IP SHOWCASE THEATRE

CURATED BY VSF VIDEO SERVICES FORUM

The Good and The Ugly
IP Studio Production Case Study

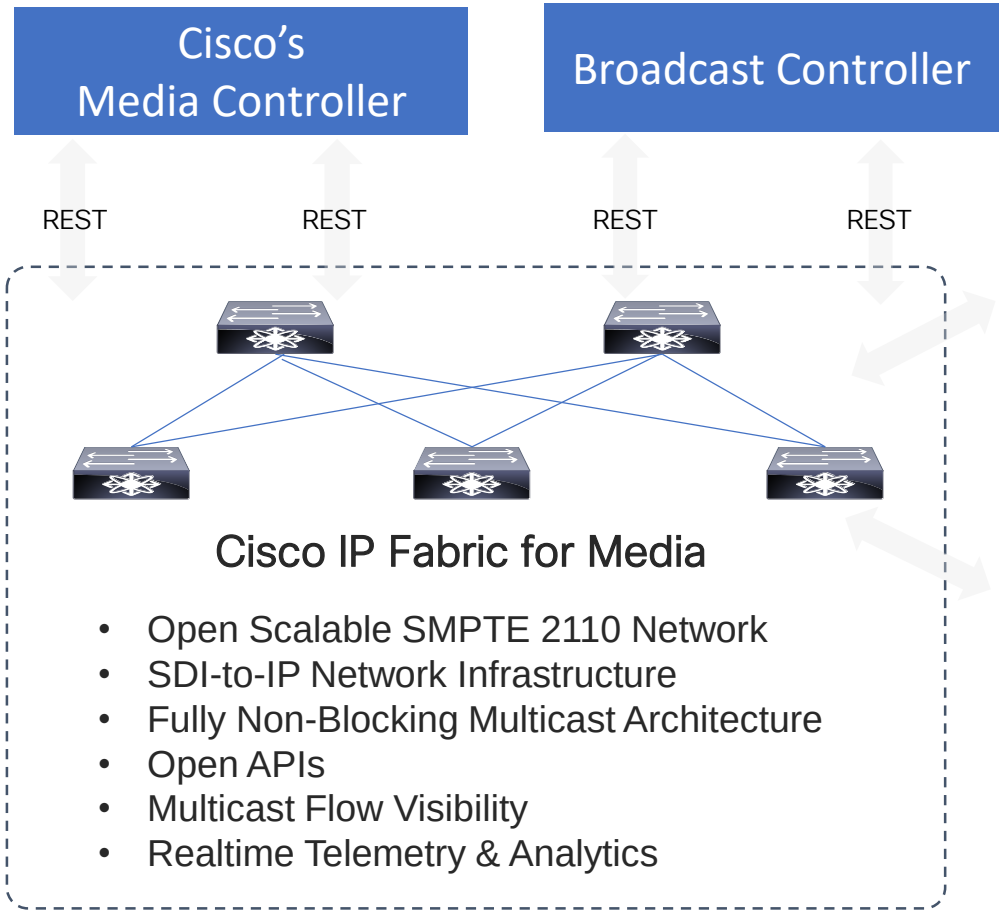
Ammar Latif

Principal Architect

Media team – Cisco Systems

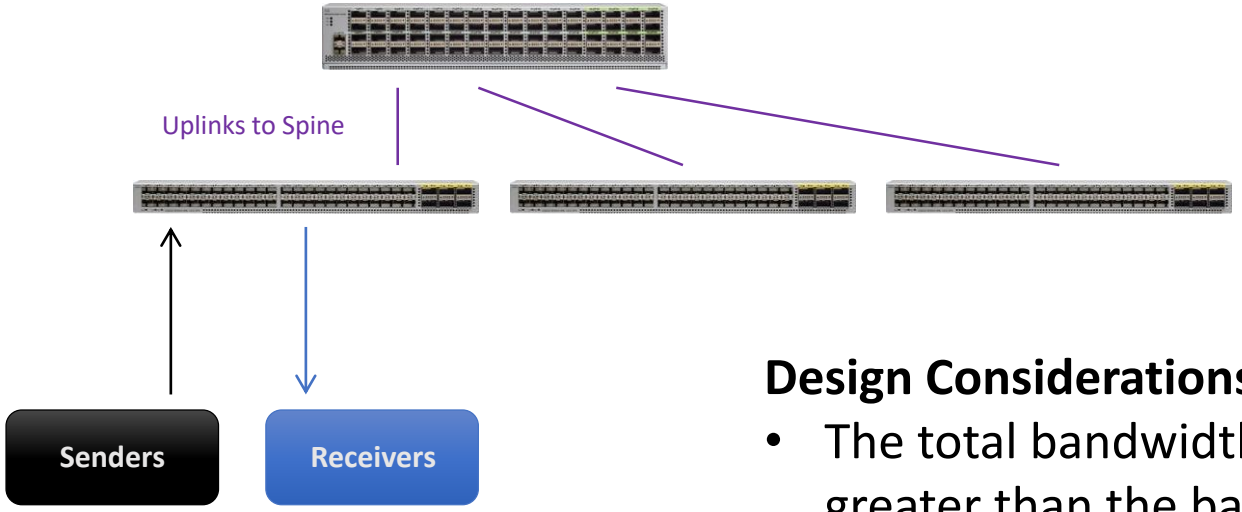
CISCO

Live Studio Production Infrastructure



IP Fabric for Media

Single Spine, Multi-Leaf

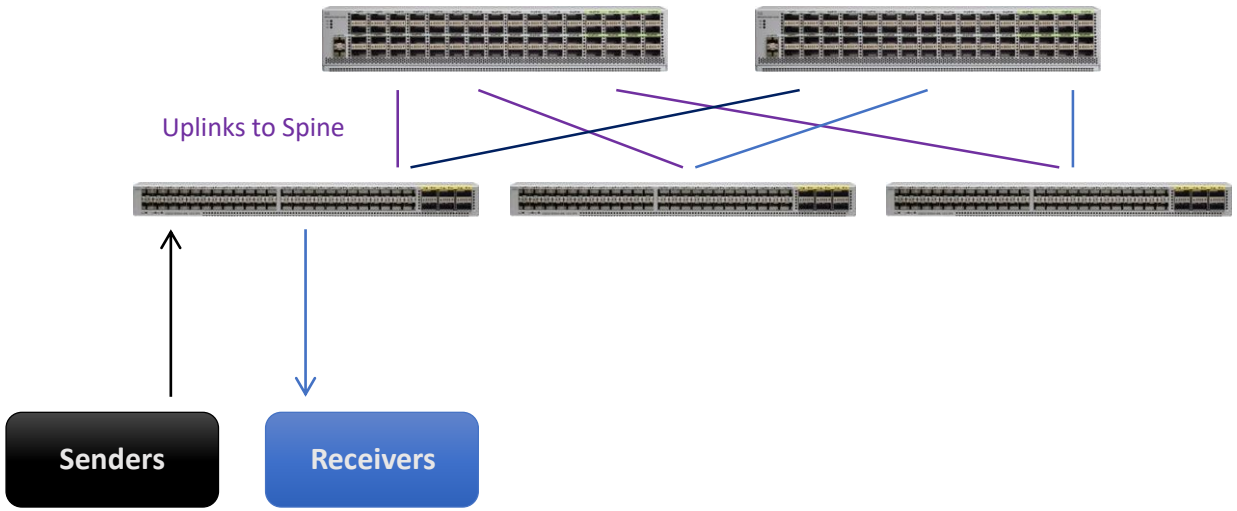


Design Considerations:

- The total bandwidth between each leaf and spine must be equal or greater than the bandwidth between leaf and endpoints to ensure a true, non-blocking fabric.
- This model provides a symmetrical I/O count (sender BW = receiver BW)
- Traffic between senders and receivers on the same leaf does not hit the spine, but this should not play into BW calculations for non-blocking

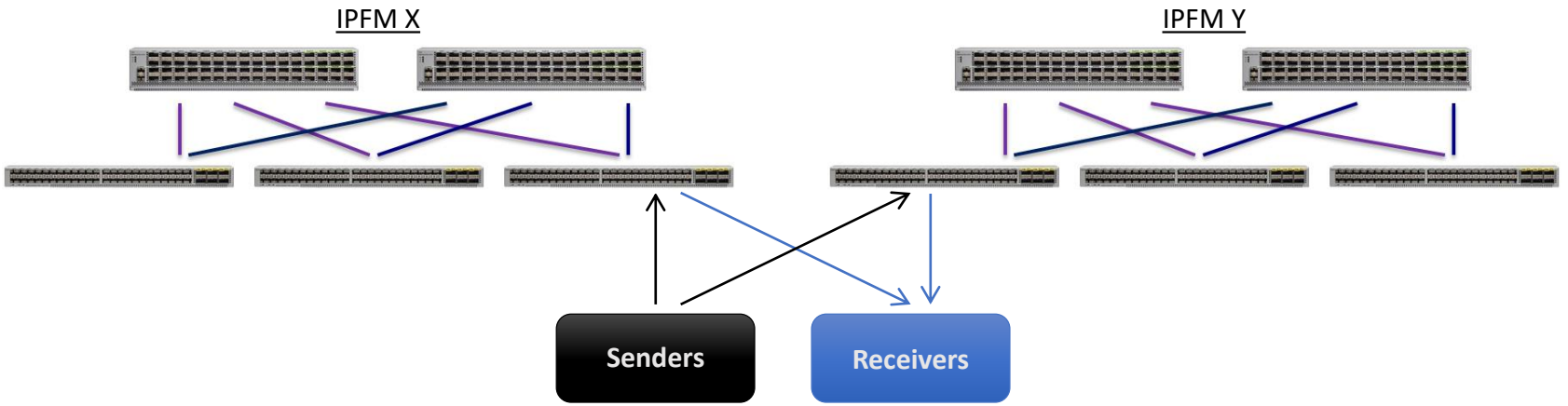
IP Fabric for Media

Multi-Spine, Multi-Leaf



IP Fabric for Media

Multi-Spine, Multi-Leaf, Redundant Networks with 2022-7

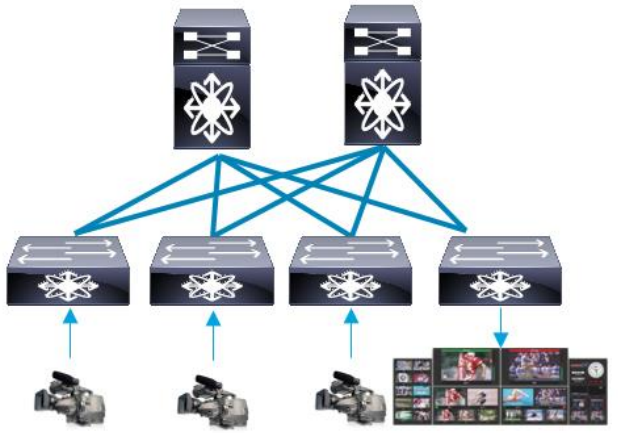


A SMPTE 2022-7-enabled transmitter duplicates the input stream and sends it via two different paths to the destination receiver. The receiver (also SMPTE 2022-7 enabled) combines the streams from both paths and reconstructs the original stream. If a packet was lost on path 1, the packet is taken from path 2. In case path 1 is completely gone, the entire stream is taken from path 2 and vice versa.

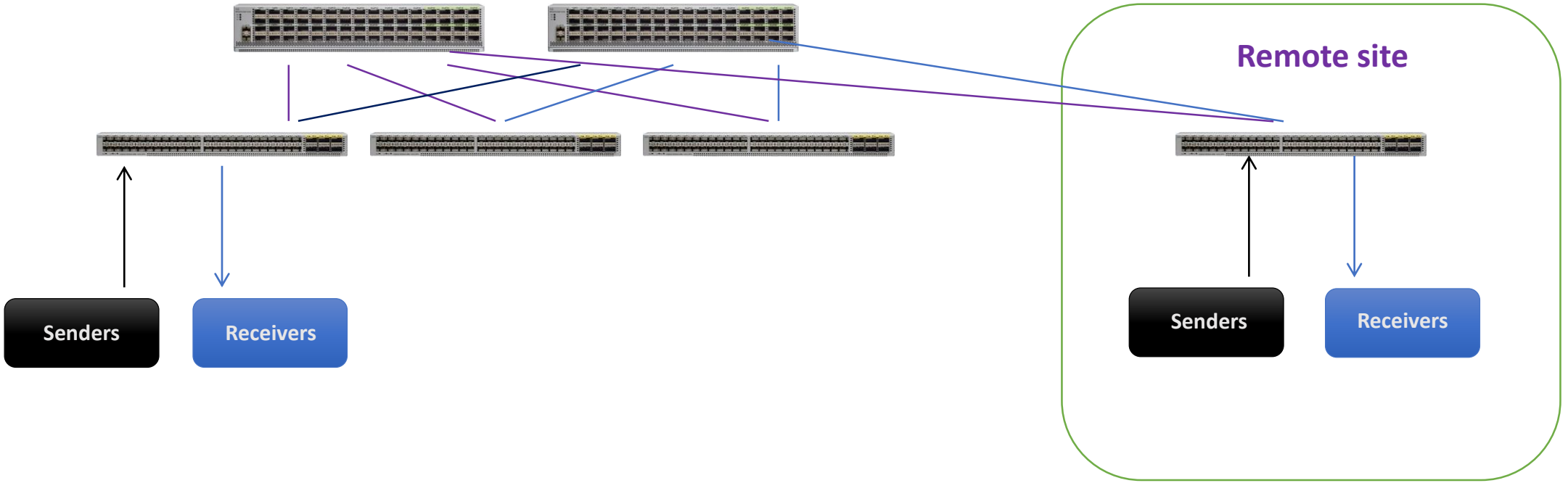
Note: 2022-7 can apply to various RTP streams, including SMPTE 2022-6, AES-67, SMPTE ST-2110 and TR-01 based environments.

Cisco's Non Blocking Multicast (NBM)

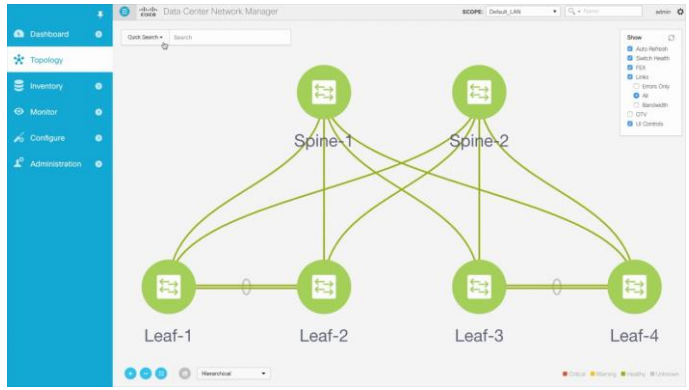
- NBM brings bandwidth awareness to PIM
- Traffic load balanced using flow bandwidth as a parameter
- Prevents link oversubscription by ensuring flows more than link capacity is not sent



IP Fabric for Media – Remote Leaf



Media Controller : Streaming Telemetry

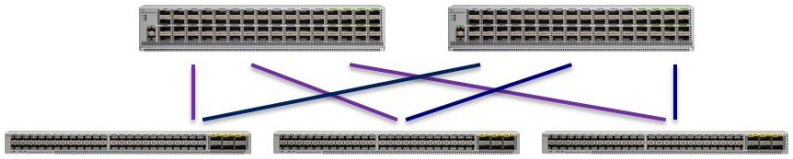


Management LAN
Connection to all IPFM switch management ports (out of band)

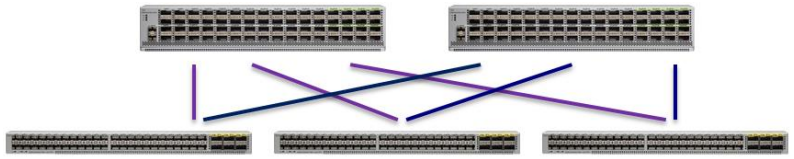
Use DCNM's Media Controller to:

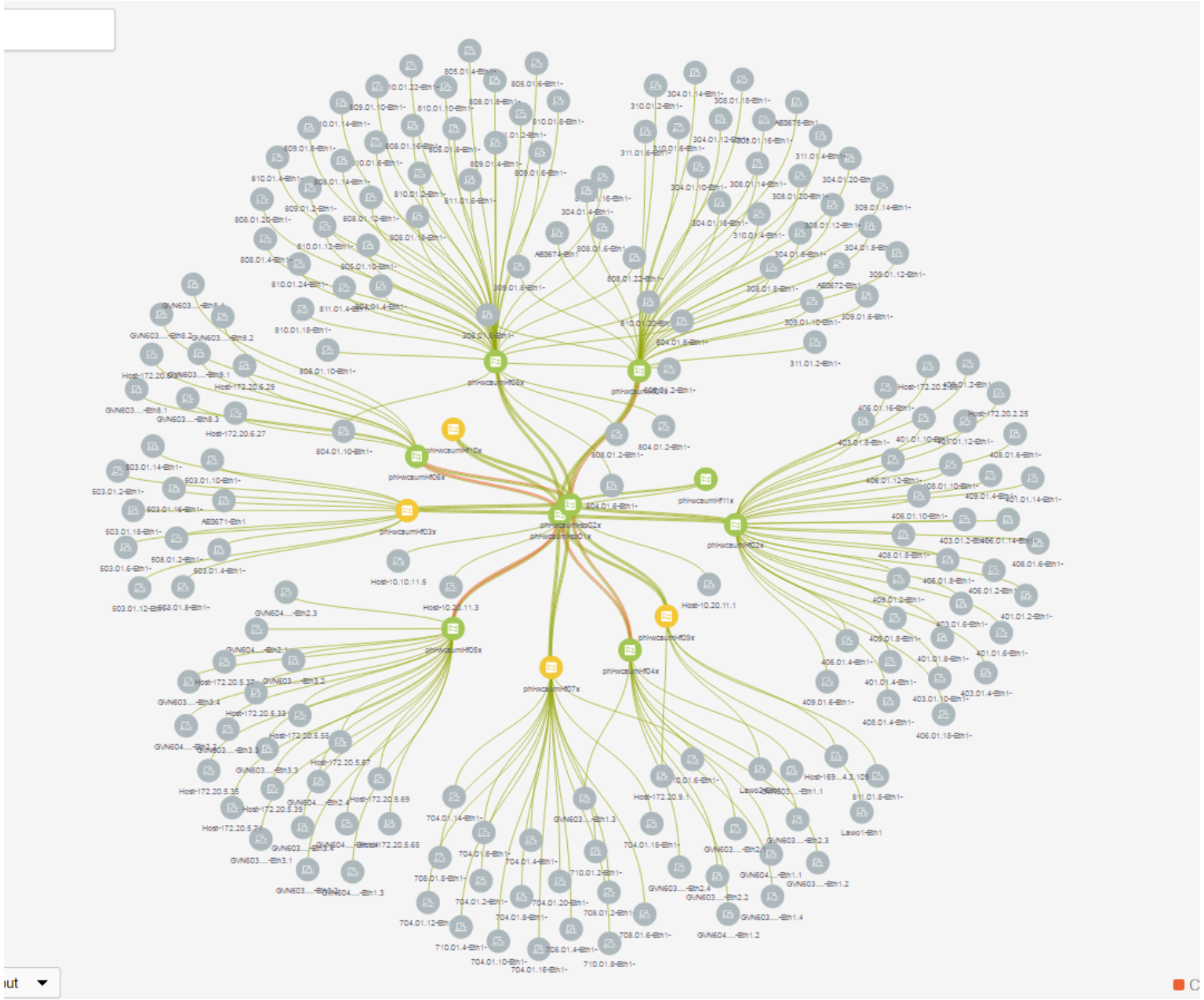
- Set host and flow policies
- View network topology and link saturation of ports

IPFM X



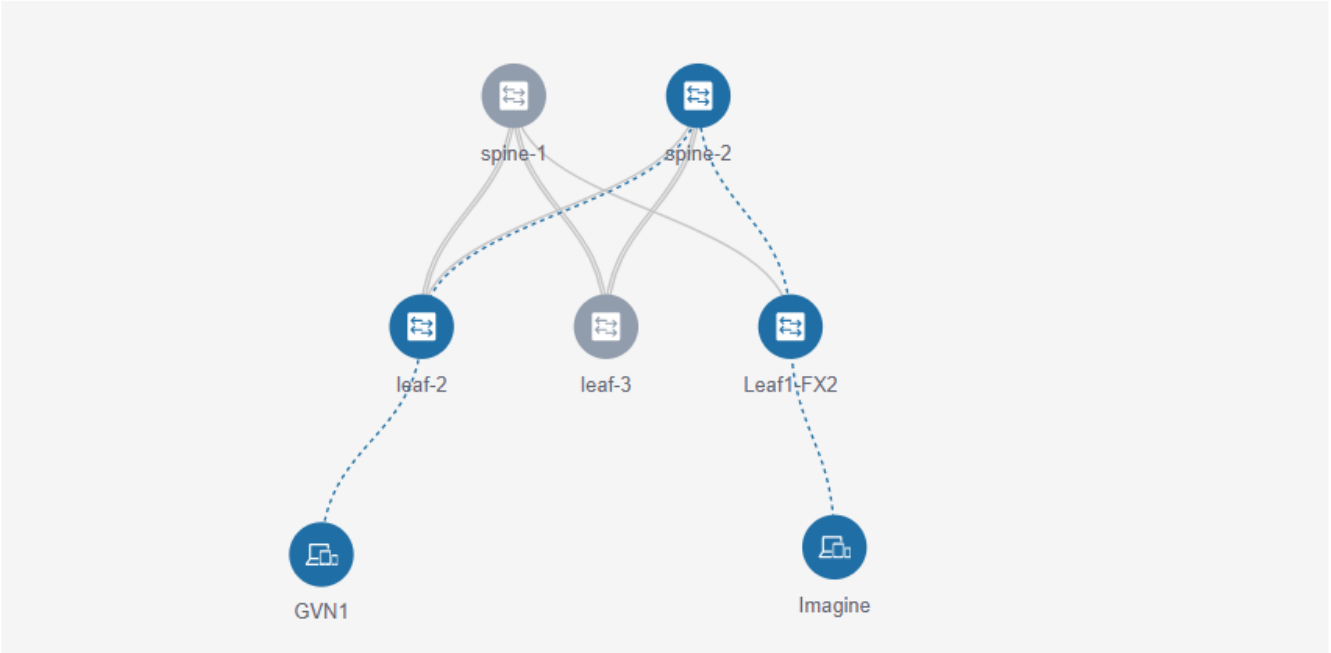
IPFM Y





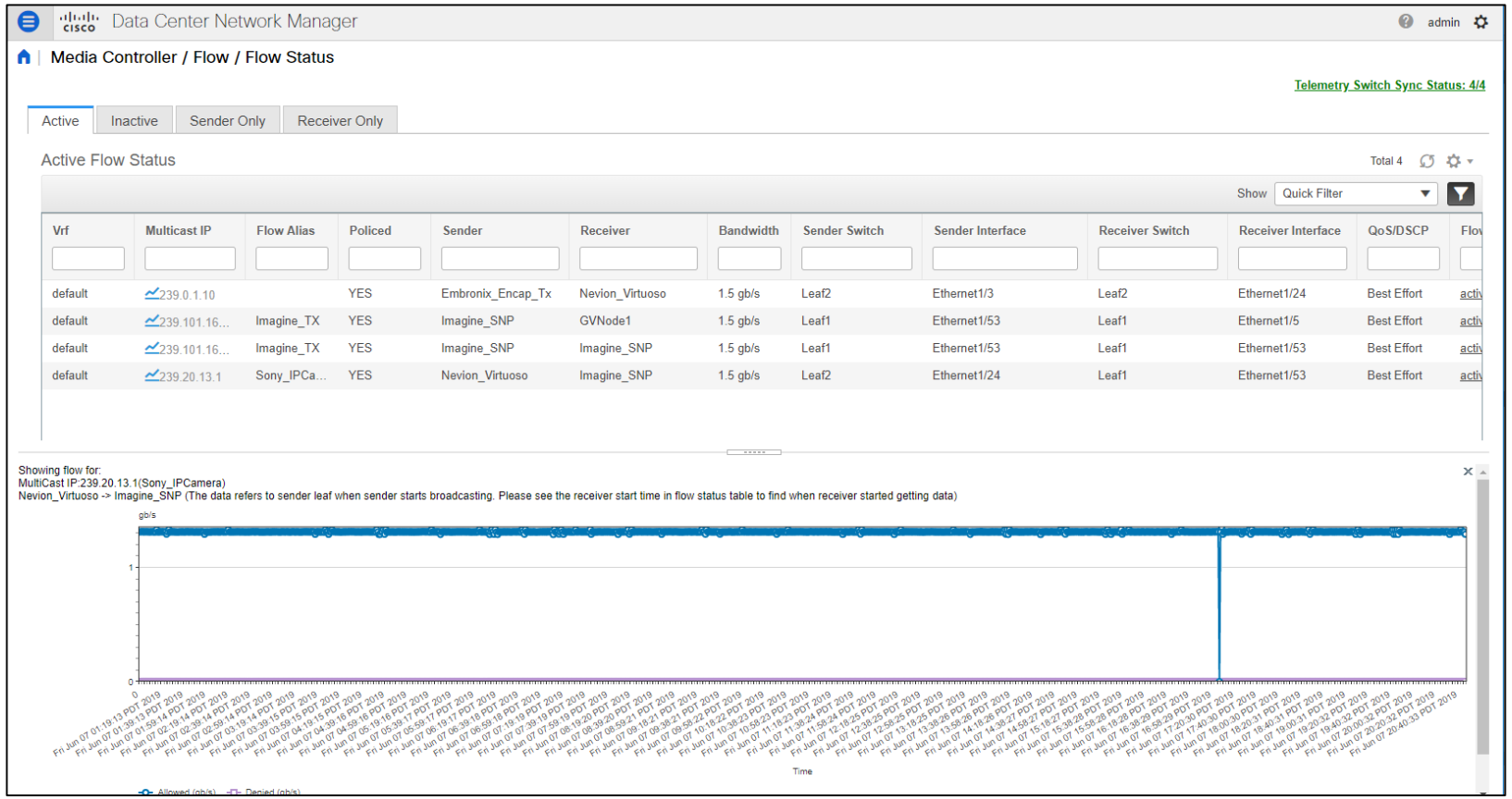
Media Controller: Multicast Flow Visualization

GVN1-Imagine (Channel1_Video-239.1.20.1)

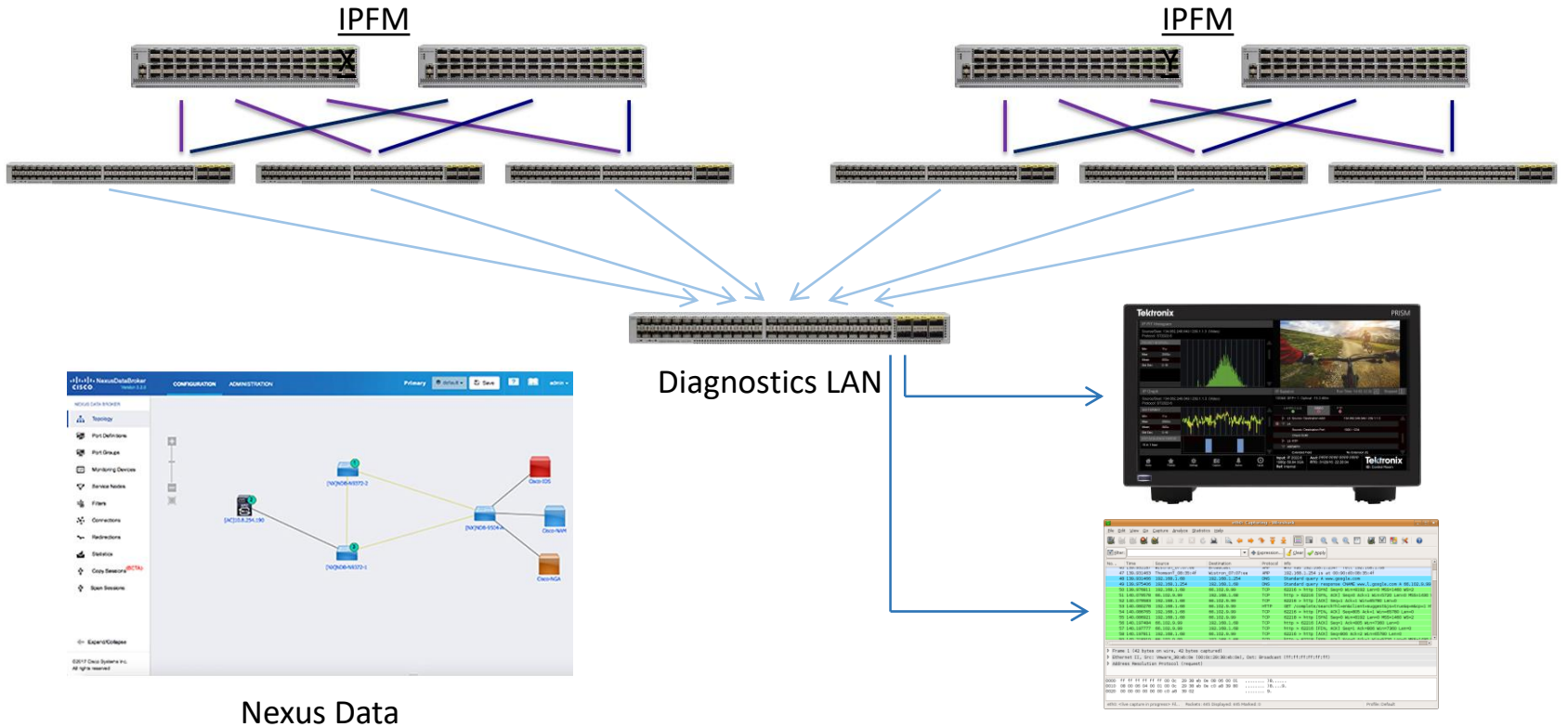


STARTING NODE	DESTINATION NODE
GVN1	leaf-2 Ethernet1/1
leaf-2 Ethernet1/52	spine-2 Ethernet1/30
spine-2 Ethernet1/1	Leaf1-FX2 Ethernet1/50
Leaf1-FX2 Ethernet1/52	Imagine

Flow Statistics



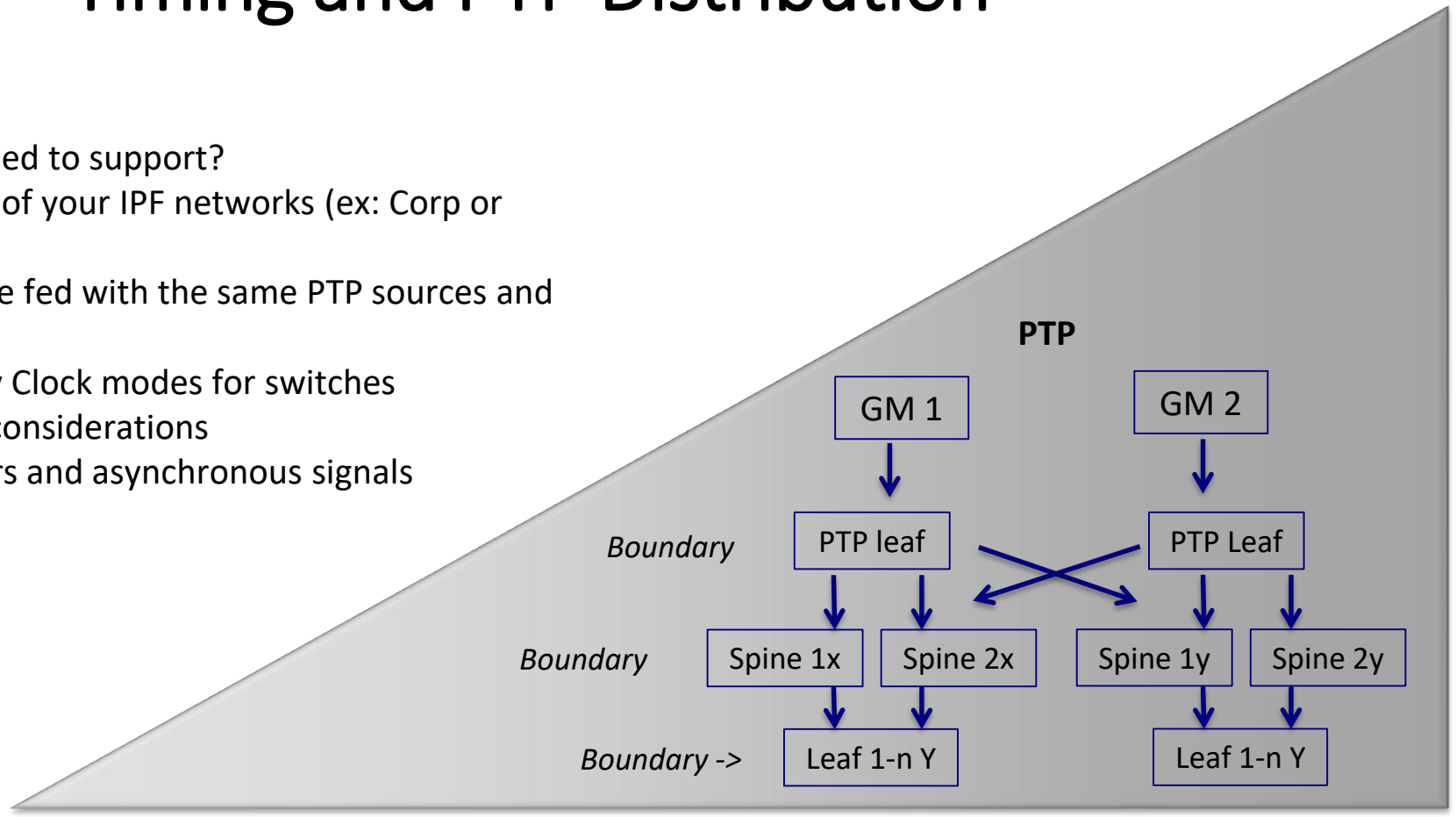
IP Fabric for Media : Diagnostics



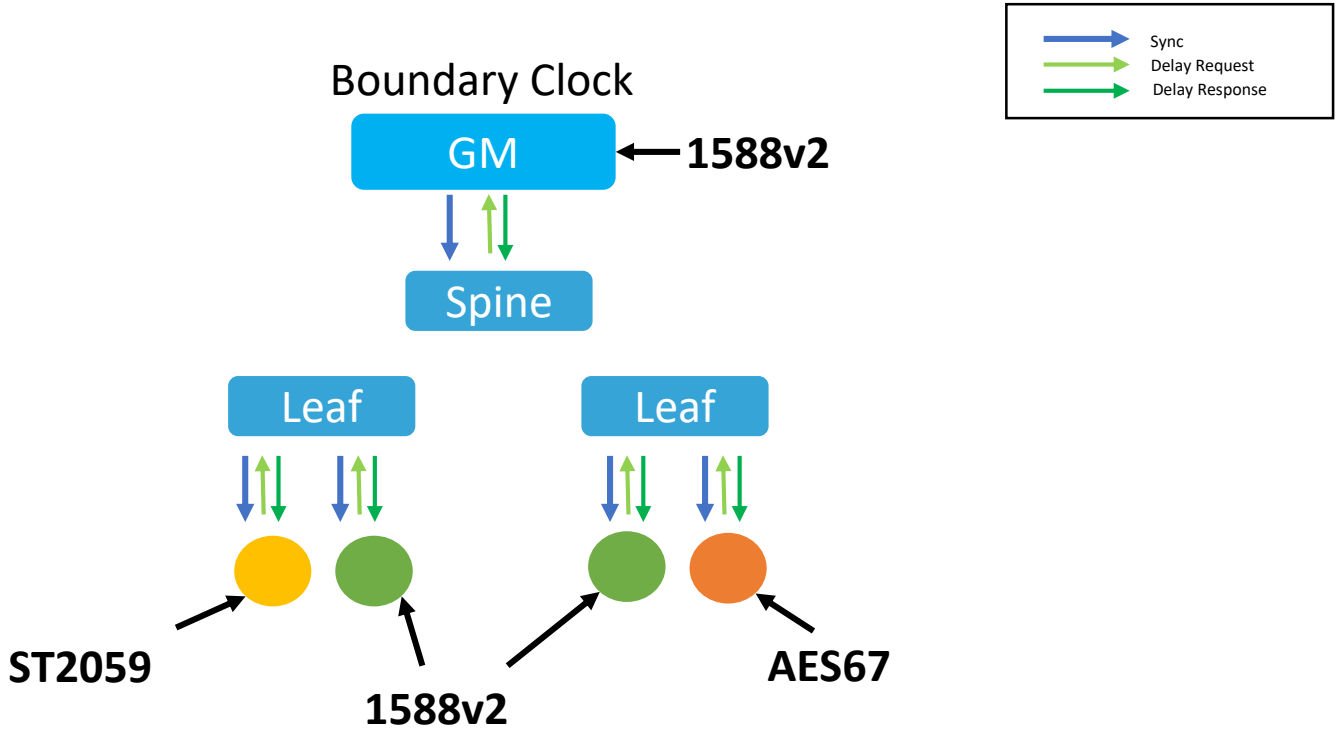
Timing and PTP Distribution

Design Considerations:

- What profile(s) do you need to support?
- Do you need PTP outside of your IPF networks (ex: Corp or Production LAN)?
- Both X & Y fabrics must be fed with the same PTP sources and priorities
- Transparent vs. Boundary Clock modes for switches
- Black Burst and Tri-level considerations
- Line buffers, frame buffers and asynchronous signals

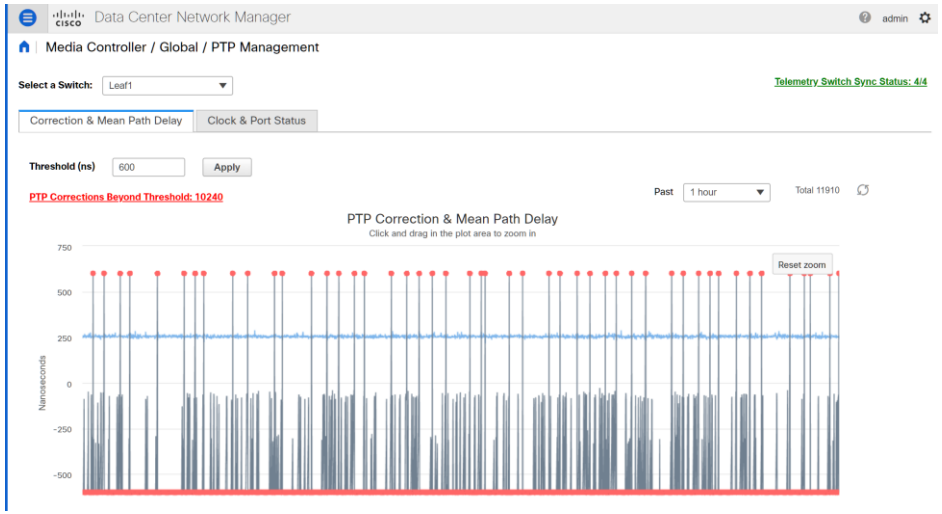


IP Fabric for Media : Multiple PTP Profiles

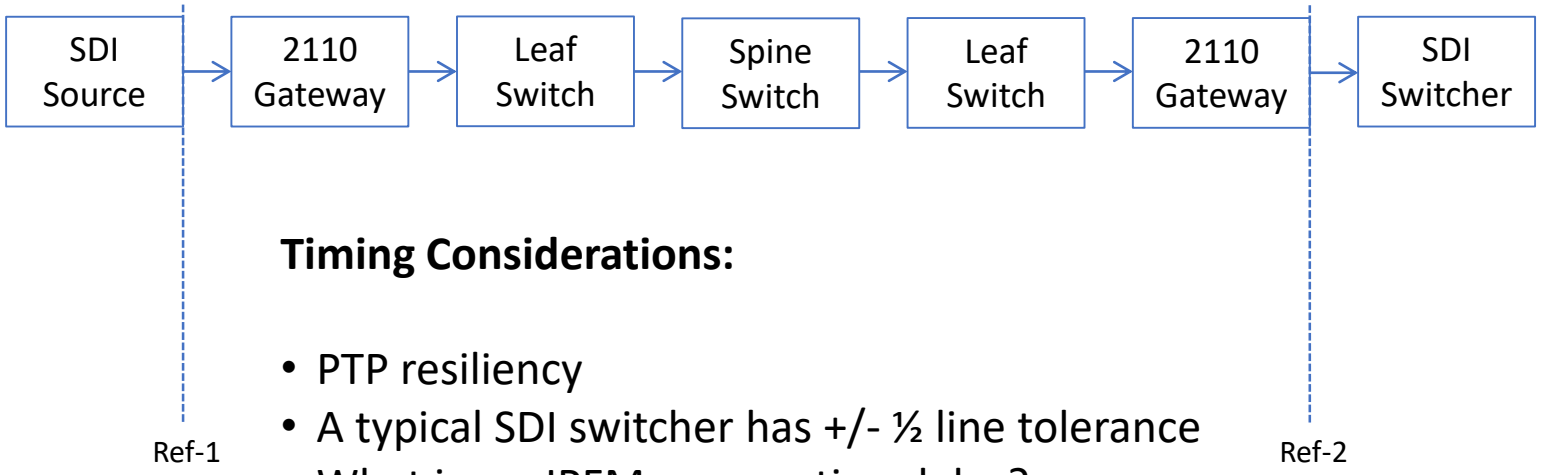


IP Fabric for Media : PTP monitoring

- PTP monitoring is a challenge
  - Correction ranges
  - Changes in GMs
  - Rogue GMs
- Switch level monitoring :
  - Scripting to monitor and alert on PTP
- Fabric wide monitoring
  - PTP Streaming telemetry to Media Controller



Timing and Latency in a Hybrid Plant



Timing Considerations:

- PTP resiliency
- A typical SDI switcher has +/- ½ line tolerance
- What is my IPFM propagation delay?
- What is my Gateway latency?
- Does my gateway, or IP end-point have a frame buffer?
- What is my total acceptable end-end latency?

The Broadcast Engineering Experience

- 3rd party native IP senders can integrate without concern for control
- Clean, quiet and vertical accurate switching: Make before Break vs. Break before Make
- Switch/Route performance
- IP addressing for 2022-7
- Managing audio in TR-04 and TR-03 designs
- AMWA NMOS IS-04 and IS-05
- Moving 2022-6 and ST-2110 inter-facility

Thank you

Presenter Name, Organization
Email and phone number (recommended)

Thank you to our Media Partners