Aligning Streams in ST 2110
or How to Manage Lip Sync

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What Problem Are We Solving?
With ST 2110, Did the Problem Magically Go Away?

No
With ST 2110, Did the Problem Get Worse?

Yes
ST 2110 Has Separate Essence Flows
t=0

Processing delay

RX@41ms

Processing delay

RX@13ms

Processing delay

RX@21ms

Receiver has to re-align the A/V

NET

Processing delay

NET

Processing delay

NET

Processing delay

Receiver
6 slides of Doom and Gloom, Will It Get Better?

Yes

Time Stamps
Processing delay

TS=0
TX@40ms

NET

Processing delay

TS=0
RX@41ms

NET

Processing delay

TS=0
TX@50ms

Receiver

(vid) TS=0
RX@51ms

Receiver has to re-align the A/V

t=0

13 in/ms

spatial delay

Processing delay

TS=0
TX@12ms

Processing delay

TS=0
RX@13ms

Processing delay

TS=0
TX@20ms

Receiver

RX@21ms

RX@51ms

RX@21ms
All Devices Locked Together
RTP Time Stamp

RTP Header
Link Offset -> Presentation Delay -> Reconstruction Delay

Source: VSF TR-03
Reconstruction Delay

• Process each stream separately
• Indirectly align
RTP Timestamps

• Metadata that describes when the essence was created
  – Can be changed independently of the essence
• Initially created from PTP/2059 time
• 32-bit rollover
• Units
  – -20 Video: 90 KHz ticks
  – -30 Audio: 48 KHz ticks
  – -40 ANC: 90 KHz ticks
RTP Timestamps

RTP Count value

Audio RTP TS

Video RTP TS

PTP Time

0 3000 6000 9000 12000 15000 18000 21000 24000 27000 30000 33000 36000 39000 42000 45000 48000 51000 54000 57000 60000 63000 66000 69000 72000 75000 78000 81000 84000 87000 90000 93000 96000 99000

0 1E+09 2E+09 3E+09 4E+09 5E+09 6E+09 7E+09 8E+09 9E+09 1E+10

RTP Value

PTP Time (s)
Testing

• “Dirty Hands” Workshop
  – Feb. 18 – 22, 2019
  – Testing newer parts of the standard and parts that were not well tested
Open Work

• Re-timestamping

• What is the minimum Reconstruction Delay a product should support?
Key Take Aways

- Separate essence flows requires alignment
- All devices locked together
- RTP Timestamps from PTP/2059 time
- Change RTP Timestamp without changing the Essence
- Reconstruction Delay
  - Indirectly aligns the streams
- Open work
  - Re-timestamping and Reconstruction Delay
Thank You

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