

Simple Way To Network AV

Convergence or Collision? The Future of Broadcast and ProAV with IPMX



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Director of International Sales

Agenda

- Video basics
- SMPTE 2110
- IPMX
- What can IPMX do for us?
- PlexusAV portfolio review
- Q&A.



networked media
NMOS
open specifications



Who is involved with IPMX?

Coordination and promotion



SMPTE Standards (ST)

ST 2110: Broadcast AVoIP Standard



Technical Recommendations (TR)



Control / API's
Interface Specifications (IS)



AES67: Audio over IP



Technical Input & Testing



AIMS Members

- Arista Networks
- AV Pro Edge
- Bosch
- Canon, Inc.
- Grass Valley
- Globo Comunicacao
- Imagine Communications
- Kakadu Software
- LAWO
- Macnica
- Matrox
- Net Insight
- Panasonic
- Ross Video Limi
- SRF
- Telos Alliance
- 7thSense
- AJA Video Systems
- Analog Way
- Appear AS
- ASTRODESIGN, Inc
- Axis Communication AB
- Barco
- Bridge Technologies
- Broadcast-Solutions GmbH
- Brompton Technology
- BFE Studio und Medien Systeme GmbH
- Calrec Audio Ltd
- Cisco Systems
- Luminex Network Intelligence
- Magewell Electronics Company, Ltd.
- MediaLinks
- Mediaproxy
- Megapixel
- Meinberg
- Mellanox Technologies
- Merging Technologies
- Netgear
- NEC
- Nextera Video
- Novastar Tech Co., Ltd.
- Panduit
- Clear-Com
- Cobalt Digital
- Colorlight
- CUX
- Deltacast
- Dayang Technology Development
- DirectOut GmbH
- Disney
- Evertz
- Focusrite Audio Engineering
- Gefei
- Genelec
- Ikegami Tsushinki Co., Ltd.
- Intelligent Wave Inc.
- IntoPix SA
- KMH Audio-Video
- Phabrix Ltd.
- ProIT AV
- ProSieben.Sat1 Tech Solution
- Qvest Media
- Sencore
- Sobey
- Solid State Logic
- Sony Corporation
- STAGETEC GmbH
- Studio Technologies
- Synamedia
- Telestream
- Utah Scientific
- Wheatstone Corporation
- Yamaha

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Interoperability

- Frequent interop events
- Multiple vendor testing.



Panasonic



matrox



MACNICA

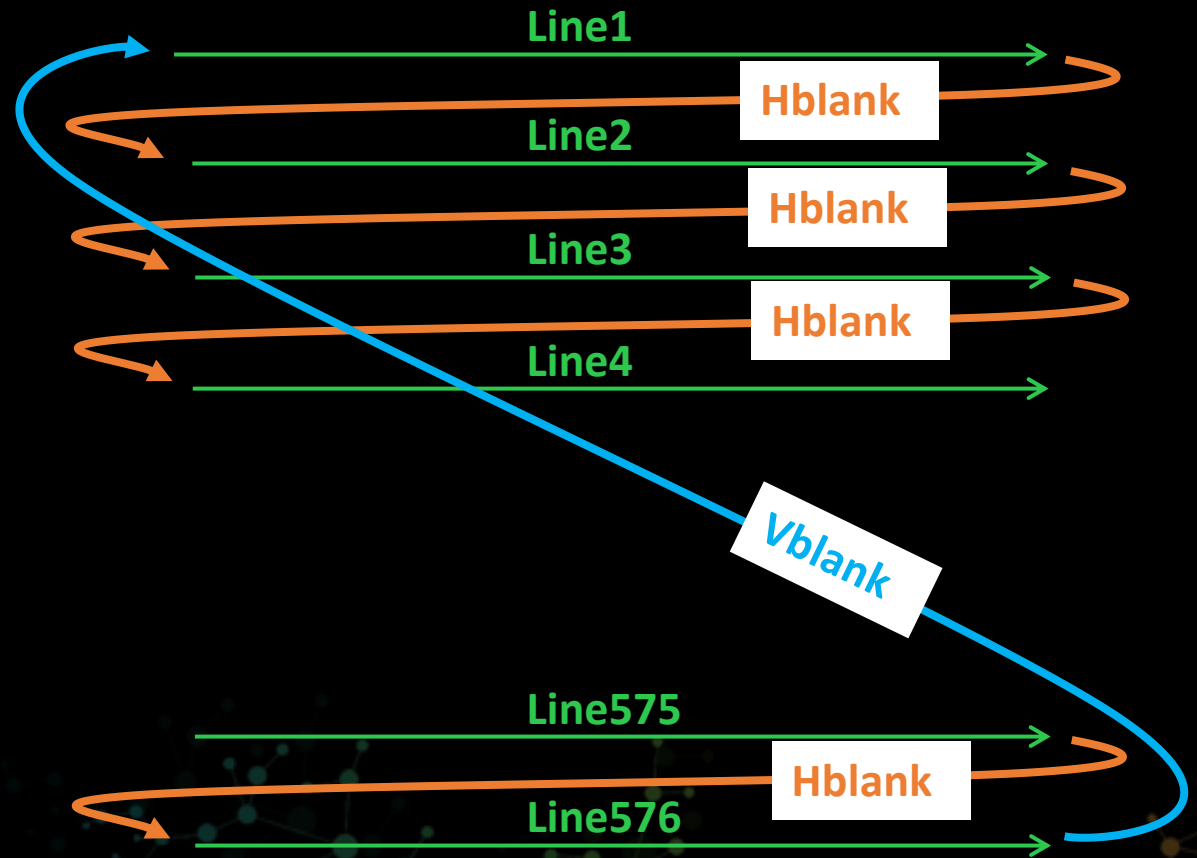
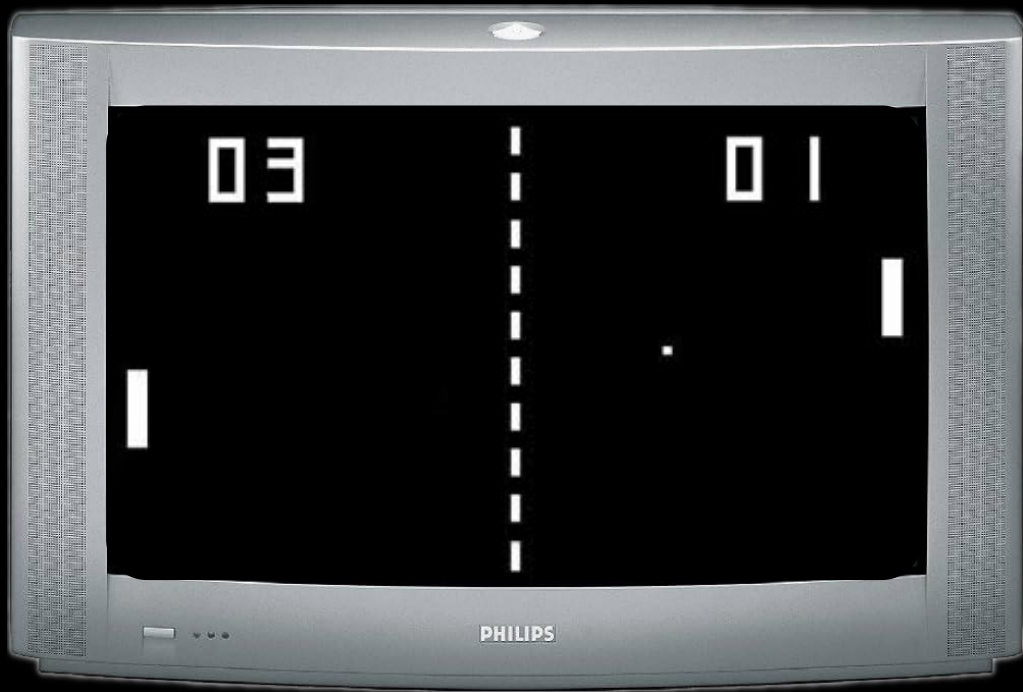


Video Basics

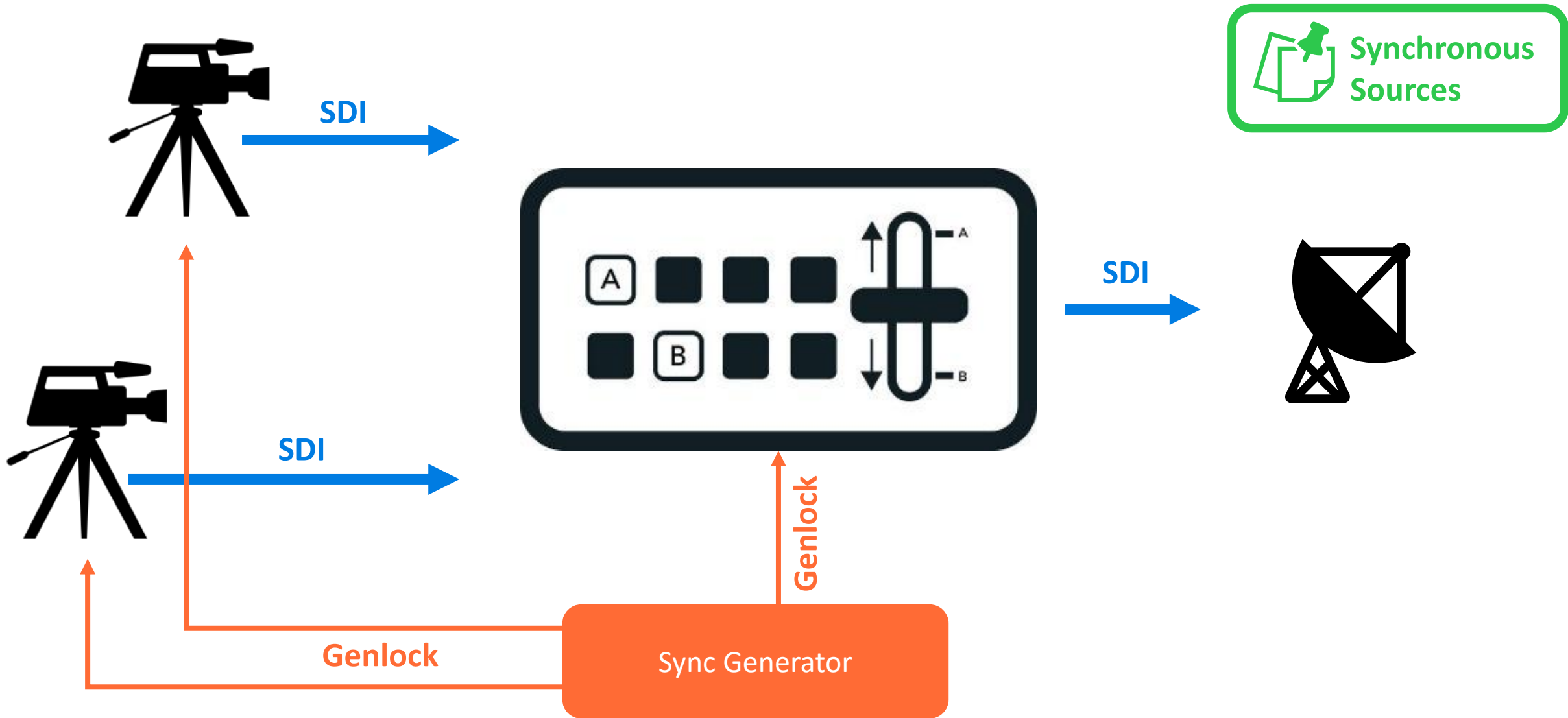


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Blanking



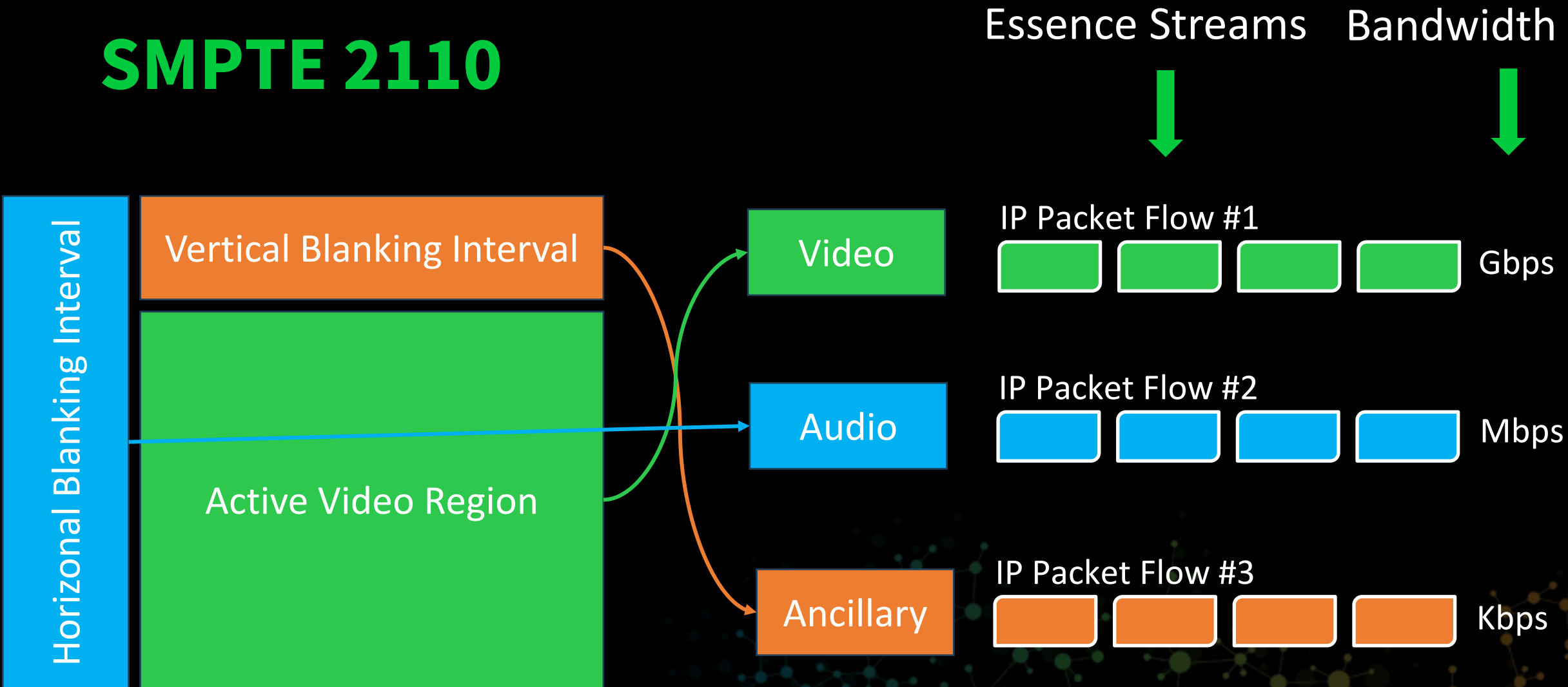
Traditional SDI broadcast



SMPTE 2110

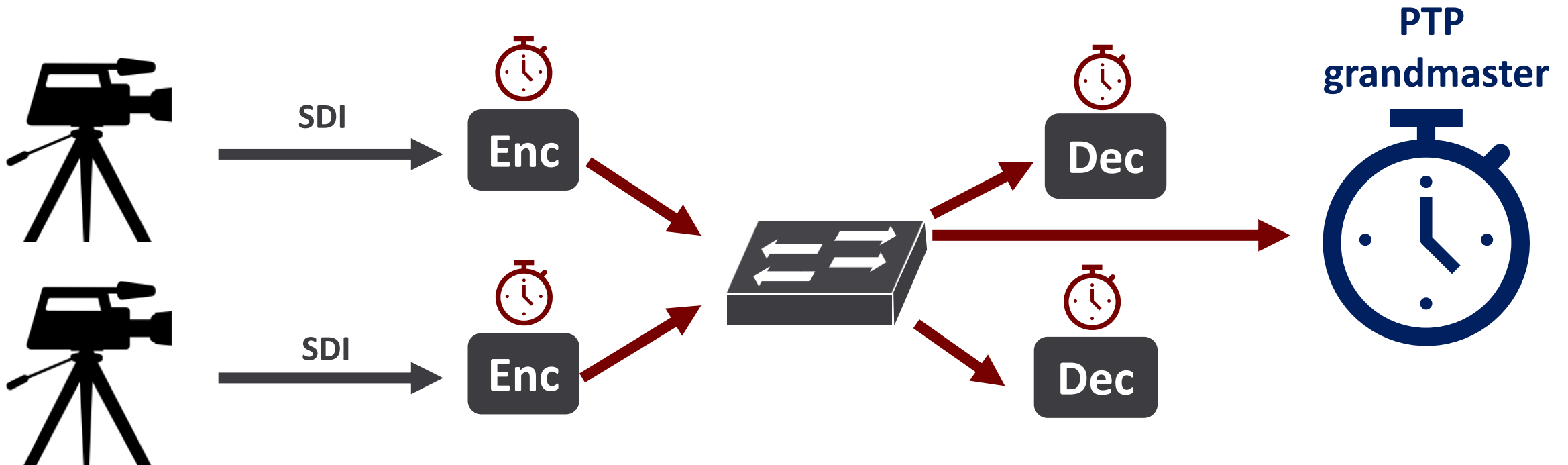


SMPTE 2110



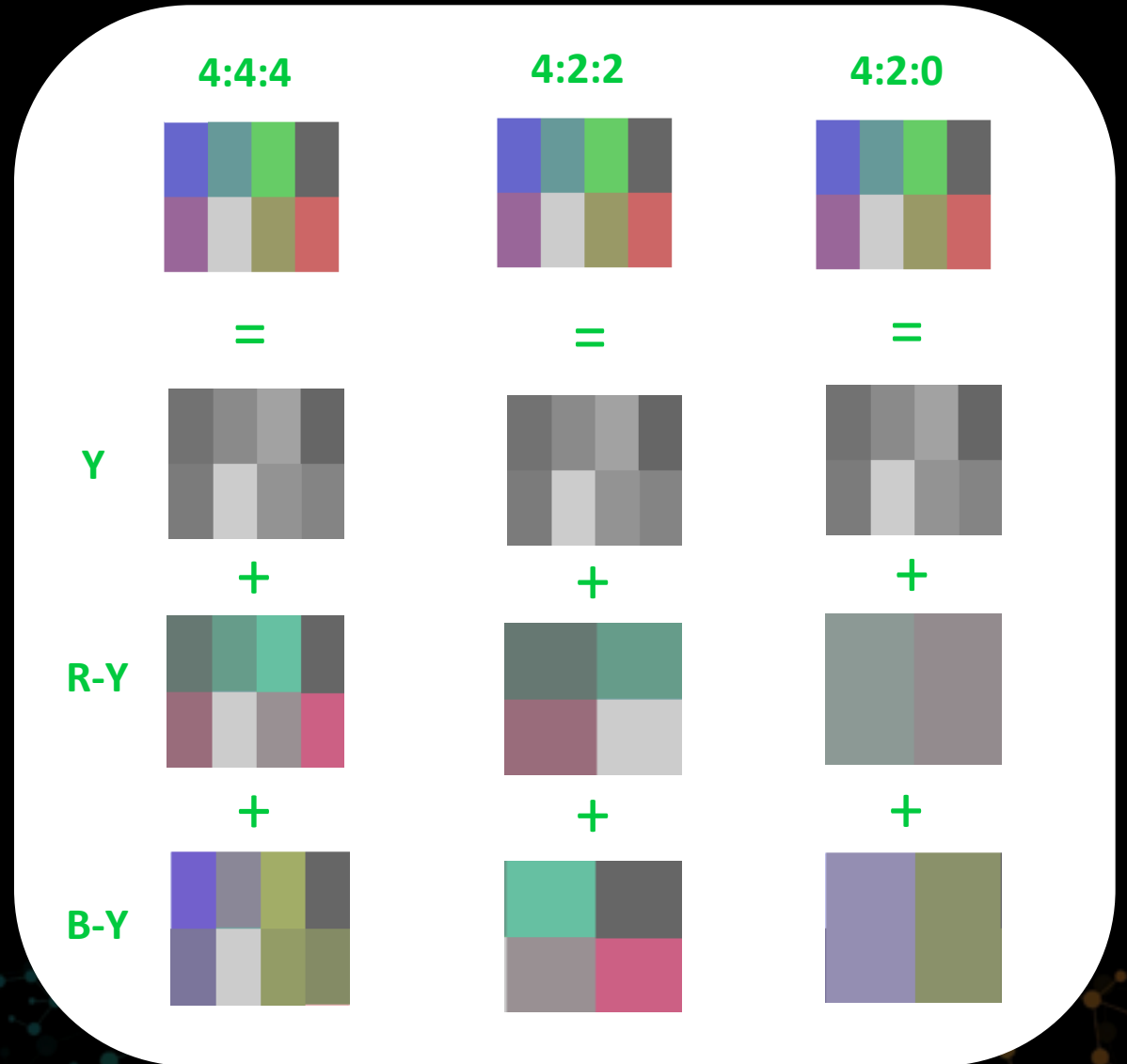
ST 2110: Precision Time Protocol (PTP)

- Genlock of ST 2110 – **mandatory**
 - NTP milli second precision
 - PTP micro / nano second precision
- Synchronizes video, audio, metadata streams



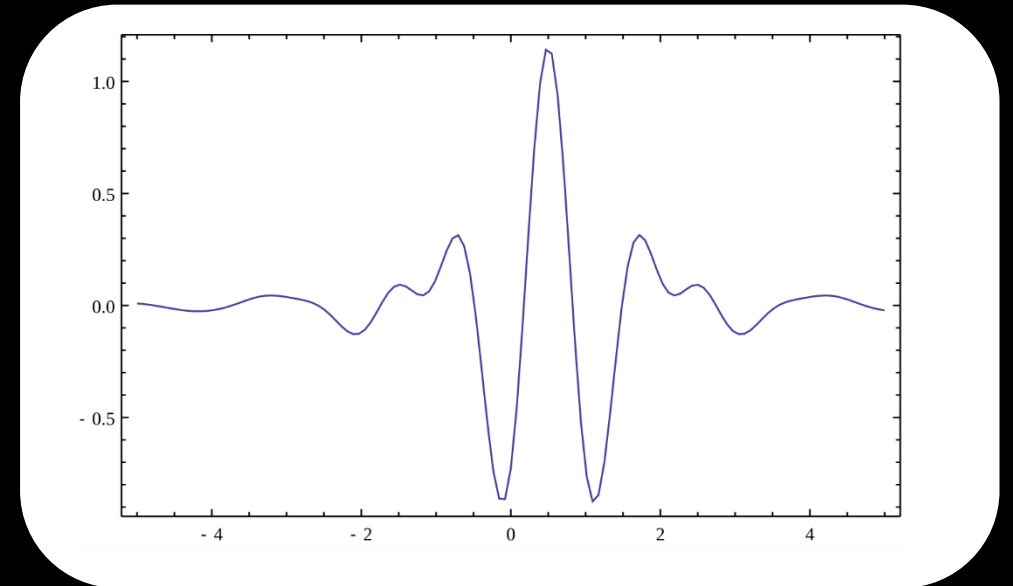
SMPTE 2110 Formats

- Video typically
 - YUV 4:2:2
 - Full HD or Ultra HD
- SMPTE 2110 supports more
 - 2x2 pixels up to 32k x 32k pixels
 - YUV 4:2:0 / YUV 4:4:4
 - RGB 4:4:4
- Audio
 - AES-67



SMPTE 2110 Bandwidth

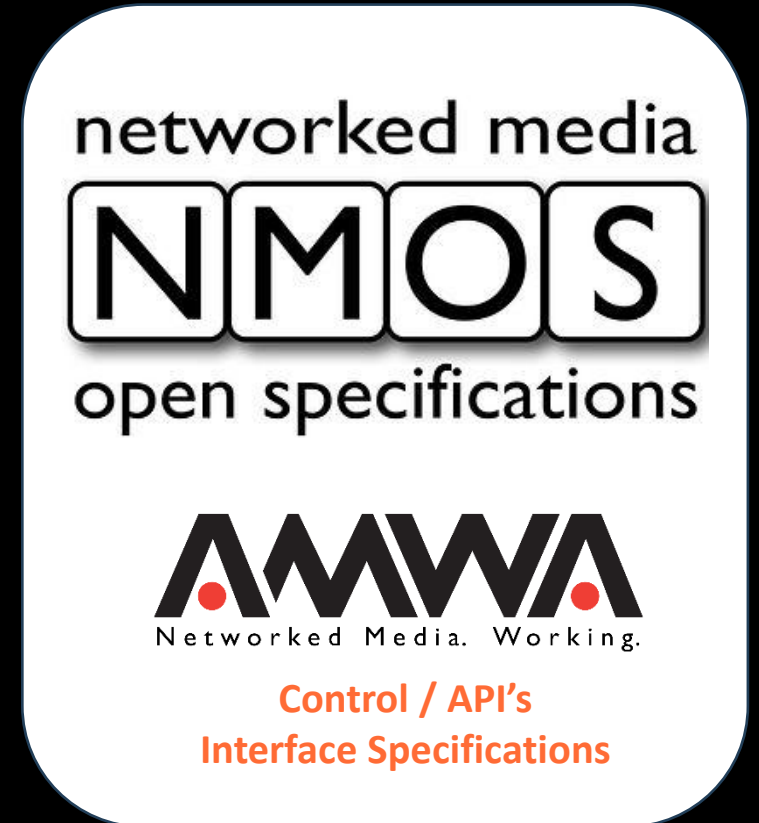
- Typical for uncompressed
 - For FHD: 10G copper / fiber
 - For UHD: 25G fiber
- Support for compression
- JPEG-XS
 - Efficient
 - Wavelet based
 - Intra frame
 - Ultra low latency (1-5ms)
 - Can run UHD on 1Gbit/s



XS

NMOS Control and API's

- Discovery and Registration
 - Devices available?
 - Streams available?
 - Register with NMOS Registry
- Connection Management
 - Connect Encoder -> Decoder.



IPMX



From SMPTE 2110 to IPMX

- What if we take:
 - Full SMPTE 2110 standard
 - Add ProAV features / requirements



ProAV vs Broadcast

- No genlock: Asynchronous Sources

- No expensive PTP network switches



- Variety of video formats (changing on the fly)



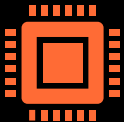
- Sleep mode



- Hot plug (laptops)



- EDID



- HDCP



- USB / KVM



- RS232 / IR / CEC

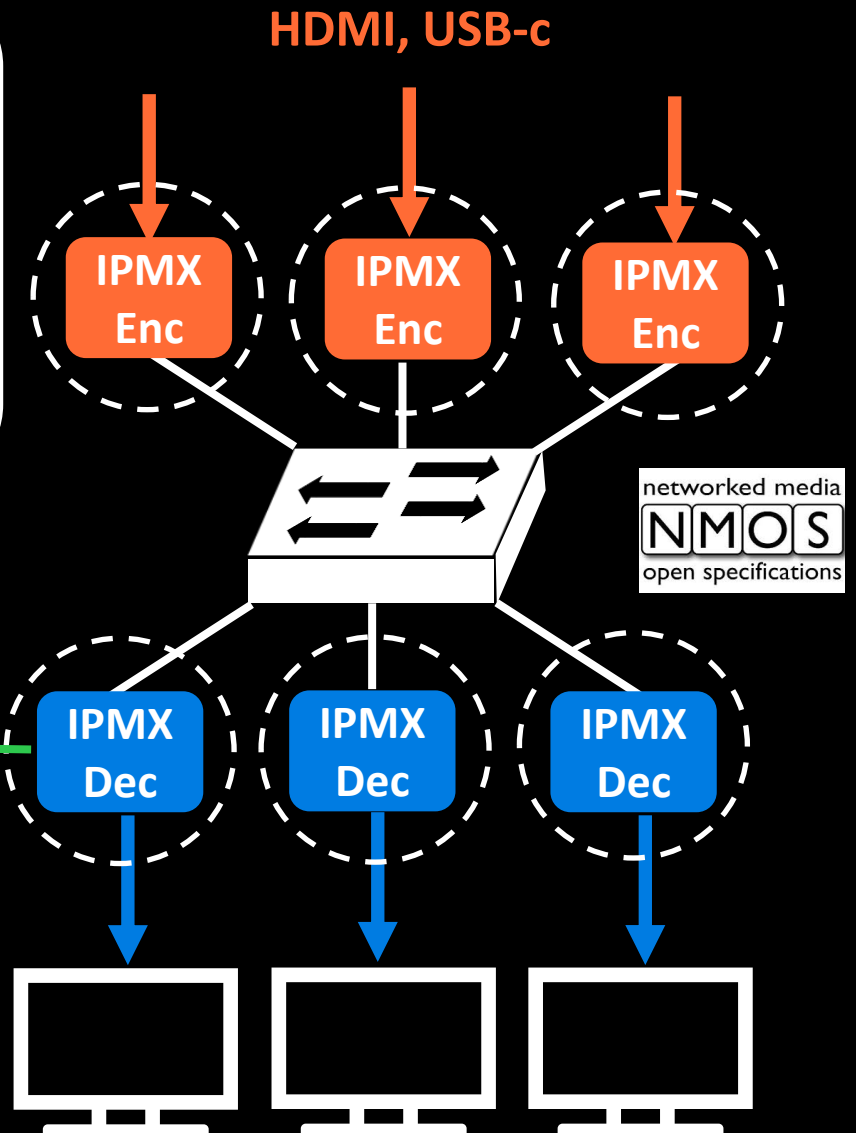


- Easy, worry-free installation.



NMOS in IPMX

- Decoders will detect:
 - Encoders
 - Encoder Streams

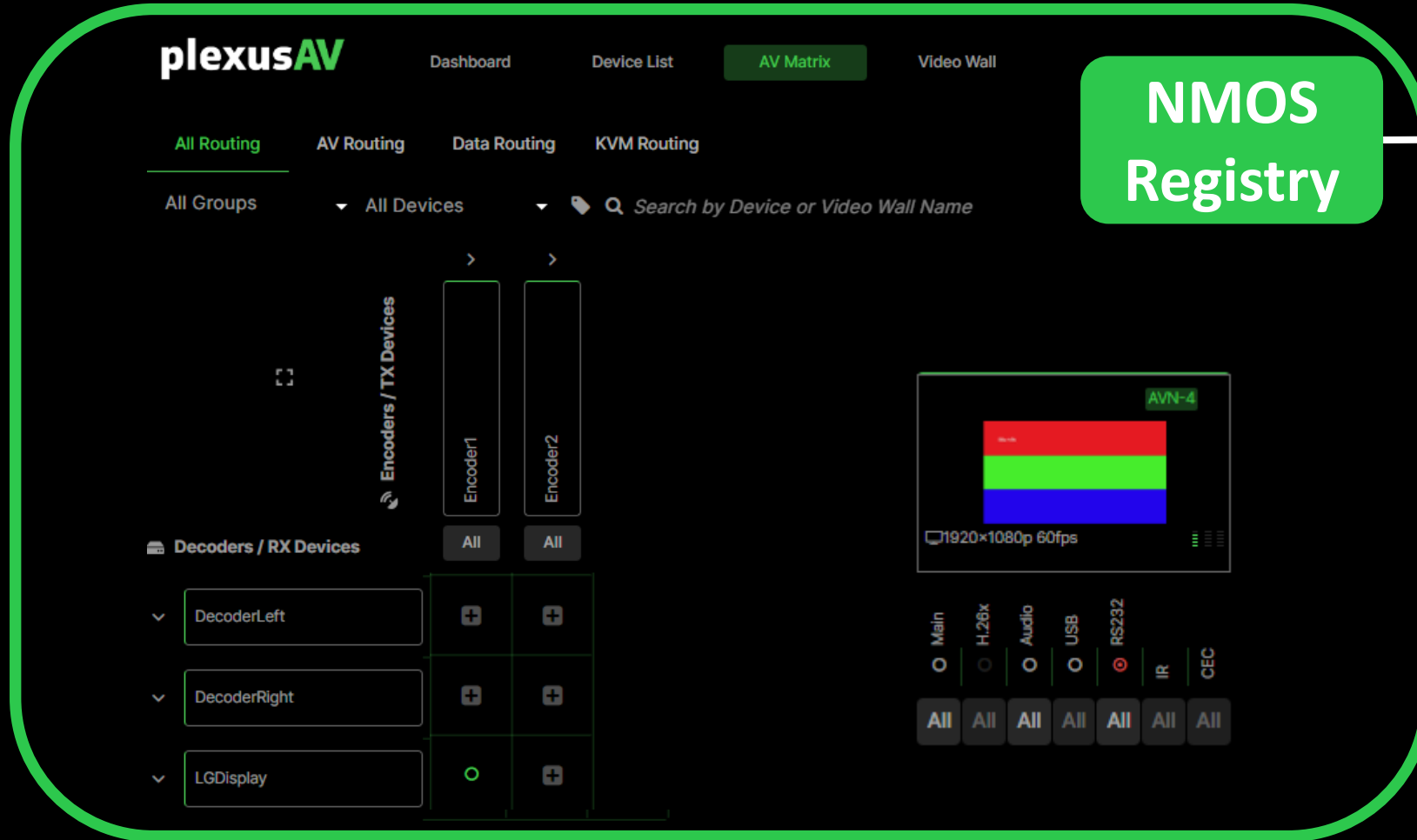


NMOS Device Discovery Network

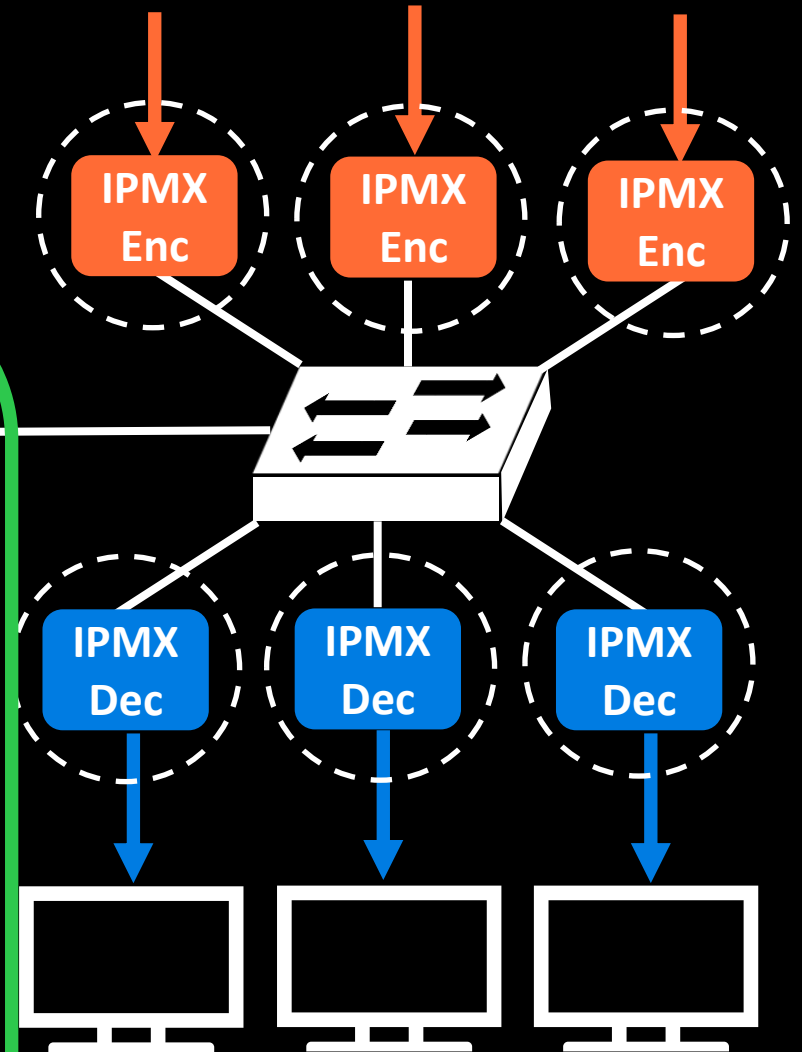
NMOS Names	Mode	IP Address	AV Link
Encoder2		172.16.100.12	• Link
Encoder1		172.16.100.9	• Link
DecoderLeft		172.16.100.11	/
DecoderRight		172.16.100.10	/

IPMX NMOS Registry Server

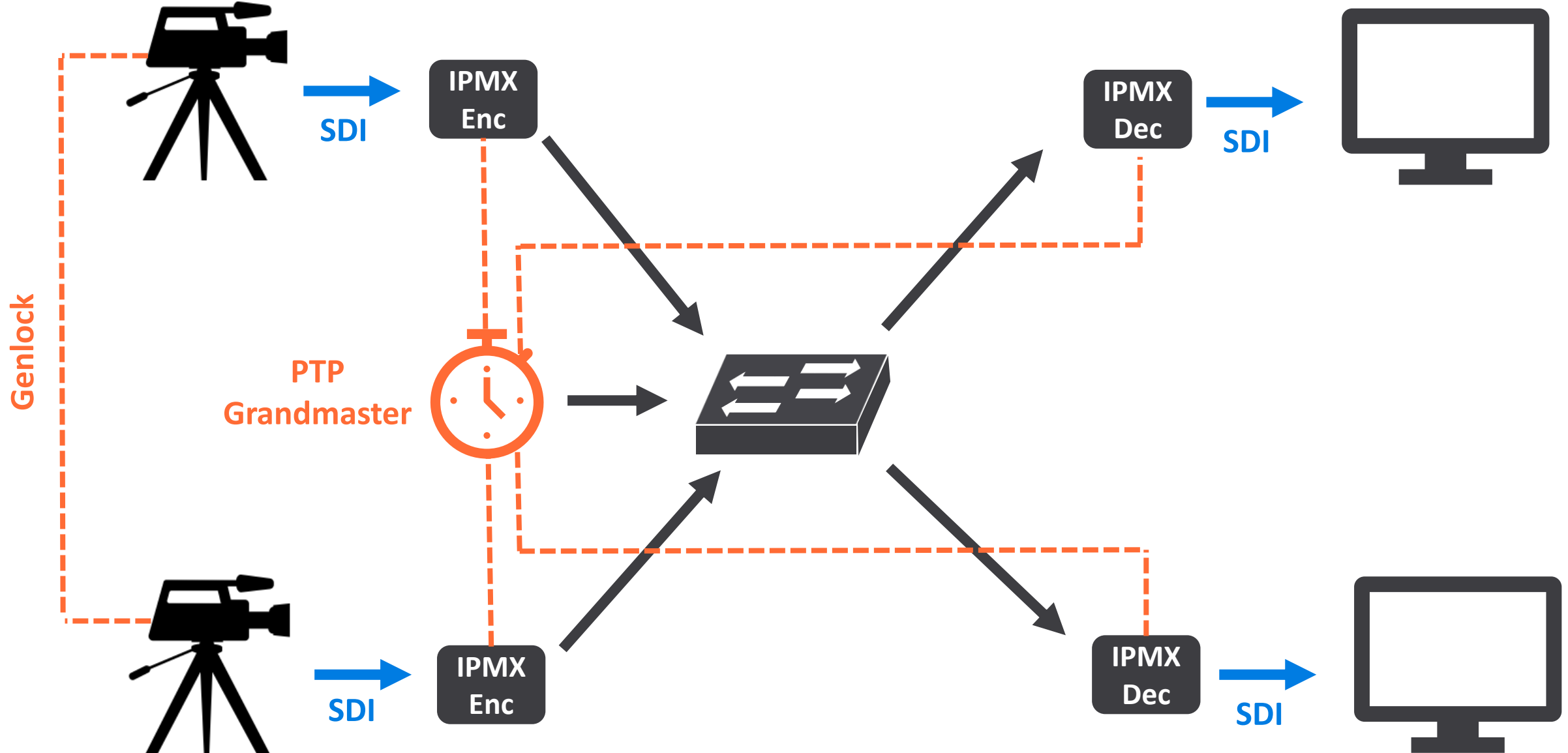
- plexusAV Visual Array



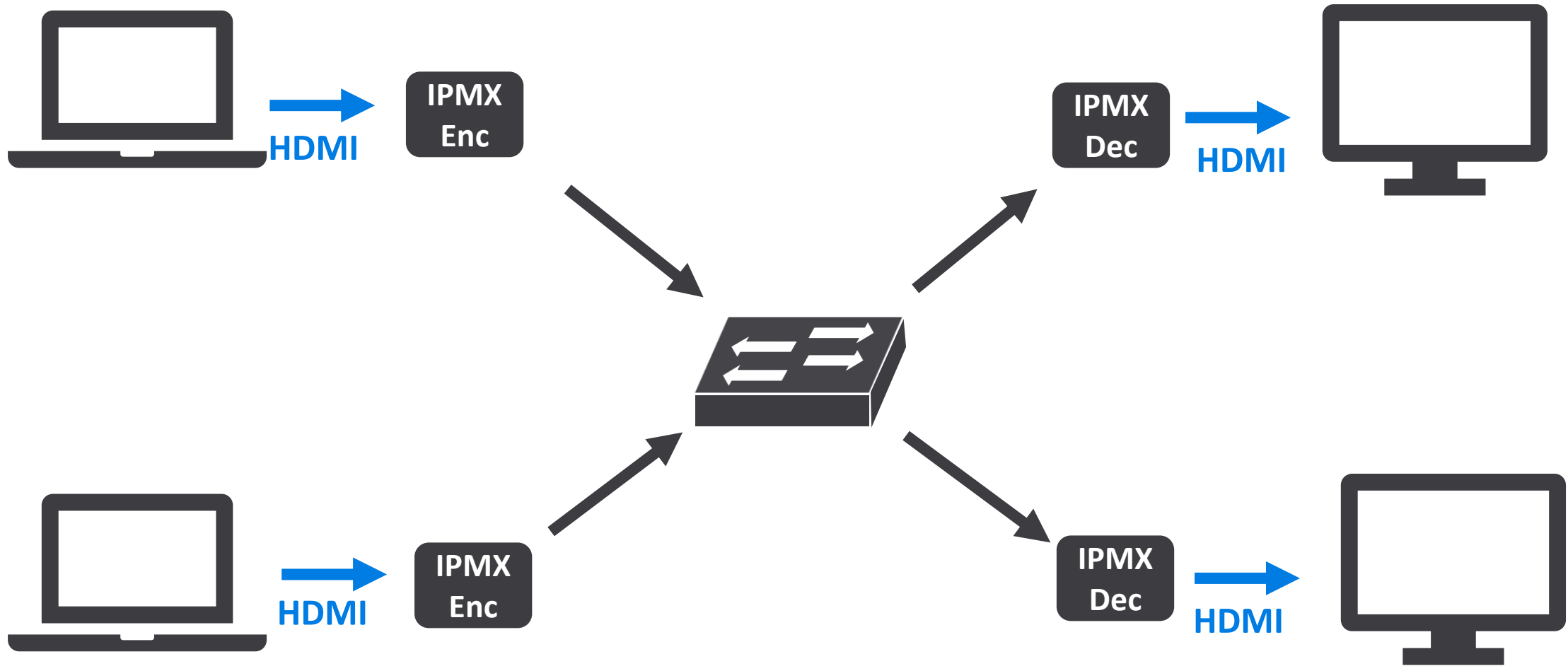
NMOS
Registry



IPMX Synchronous Sources



IPMX Asynchronous Sources [HDMI]



ST 2110 ↔ IPMX Standards Mapping

ST 2110 Standard	IPMX Standard	Description
ST 2110-10	TR-10-1	System timing, synchronization, and basic definitions.
ST 2110-20	TR-10-2	Uncompressed video transport over RTP.
ST 2110-30	TR-10-3	PCM audio transport over RTP.
ST 2110-40	TR-10-4	Ancillary data transport (captions, metadata, timecode).
—	TR-10-5	HDCP key exchange for protected HDMI content.
ST 2022-5	TR-10-6	Forward Error Correction (FEC) for network resilience.
ST 2110-22	TR-10-7	Variable bit-rate compressed video transport.
AMWA NMOS (external to ST 2110)	TR-10-8	NMOS discovery, registration, and connection management requirements.
—	TR-10-9	System environment and device behavior requirements.
—	TR-10-10	HDMI InfoFrame transport.
ST 2110-22	TR-10-11	Constant bit-rate compressed video transport (e.g., JPEG XS).
ST 2110-31	TR-10-12	AES3 transparent audio transport.
—	TR-10-13	Privacy Encryption Protocol (PEP) for media security.
—	TR-10-14	USB/KVM transport extension.
—	TR-10-15	JPEG XS codec requirements and interoperability profiles.

plexus **HDBT™**

AES67

NMOS



HDBASET 3.0
Wall Plates



HDBaseT 3.0 IPMX
Gateway Transceivers



H.264/5 IPMX Decoders



H.264/5 IPMX
Gateway Transceivers

Dante®



H.264/5 IPMX Encoders



JPEG-XS IPMX Decoders



JPEG-XS IPMX Encoders



Third-Party Streaming

IPTV

NDI|HX

RTSP



Stream Conversion
Gateway



SRT
SECURE
RELAY
TRANSPORT



JPEG-XS-FIP/TDC
IPMX Gateway Transceiver



Visual Array
Management Platform



DANTE / AES67
Ceiling Speakers



KvMoIP

AV-over-IPMX Solutions



Visual Array

plexusAV

Dashboard

Device List

AV Matrix

Video Wall

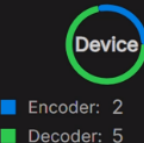
Visual Array



Version: dev-r27316-p29-g3347563
Serial: 182528668
Uptime: 3 days 5 hours 11 minutes

Active Devices

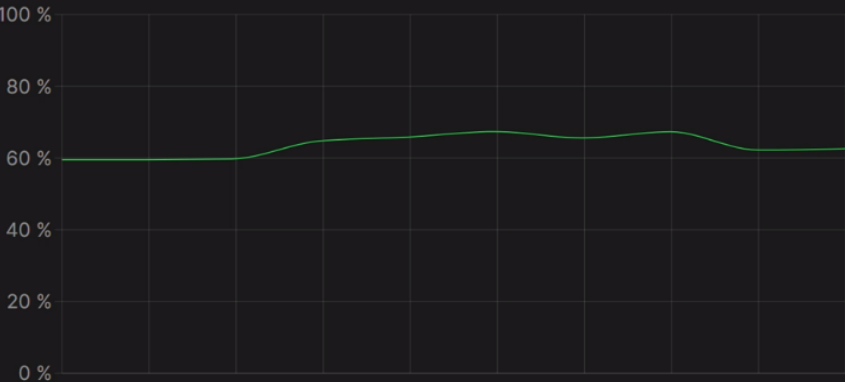
Total: 7



Offline Device

0

CPU Utilization



IGMP Querier

Active

192.168.1.254

RAM



Conflicted Device

0

Network

Name	Status	IP	Subnet	Gateway
eth0	1 Gbps (UP)	192.168.1.10	255.255.255.0	192.168.1.1

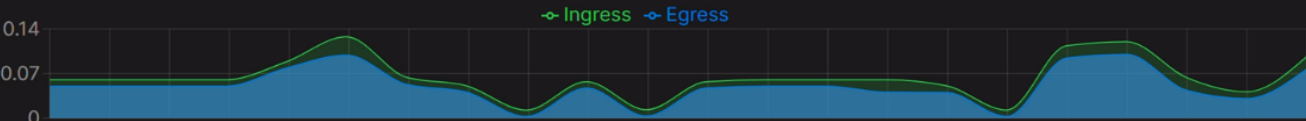
CPU Temperature

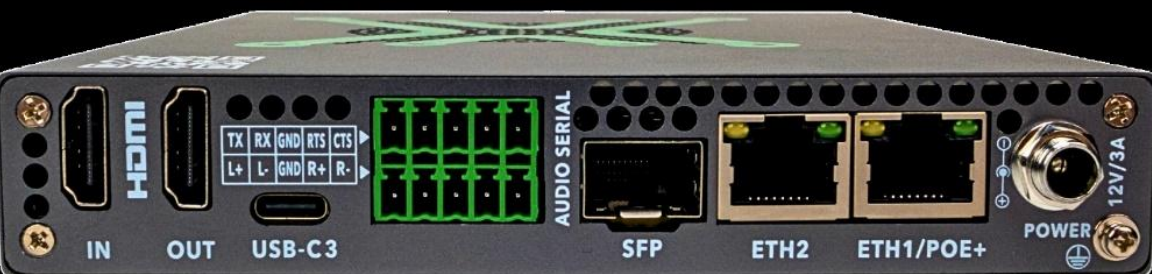


Notification

Left TV (192.168.1.50) Nmos device offline 1 days 23 hours 14 minu...

Bandwidth (Mbps)





P-AVN-4

Transceiver – 4K Encoder & Decoder

- 1/3 RU, POE+
- 1GB Ultra low latency with IPMX (LC Stream)
- 4K60 4:4:4
- JPEGXS with RGB profile (FIP/TDC)
- **Secondary H.264/265 streaming – Multi or UniCast**
- HDMI and USB-C Video
- Balanced Audio, Dante Audio and AES67
- IR, USB-C and serial
- Video, audio, control and USB are separate and individually switchable streams
- Front panel display and on-board webUI
- HDCP and HTTPs secure control
- API
- 3 Year warranty

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4RU x 14 unit
Rack Mount

1RU x 3 unit
Shelf



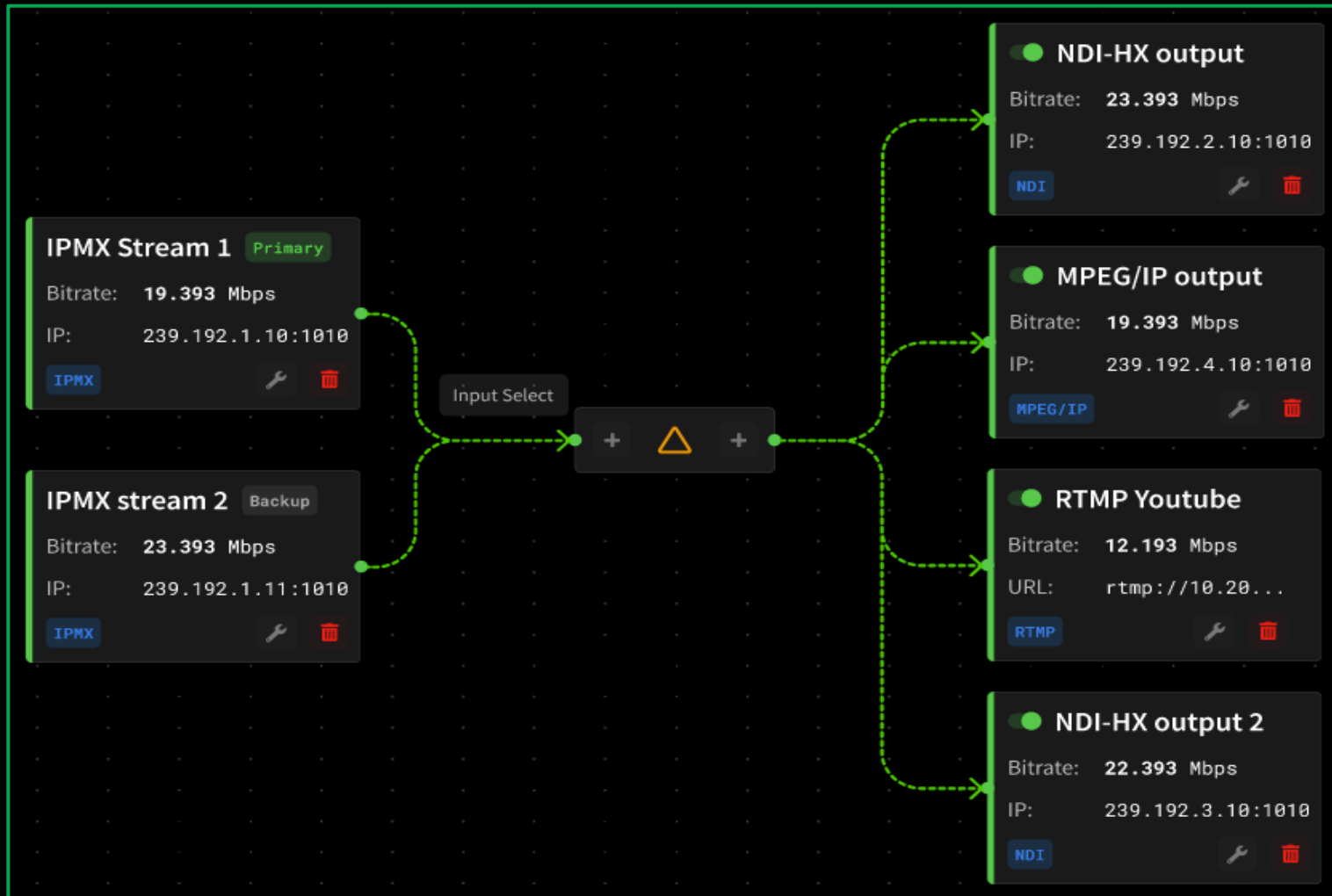
P-AVN-6-S

Transceiver – 4K Encoder & Decoder



- 1/2 RU, POE+
- 25GB Uncompressed and JPEG-XS
- 4K60 4:4:4
- JPEGXS with RGB profile (FIP/TDC)
- 12G SDI with Genlock
- HDMI and USB-C Video
- Balanced Audio, Dante Audio and AES67
- IR, USB-C and serial
- Video, audio, control and USB are separate and individually switchable streams
- Front panel display and on-board webUI
- HDCP and HTTPs secure control
- API
- 3 Year warranty

Stream Conversion Gateway



IPMX Speaker Form Factor Roadmap



P-ANS-6C
Ceiling Speaker



P-ANS-6P
Pendant Speaker



P-ANS-6S
Surface Speaker

Control Options



NMOS

Dante®

AES67



IPMX / NMOS Control Mode

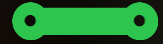
- ✓ Speaker is auto-detected by Visual Array device list
- ✓ AV Matrix can route channel changes (new Audio Tab)
- ✓ Audio signal comes IPMX (including P-AVN products)
- ✓ IP signal is IPMX[AES-67[PCM Audio]]

Dante Controller Mode

- ✓ Speaker is auto-detected by Dante Controller Software
- ✓ Dante Controller routes channel changes
- ✓ Audio signals any Dante source (including P-AVN products)
- ✓ IP signal is Dante[PCM Audio]

AES-67 Direct Mode

- ✓ No auto-detection
- ✓ Audio signals any AES-67 source (including P-AVN products)
- ✓ IP signal [AES-67[PCM Audio]]



Time for Questions

Time for Projects