The Role of DMIF in Support of RTP MPEG-4 Payloads

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Generic MPEG-4 terminal architecture

media aware
delivery unaware
14496-2 Visual
14496-3 Audio

Compression Layer
Streams from as low as bps to Mbps

media and delivery unaware
14496-1 Systems

Systems Layer
Manages Elementary Streams, their synchronization and hierarchical relations

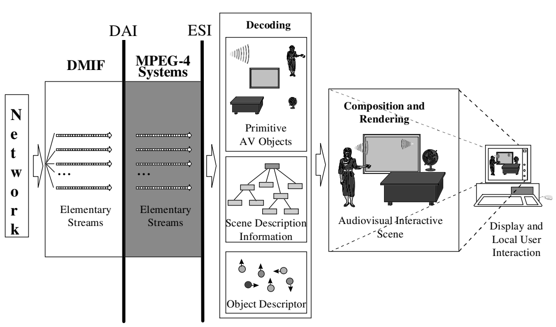
delivery aware
media unaware
14496-6 DMIF

Delivery Layer
Provides transparent access and delivery of content irrespective of delivery technologies

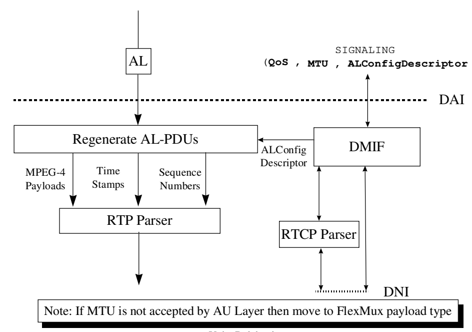
Elementary Stream Interface (ESI)

DMIF Application Interface (DAI)

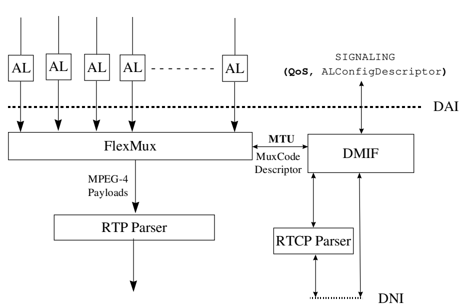
DMIF Relationship to MPEG-4



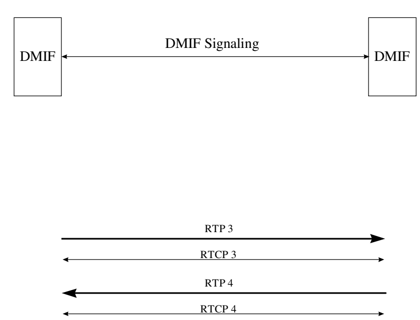
DMIF with RTP MPEG-4 single Stream Payload



DMIF with RTP MPEG-4 FlexMux Stream Payload



DMIF-DMIF Signaling



AL-PDU LOSS_PROB Vs RTP-PDU Fraction Lost

Assumptions:
- Each AL-PDU contains a whole Access Unit
- In case of N:1 each belongs a different AU stream
- In case of 1:N the end of the AL-PDU is known in RTP-PDU
- Only one single FlexMux PDU per RTP-PDU
- Single FlexMux Index per RTP stream

AL-PDU	RTP-PDU	Payload
1 TS<=32 bits	1	single
1 TS>32 bits	1	FlexMux
N	1	FlexMux
1	N	FlexMux

$$\text{LOSS\_PROB} = \frac{\text{AL-PDUs lost}}{\text{AL-PDUs expected}}$$

$$\text{Fraction Lost} = \frac{\text{RTP-PDUs lost}}{\text{RTP-PDUs expected}}$$

- In case of 1:1 or N:1 Fraction Lost <= LOSS_PROB
- In case of 1:N Fraction Lost gives an pessimistic measure
- Having 2 byte length field for FlexMux will reduce the occurrence of 1:N
- Better to do MTU segmentation at RTP-PDU in order to adjust measurement

AL-PDU GAP_LOSS Vs RTP-PDU ??

Assumptions:
- Each AL-PDU contains a whole Access Unit
- In case of N:1 each belongs a different AU stream
- In case of 1:N the end of the AL-PDU is known in RTP-PDU
- Only one single FlexMux PDU per RTP-PDU
- Single FlexMux Index per RTP stream

AL-PDU	RTP-PDU	Payload
1 TS<=32 bits	1	single
1 TS>32 bits	1	FlexMux
N	1	FlexMux
1	N	FlexMux

$$\text{GAP\_LOSS} = \frac{\text{>=2 AL-PDUs lost}}{\text{AL-PDUs expected}}$$

$$\text{??} = \frac{\text{>=2 RTP-PDUs lost}}{\text{RTP-PDUs expected}}$$

- In case of 1:1 or N:1 ?? <= GAP_LOSS
- In case of 1:N ?? gives an pessimistic measure
- Having 2 byte length field for FlexMux will reduce the occurrence of 1:N
- Better to do MTU segmentation at RTP-PDU in order to adjust measurement

AL-PDU Jitter Vs RTP-PDU Jitter

Assumptions:
- Each AL-PDU contains a whole Access Unit
- In case of N:1 each belongs a different AU stream
- In case of 1:N the end of the AL-PDU is known in RTP-PDU
- Only one single FlexMux PDU per RTP-PDU
- Single FlexMux Index per RTP stream

AL-PDU	RTP-PDU	Payload
1 TS<=32 bits	1	single
1 TS>32 bits	1	FlexMux
N	1	FlexMux
1	N	FlexMux

$$\text{DMIF Jitter} = \frac{\text{.5* Dejitter\_Buffer}}{\text{Max\_RTP\_Size * Max\_RTP\_Rate}}$$

$$\text{RTCP Jitter J} = \frac{J + (|D(i-1,i)| - J)}{16}$$

where D(i-1,i) = delay of i packet - delay of i-1 packet

- In case of 1:1 or N:1 J <= DMIF Jitter
- RTP with single payload needs to explicitly carry a RTP timestamp
- In case of 1:N, J gives an optimistic measure
- Having 2 byte length field for FlexMux will reduce the occurrence of 1:N
- Better to do MTU segmentation at RTP-PDU in order to adjust measurement

AL-PDU Delay Vs RTP-PDU Round Trip Delay

Assumptions:
- Each AL-PDU contains a whole Access Unit
- In case of N:1 each belongs a different AU stream
- In case of 1:N the end of the AL-PDU is known in RTP-PDU
- Only one single FlexMux PDU per RTP-PDU
- Single FlexMux Index per RTP stream

AL-PDU	RTP-PDU	Payload
1 TS<=32 bits	1	single
1 TS>32 bits	1	FlexMux
N	1	FlexMux
1	N	FlexMux

DMIF MAX_DELAY = maximum sender to receiver delay
DMIF AVG_DELAY = Delay averaged over x minutes

RTCP Delay = Round trip delay measured at report intervals

- In case of 1:1 or N:1
  RTCP Delay <= 2*DMIF MAX_DELAY
  RTCP Delay averaged over x minutes <= 2*DMIF MAX_DELAY
- Assumes Delay is symmetrical w.r.t. direction

Use of RTCP BYE with DMIF

In case of 1:1

BYE packet is sent along with DS_ChannelDelete

On the receive side either a BYE or DS_ChannelDelete will cause DA_ChannelDelete on the DAI

In case of N:1

BYE packet is sent only if when DS_ChannelDelete is sent for all the channels

On receive side the application already has been notified with DA_ChannelDelete at receiving the individual DS_ChannelDelete

Conclusion

- Having 2 byte length field for FlexMux will reduce the occurrence of 1:N
- Better to do MTU segmentation at RTP-PDU in order to adjust measurement
- In case of 1:N the end of the AL-PDU must be marked in RTP-PDU
- RTP with single payload needs to explicitly carry a RTP NTP timestamp
- The choice of Single or FlexMux payload type is done by DMIF based on defined criteria of overhead: payload efficiency
- RTCP measurements should be made in AL-PDU lost not in RTP-PDU lost
- Need RTCP measurement for consecutive AL-PDU lost