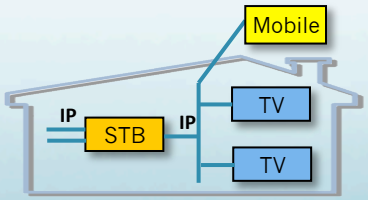
Key Transport Scenarios

Provisioned Broadcast

- Terrestrial, satellite, and mobile broadcast
- Channel capacity allocated for air transmission

Provisioned Unicast

- IPTV using provider's network
- Usually multicast in the head-end and unicast in the last hop

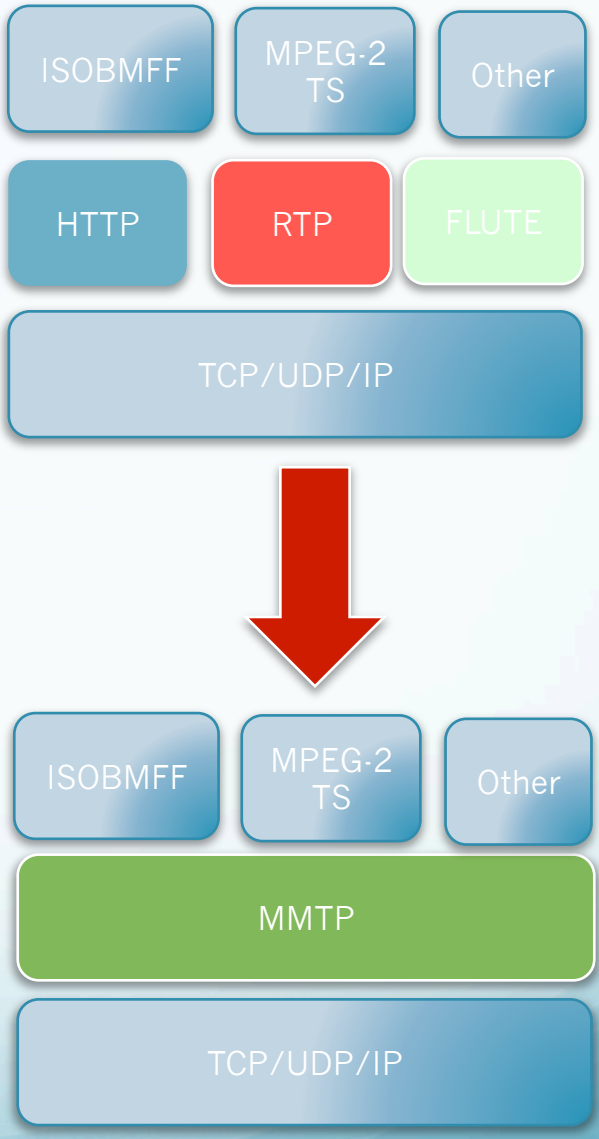


Best-effort Unicast

- Streaming OTT content to devices
- Hybrid delivery with reception over broadcast and unicast simultaneously

Requirements

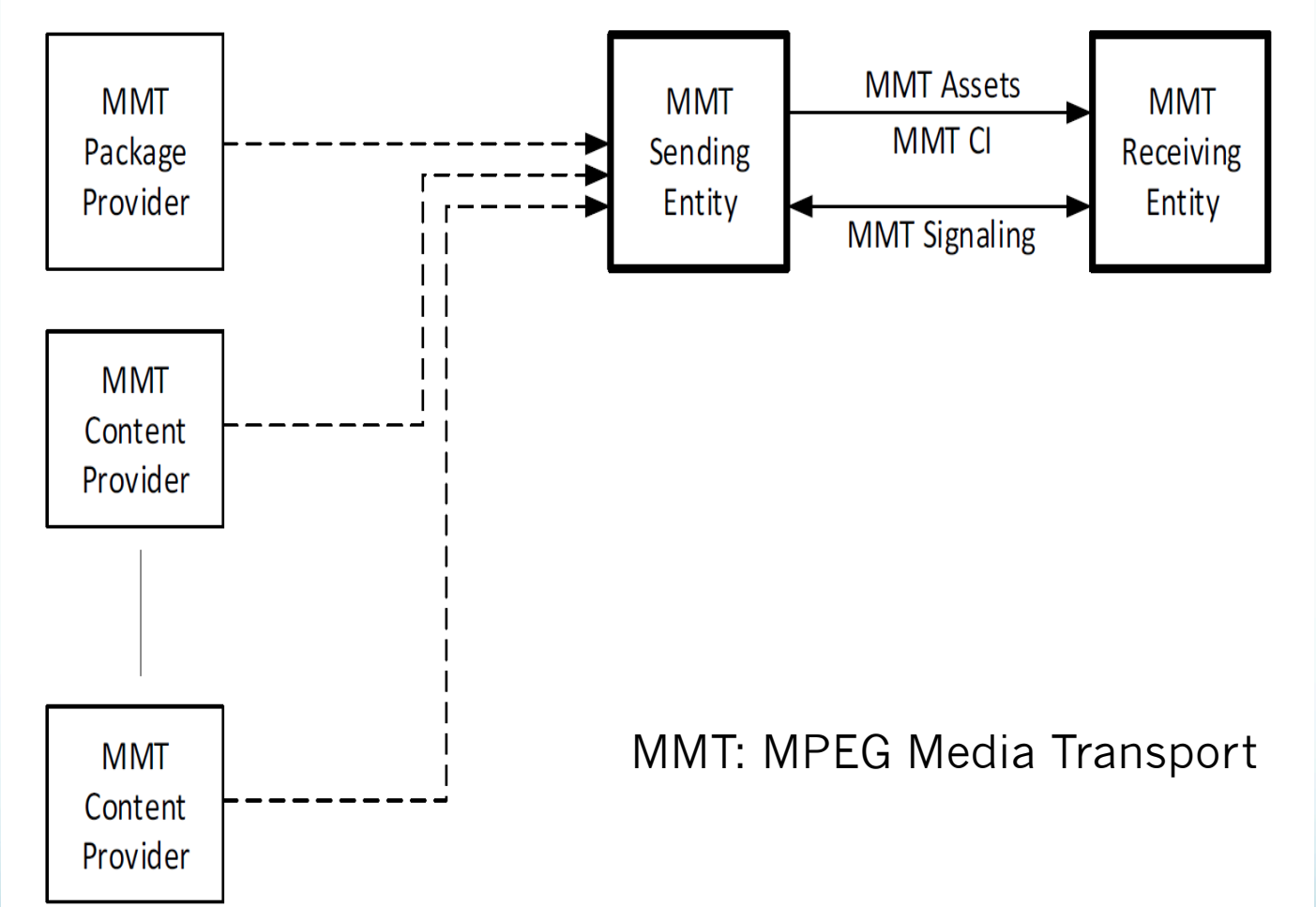
- Generic
  - Works with any media type without modification
  - Supports both real time and non-real time media delivery, i.e. supports both download and streaming
- Multiplexing
  - Enables multiplexing all media components and related signaling in one session/flow using only 1 port
  - Each component is a sub-stream, identified by packet_id
- Self-contained
  - Signaling information describes all sub-streams of the MMTP flow
- Focus on Delivery
  - Decouples Transport from Presentation
  - Transport Protocol provides delivery timestamp
  - Signaling and other Presentation Information provide presentation time
- Multi-Source Support
  - Enable hybrid broadcast/broadband delivery



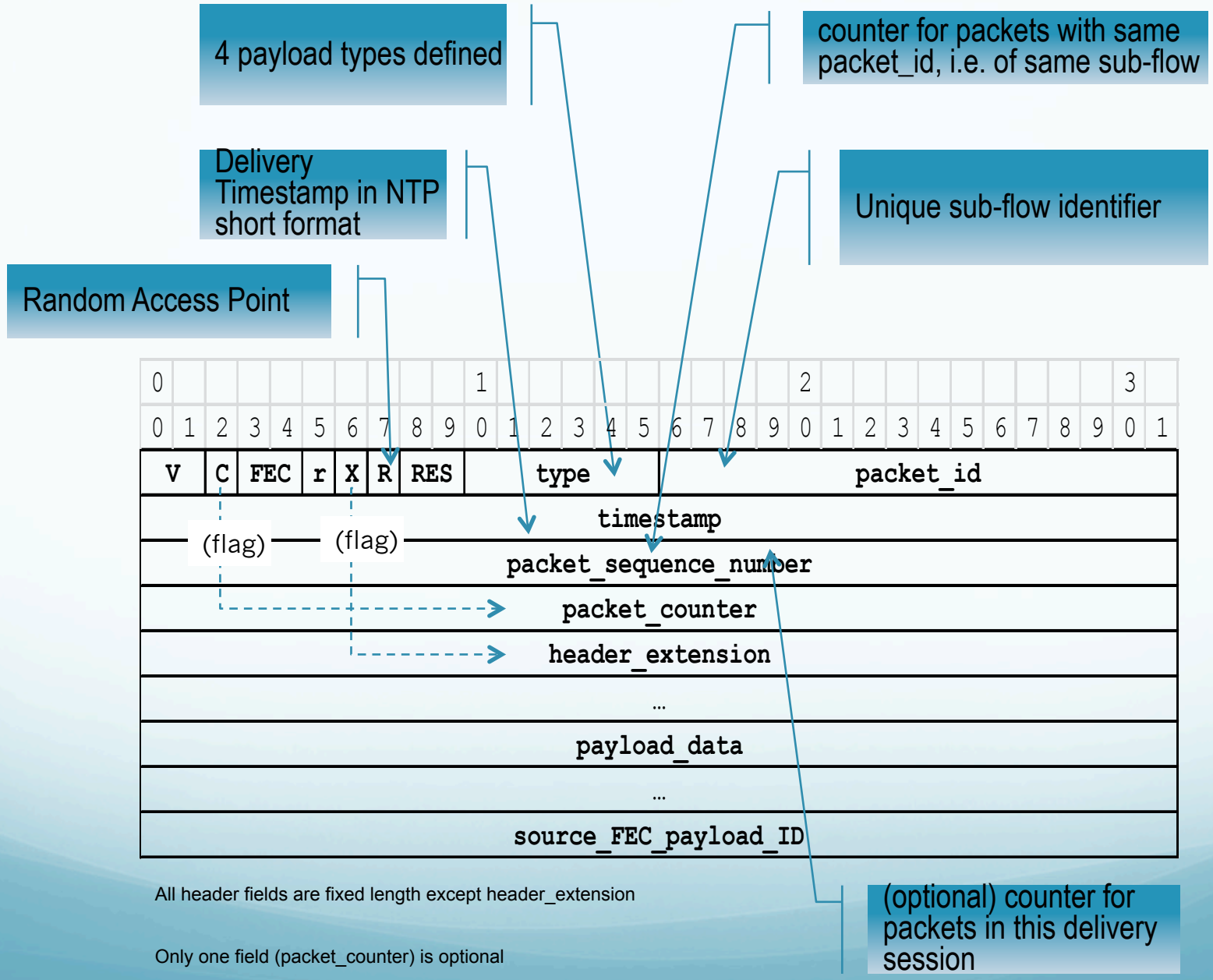
Why not RTP?

- Lack of Multiplexing
  - One media session per component and without RTP multiplexing, 2 ports per session
- Server Maintenance
  - RTP Payload Format for every new media codec
  - Support needs to be added to the media server
- Coupling of Presentation and Delivery
  - RTP carries presentation and synchronization information at the transport level
- Limited support for Non-Real Time Media
  - Presentations consist of timed and non-timed media
  - Need other protocol or countless number of payload formats to support NRT

Target Architecture



MMTP Packet


4 payload types defined
counter for packets with same packet_id, i.e. of same sub-flow
Delivery Timestamp in NTP short format
Unique sub-flow identifier
Random Access Point
0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
V
C
FEC
r
X
R
RES
type
packet_id
timestamp
(flag)
(flag)
packet_sequence_number
packet_counter
header_extension
...
payload_data
...
source_FEC_payload_ID
All header fields are fixed length except header_extension
Only one field (packet_counter) is optional
(optional) counter for packets in this delivery session

Protocol Procedures

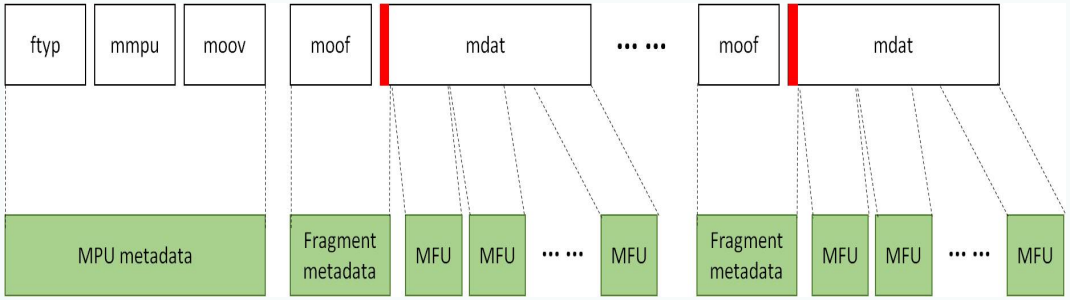
- MMTP session consists of one MMTP flow
- MMTP flow identified by the destination IP address and port number (both SSM and ASM supported)
- MMTP flow consists of multiple sub-flows, each identified by a packet_id
- Each MMTP sub-flow carries a service component (e.g. Audio, Video, Subtitling, Signaling, Generic Data, ...)
- Supports FEC at flow or sub-flow level

Payload Formats

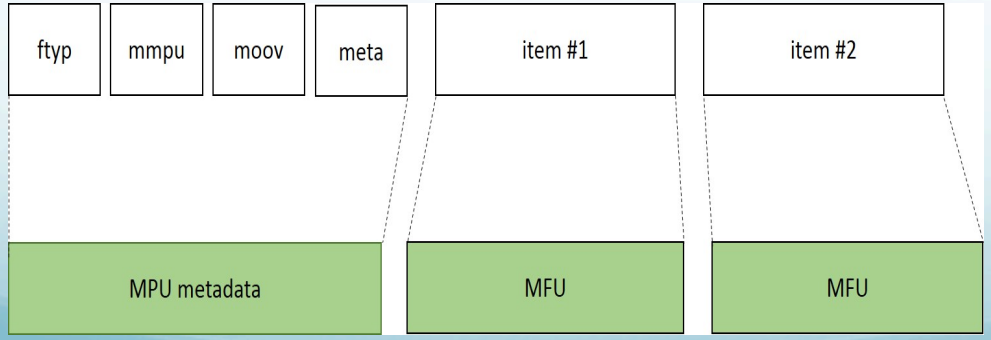
- MMT defines 4 distinct payload formats
  - Media Processing Unit format: optimized for streaming of ISOBMFF file formats as defined in ISO/IEC 14496-12
  - Generic File Delivery format: carries all types of files with self-contained meta-data (similar to FCAST). This is suitable for carriage of non-real time media.
  - Signaling format: carries MMT-defined and private signaling in a common envelope, supporting both binary and XML representation
  - FEC Repair Data format: carries repair data according to the MMT FEC framework that applies to one or more sub-flows of an MMTP flow
- Fragmentation and Aggregation are performed at payload format level

MPU Payload Format

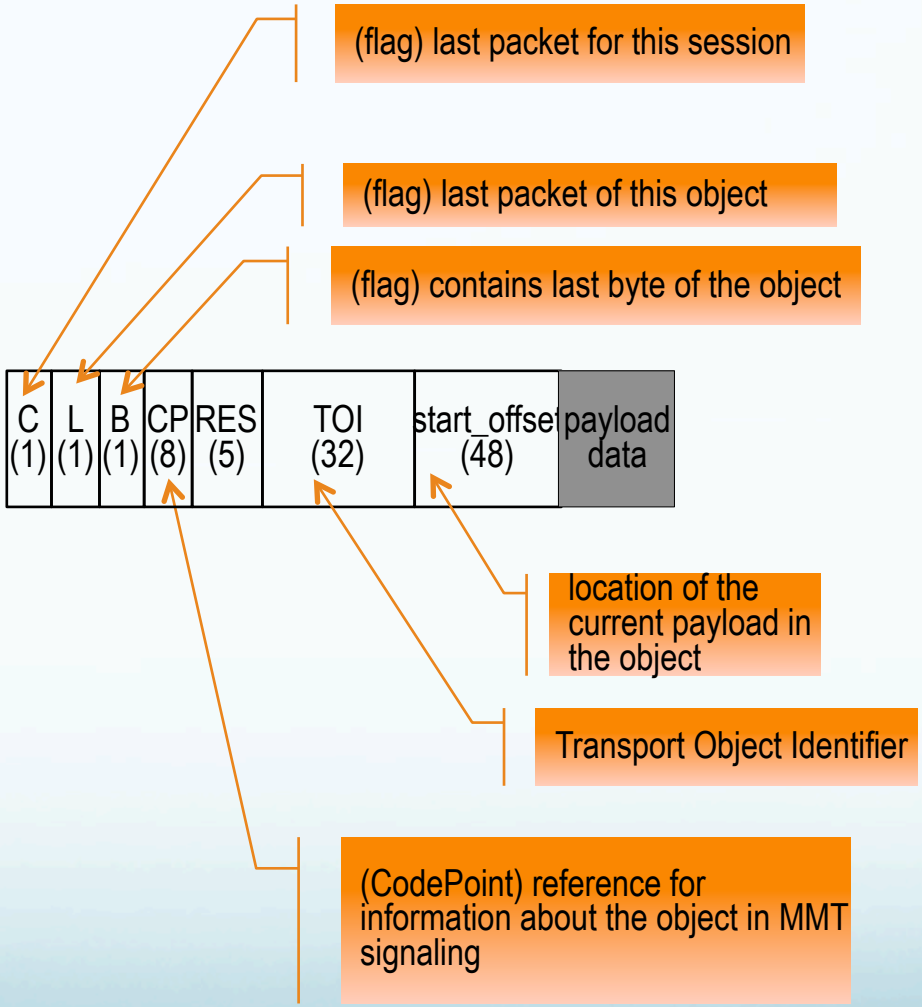
- Optimized for ISOBMFF
  - generic capability (anything that can be stored in ISOBMFF) can be streamed by MMTP
- Timed data



- Non-timed data

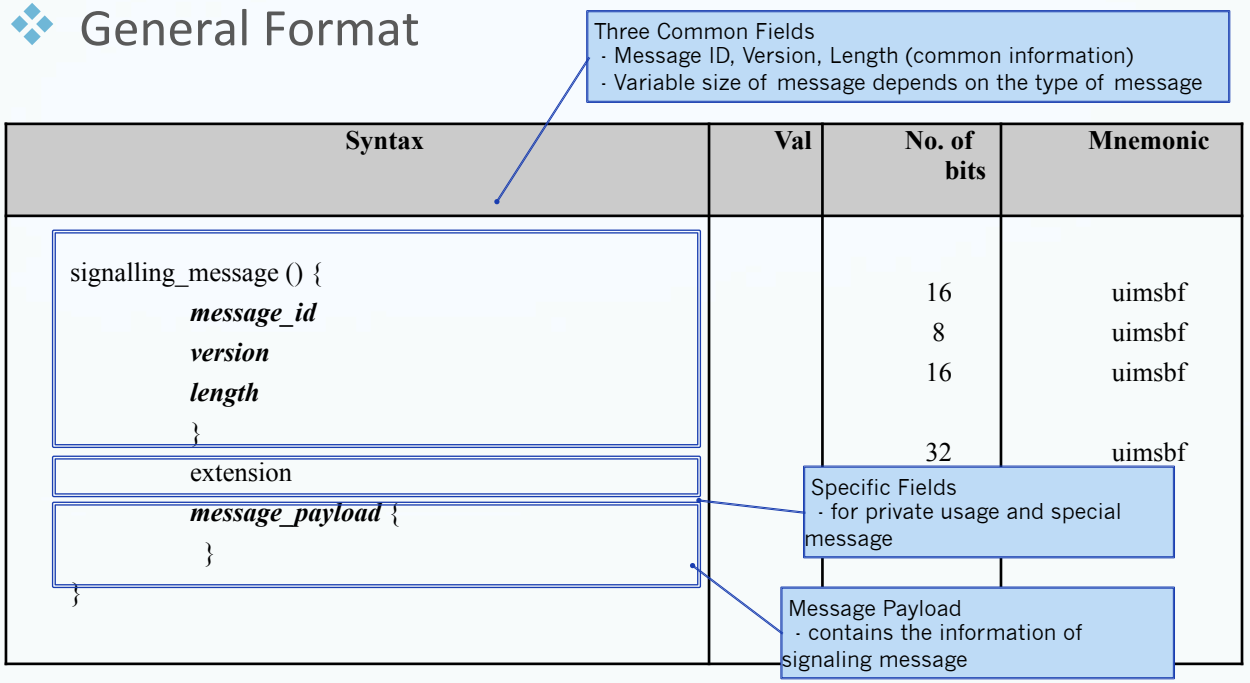


Structure of GFD mode Payload



General Signaling Message Format

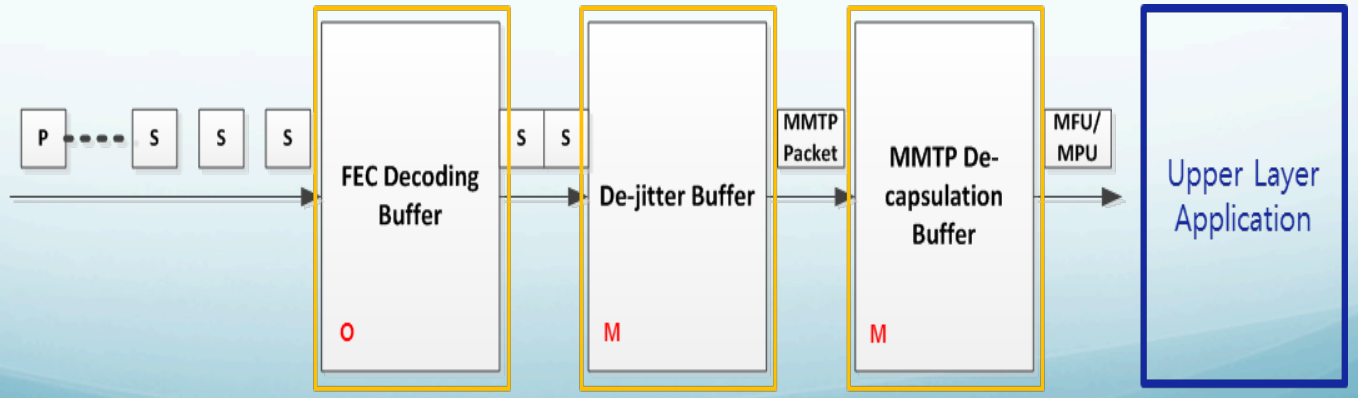
- General Format



Syntax	Val	No. of bits	Mnemonic
signalling_message () {			
message_id		16	uimsbf
version		8	uimsbf
length		16	uimsbf
}			
extension		32	uimsbf
message_payload {			
}			
}			

Built-In Buffer Model

- Buffer model for jitter compensation and multi-path delay adjustment
  - Consideration
    - Each network has its own transmission delay and error characteristics which may result in various combinations of overall delays between the sender and the receiver in a hybrid delivery
  - Features to achieve
    - Hypothetic buffer model enabling a service to control the overall delay for delivery given various transmission jitter, transmission delay and error recovery delay for each delivery network involved



[MMT Protocol Hypothetical Receiver Model]

Congestion Control

- MMTP initially designed to work in provisioned networks such as Broadcast networks where channel capacity is reserved for the service
- Support for Congestion Control through
  - Sender and receiver feedback to estimate delay, delay jitter and packet loss
  - Receiver feedback controlled through setting fraction of reporting receivers
  - Inherent support for stream thinning and bitstream switching
  - Inherent support for Receiver-driven Layered Multicast (RLM) through sub-flows that can be remuxed at receiver effortlessly
  - MMTP may support any RLM-based congestion control algorithm such as WEBRC or TFMCC

Why are we here?

- We want to develop MMTP further in the IETF
- We want to address the Internet (unicast and Multicast)
- We want to reuse existing components such as congestion control and security
- A protocol is needed by many SDOs: MPEG, ATSC, 3GPP, DVB, …
- Can we revive rmt?
- Can we start a BoF or a new ad-hoc group?
- Or can we do an informational RFC?

Questions