

# 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?

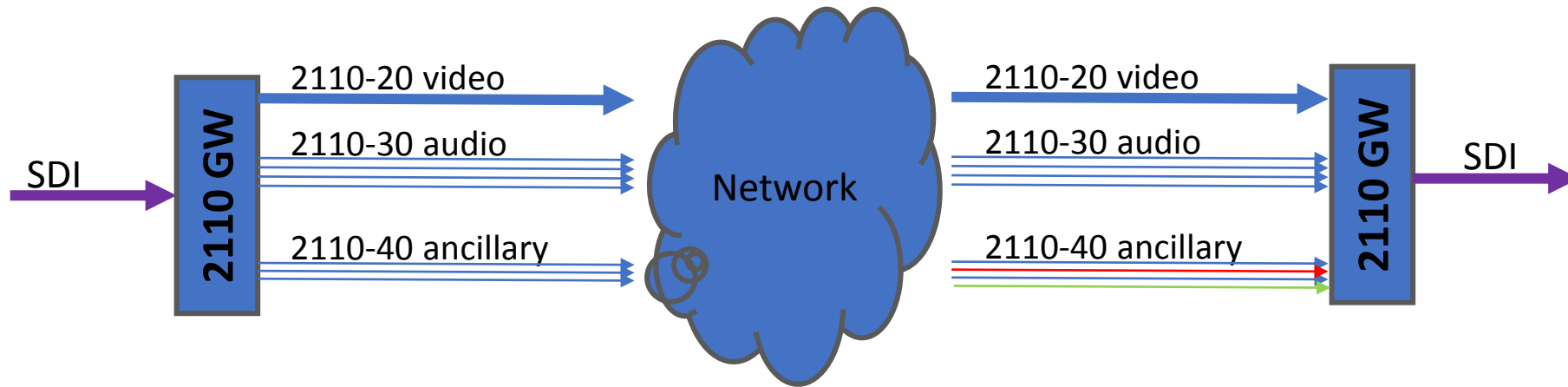
No



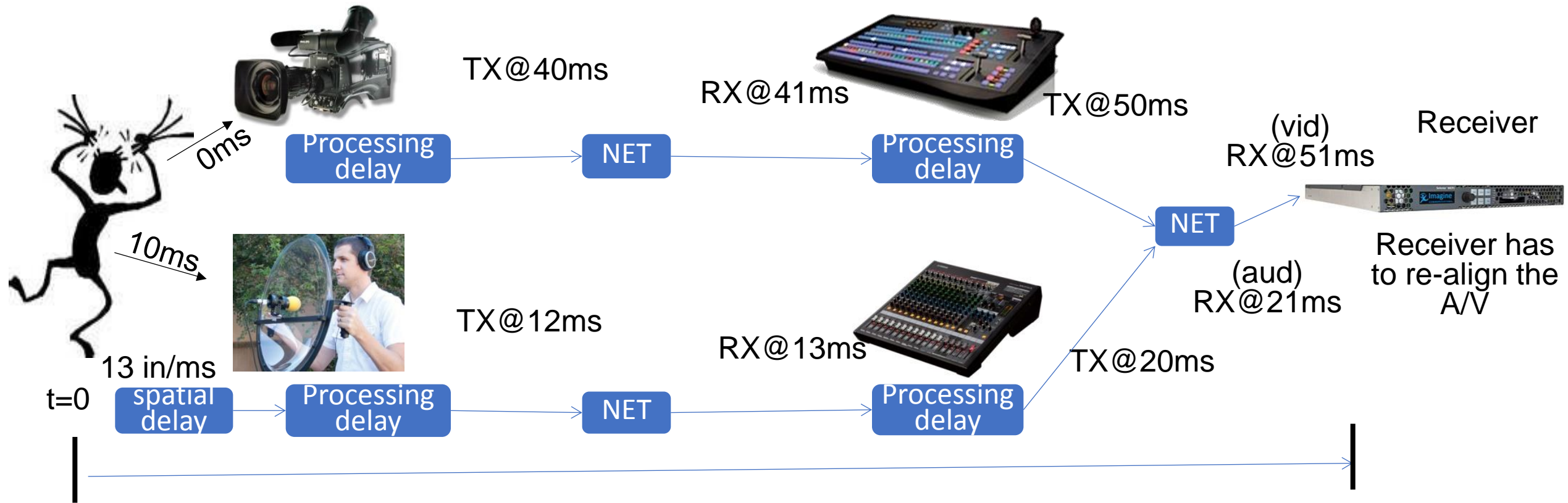
With ST 2110, Did the Problem Get Worse?

Yes

# ST 2110 Has Separate Essence Flows



# IP SHOWCASE™ THEATER



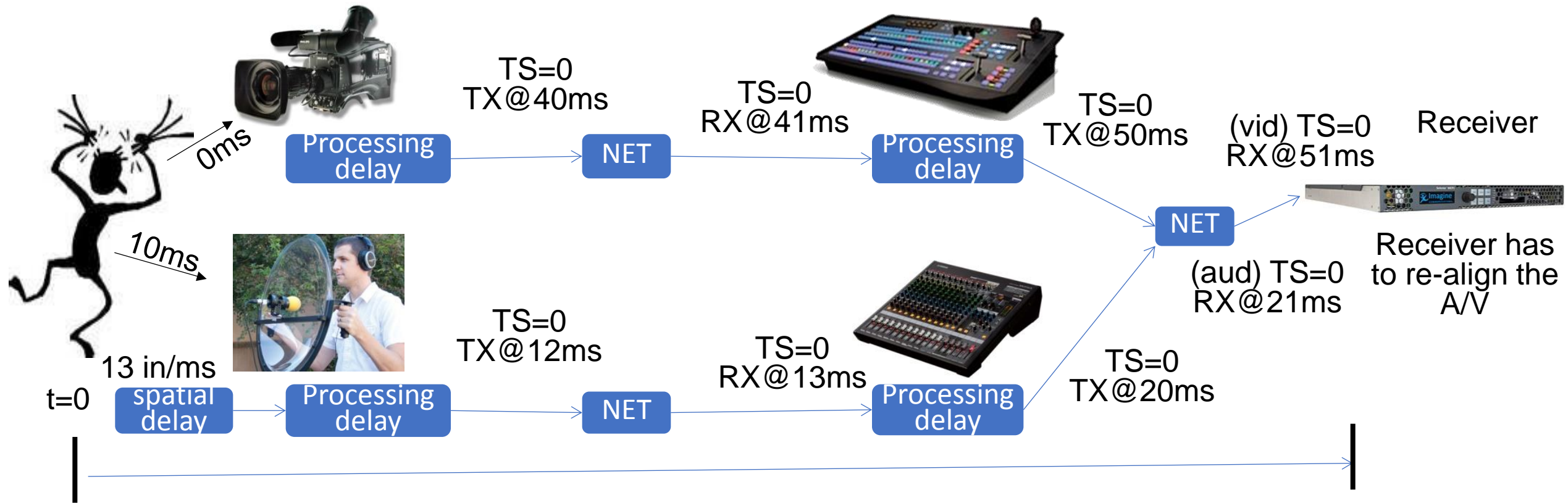
Receiver has to re-align the A/V

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

Yes

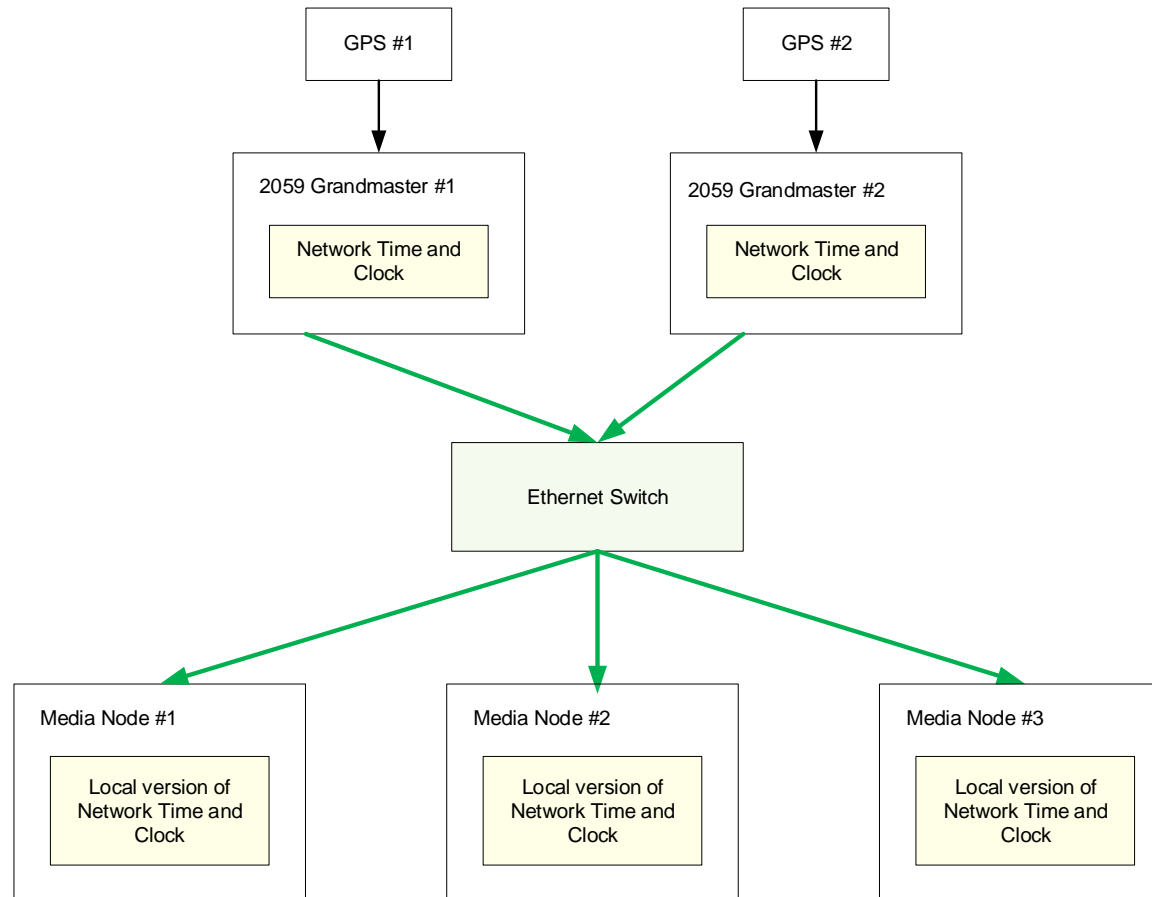
Time Stamps

# IP SHOWCASE™ THEATER



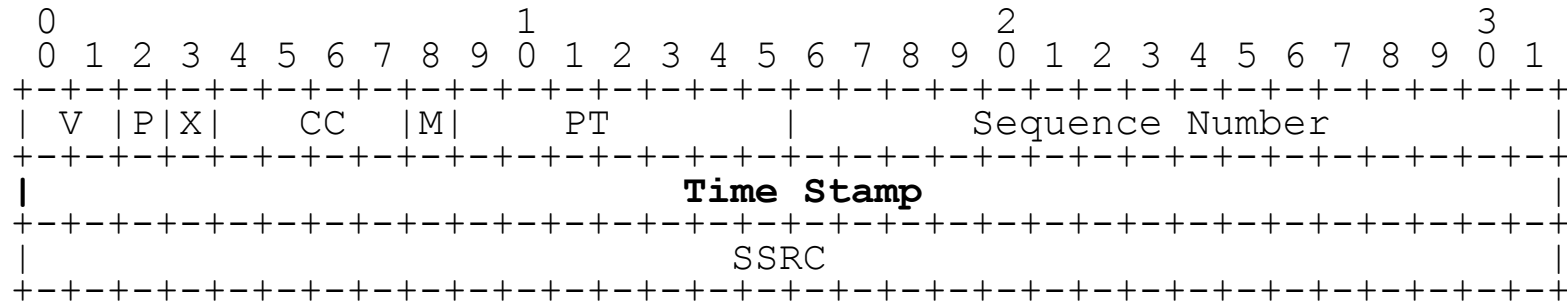


# All Devices Locked Together

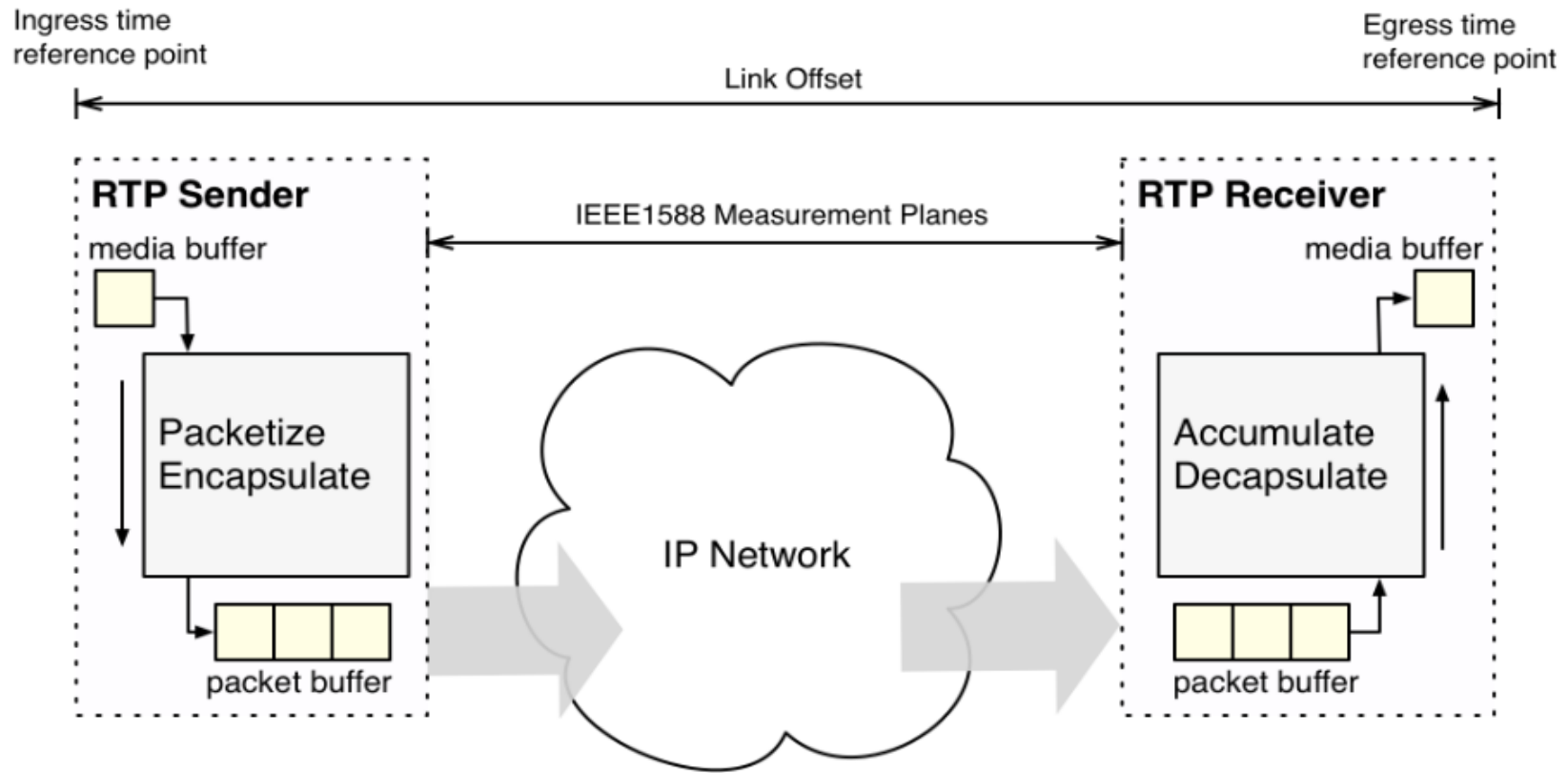


# RTP Time Stamp

## RTP Header

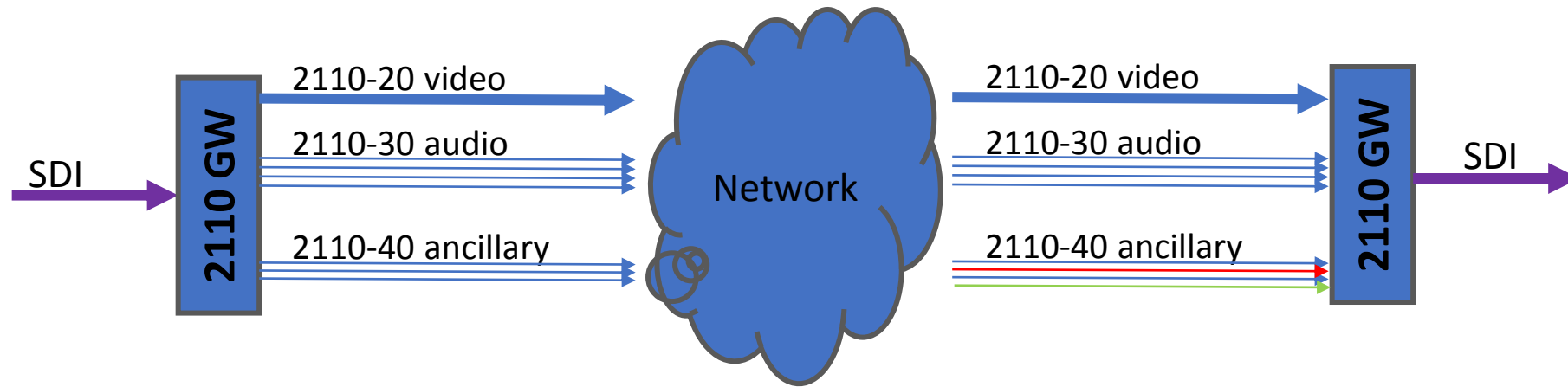


## Link Offset -> Presentation Delay -> Reconstruction Delay



## Reconstruction Delay

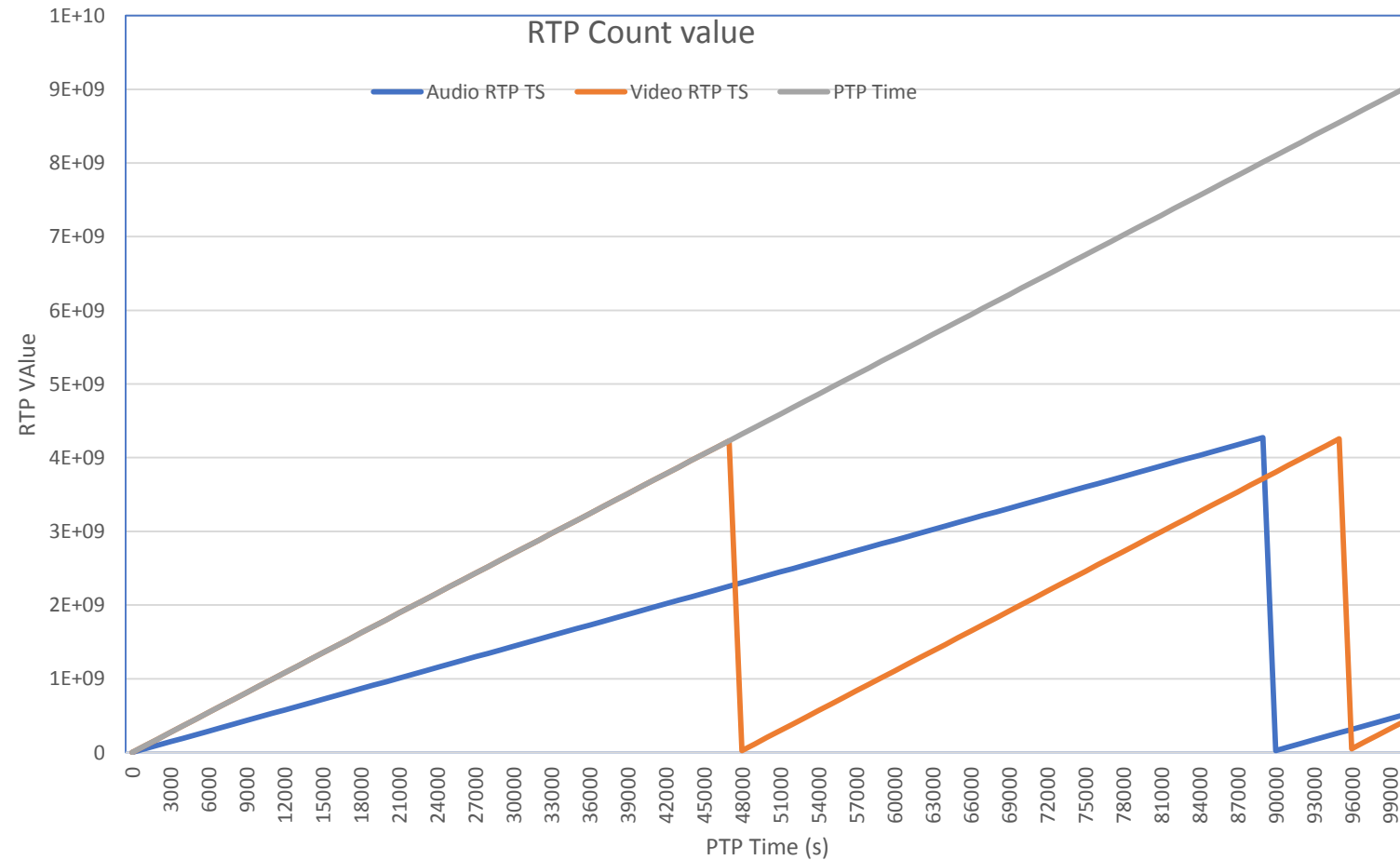
- Process each stream separately
- Indirectly align



## 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

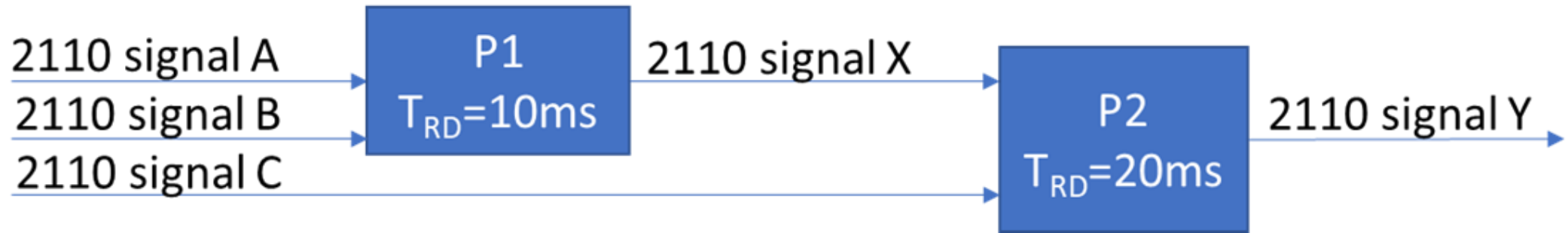


## Testing

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

# Open Work

- Re-timestamping

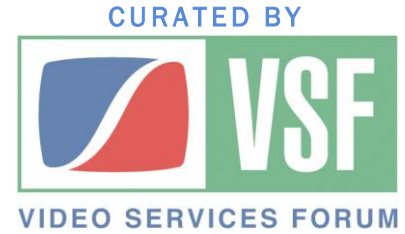


- What is the minimum Reconstruction Delay a product should support?



## 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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IP SHOWCASE THEATER AT NAB – APRIL 8-11, 2019