

<https://AES.NYC.Routing.audio>



Anthony P. Kuzub

IP Audio Product Manager

Anthony@Ward-Beck.Systems

www.Ward-Beck.Systems



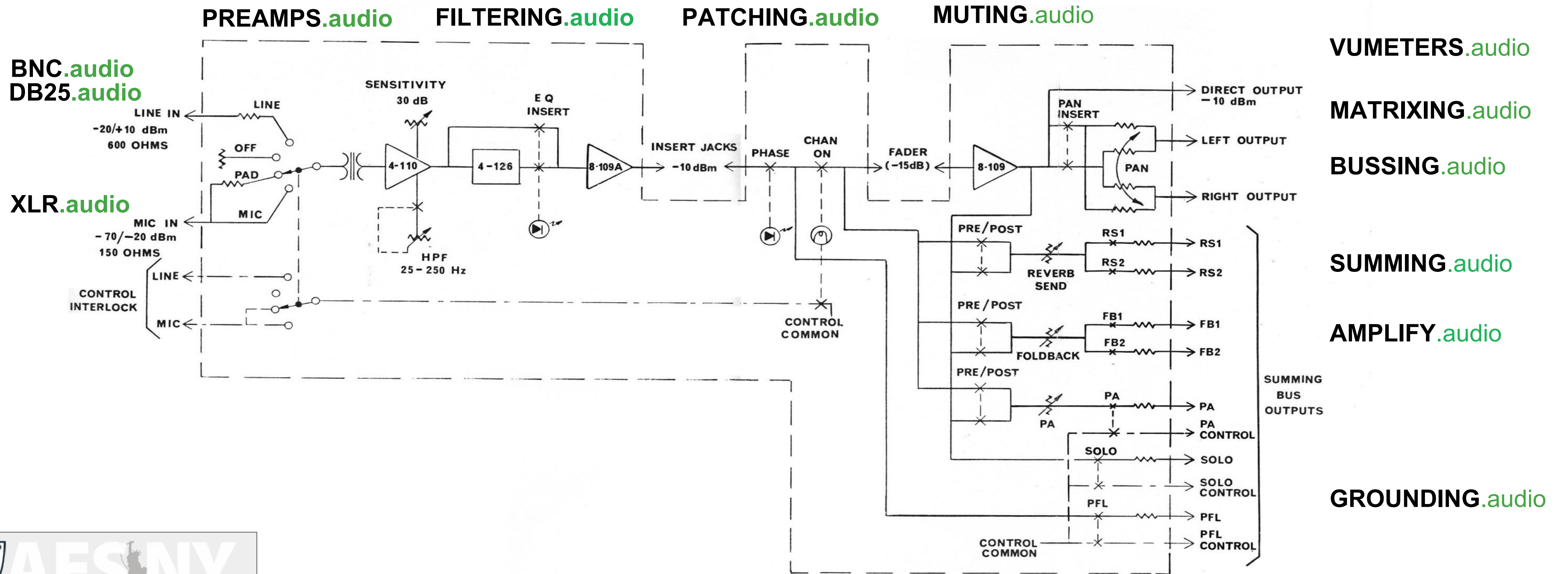
WARD-BECK SYSTEMS

TorontoAES.org

Vice-Chair



Audio Domains



AES67

AES67-2013

Standard for audio applications of networks:
High-performance streaming audio
over-IP



AES67

***AES67-2018 Standard for
audio applications of networks:
High-performance streaming a
udio-over-IP interoperability***

References

Audio Engineering Society, New York, NY., US.

AES11 - AES recommended practice for digital audio engineering
Synchronization of digital audio equipment in studio operations

Institute of Electrical and Electronics Engineers (IEEE)

IEEE 1588-2008 - IEEE Standard for a Precision Clock Synchronization Protocol
for Networked Measurement and Control Systems, July 2008

Internet Engineering Task Force

RFC 768 – User Datagram Protocol”
RFC 791 – Internet Protocol
RFC 1112 – Host Extensions for IP Multicasting
RFC 2236 - Internet Group Management Protocol, Version 2
RFC 2474 – Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers
RFC 2616 - Hypertext Transfer Protocol - HTTP/1.1
RFC 2974 – Session Announcement Protocol
RFC 3190 – RTP Payload Format for 12-bit DAT Audio and 20- and 24-bit Linear Sampled Audio
RFC 3261 - SIP: Session Initiation Protocol
RFC 3264 - An Offer/Answer Model with the Session Description Protocol (SDP)
RFC 3376 - Internet Group Management Protocol, Version 3
RFC 3550 – RTP: A Transport Protocol for Real-Time Applications
RFC 3551 - RTP Profile for Audio and Video Conferences with Minimal Control
RFC 4566 – Session Description Protocol
RFC 5939 – Session Description Protocol (SDP) Capability Negotiation
RFC 7273 – RTP Clock Source Signalling



The least you **SHOULD**
know about networking:

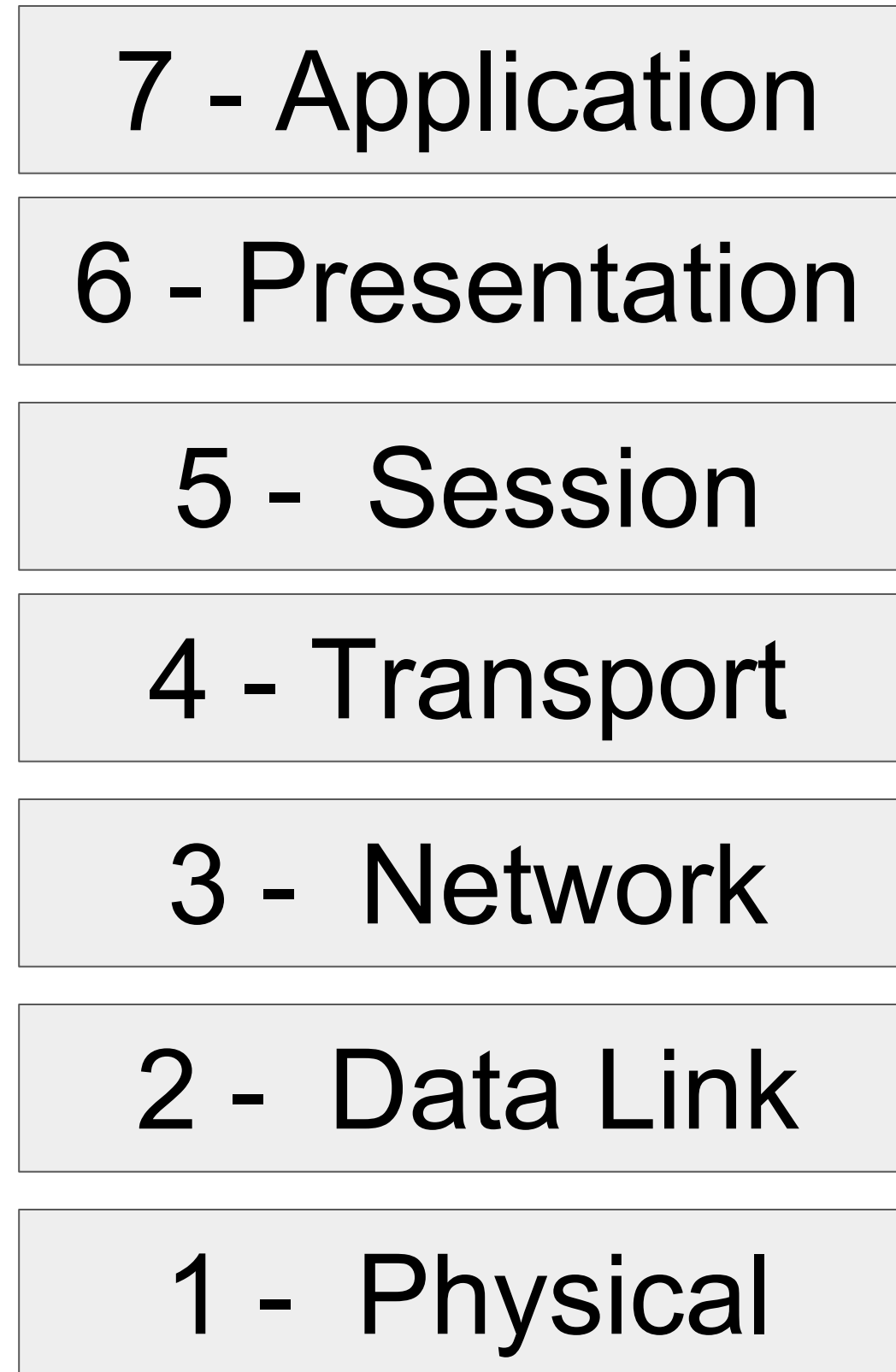
**The physical datalink networks
transported sessions
presented by the application**

AES67.audio - Click to view Presentation

[AES67.audio](#)
[2110-30.AES67.audio](#)

[IGMP.audio](#)
[CLOCKING.audio](#)

TX
DATA



RX
DATA

[PATCHING.audio](#)
[MATRIXING.audio](#)
[BUSSING.audio](#)

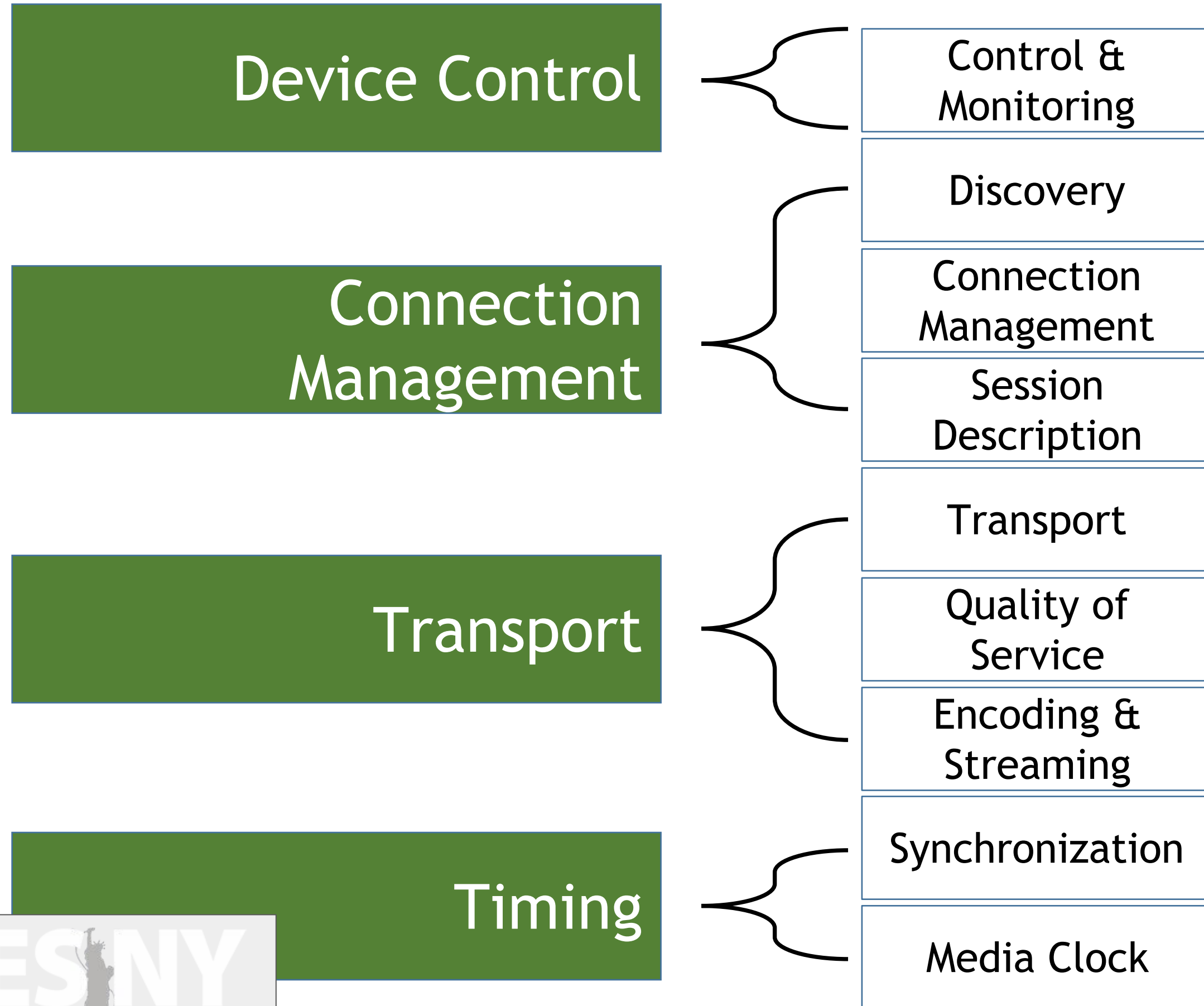
[ROUTING.audio](#)
[SWITCHING.audio](#)
[MULTICASTING.audio](#)



[RJ45.audio](#)



FULLstack.AES67.audio



AES70.audio

PATCHING.audio

MATRIXING.audio

SWITCHING.audio

IGMP.audio

MULTICASTING.audio

ROUTING.audio

CLOCKING.audio



Transport

AES67 / ST 2110-30

Discover / Announce / Query

Ravenna / SAP / IS-04

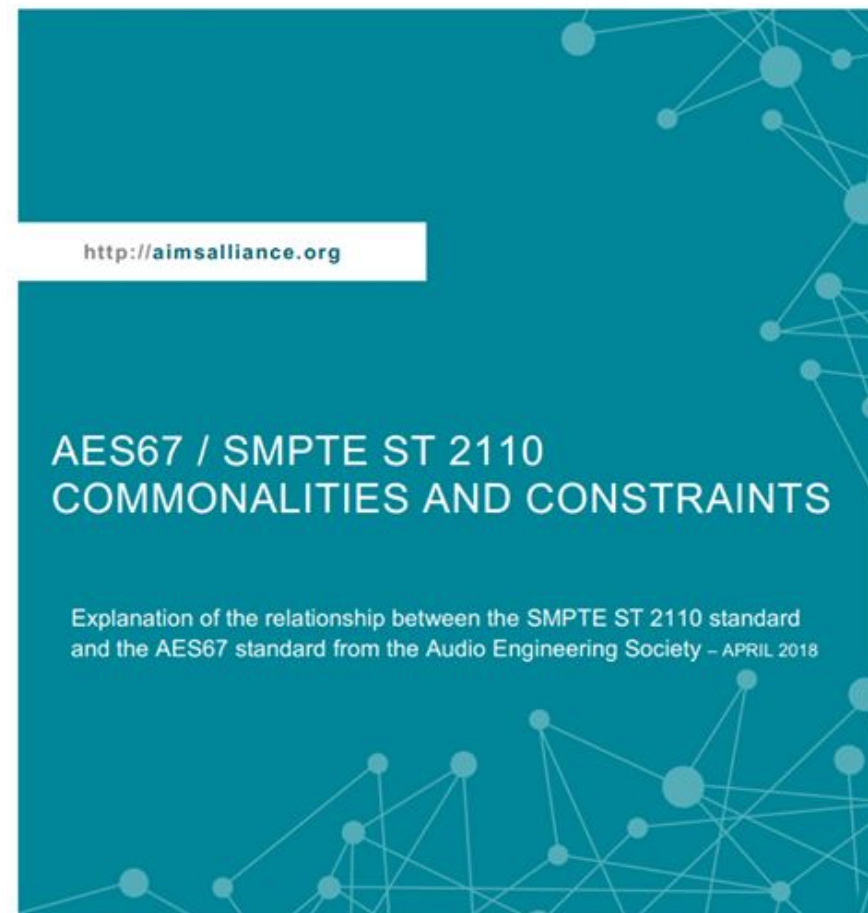
Control / Subscription

AES70 / Operator Web Gui



2110-30.AES67.audio

2110-30

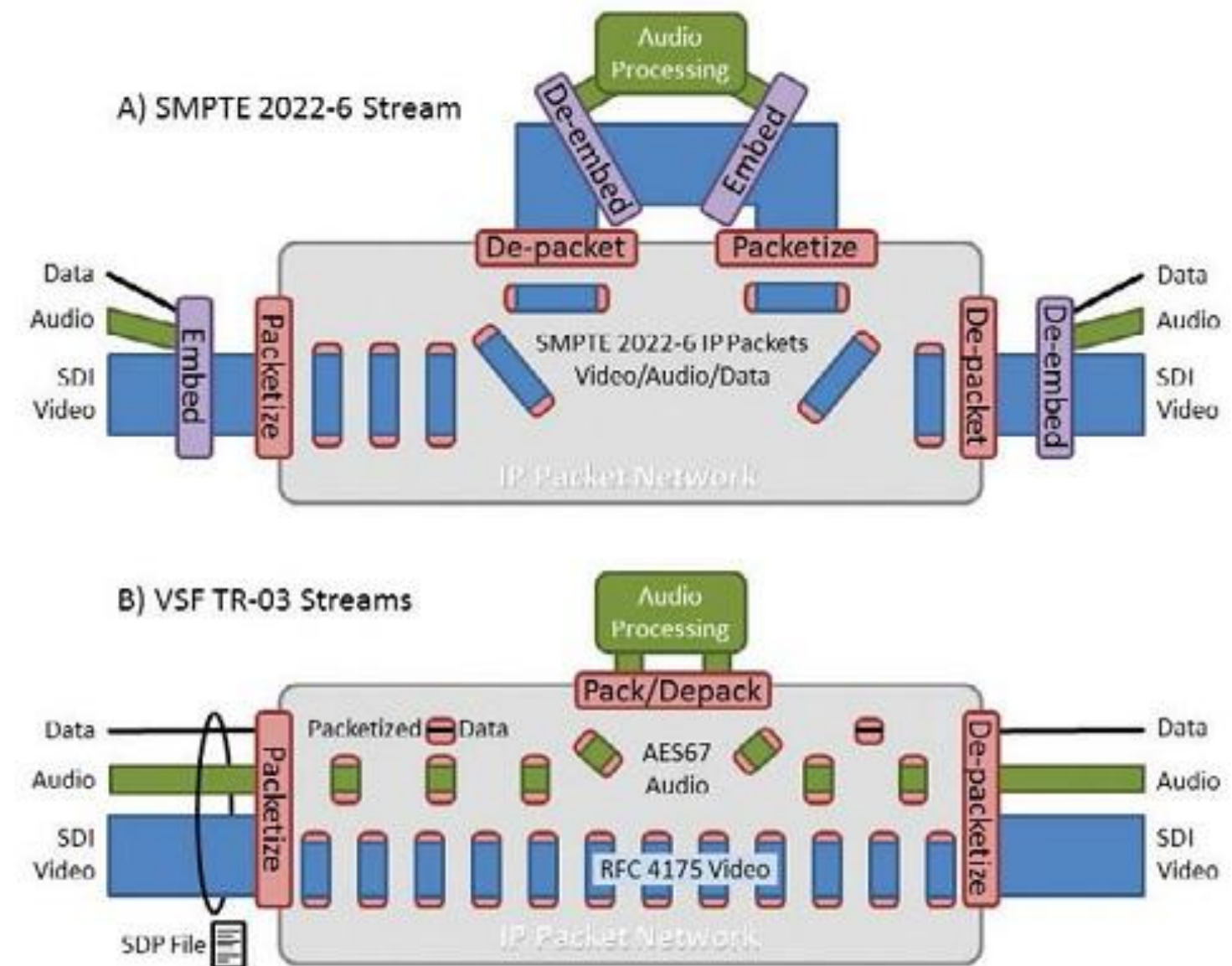


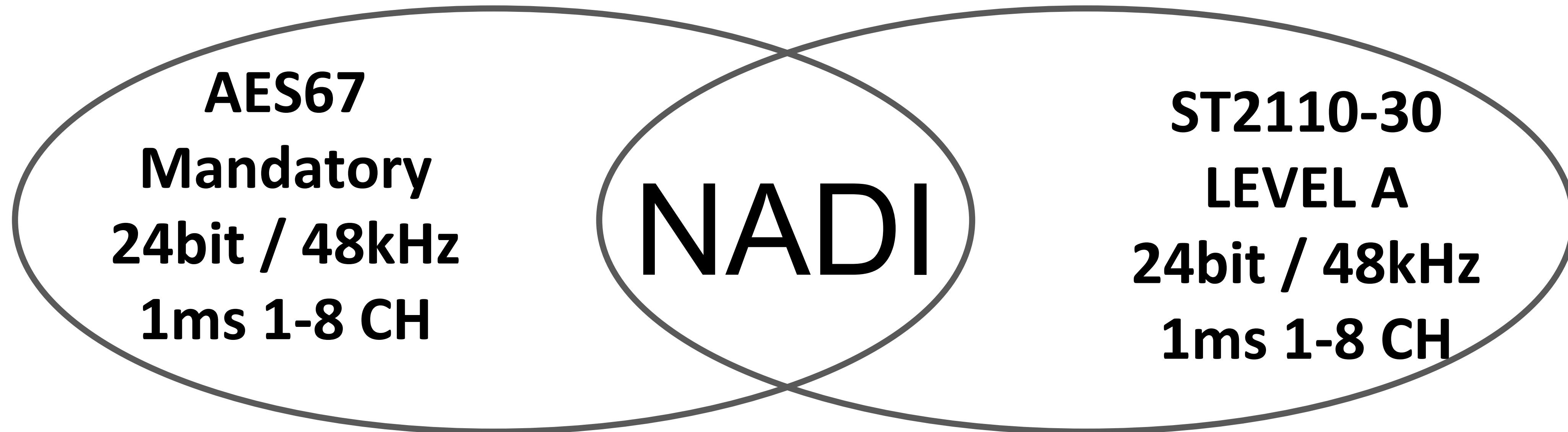
JOIN THE ALLIANCE

The Alliance for IP Media Solutions (AIMS) is a non-profit trade organization founded by leading companies to foster the adoption of industry standards for the broadcast and media industry as it transitions from SDI to IP.

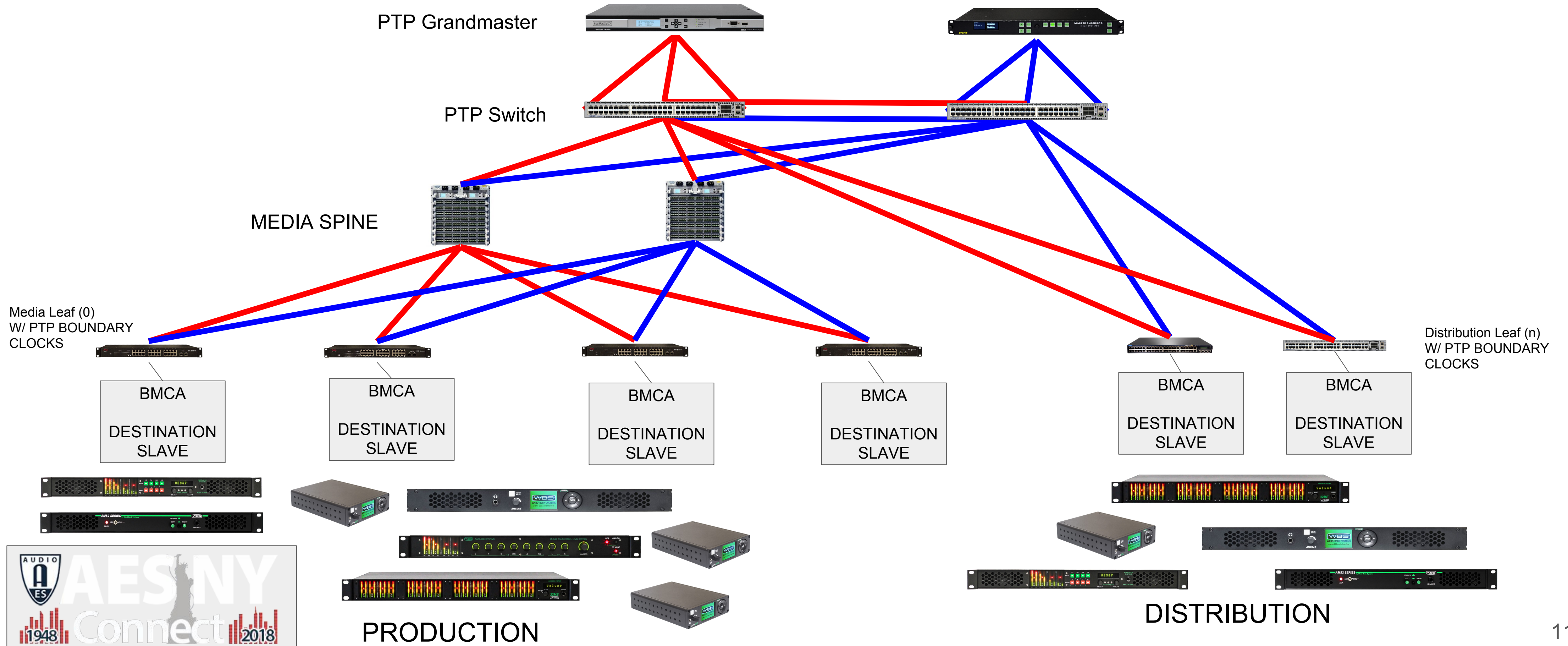


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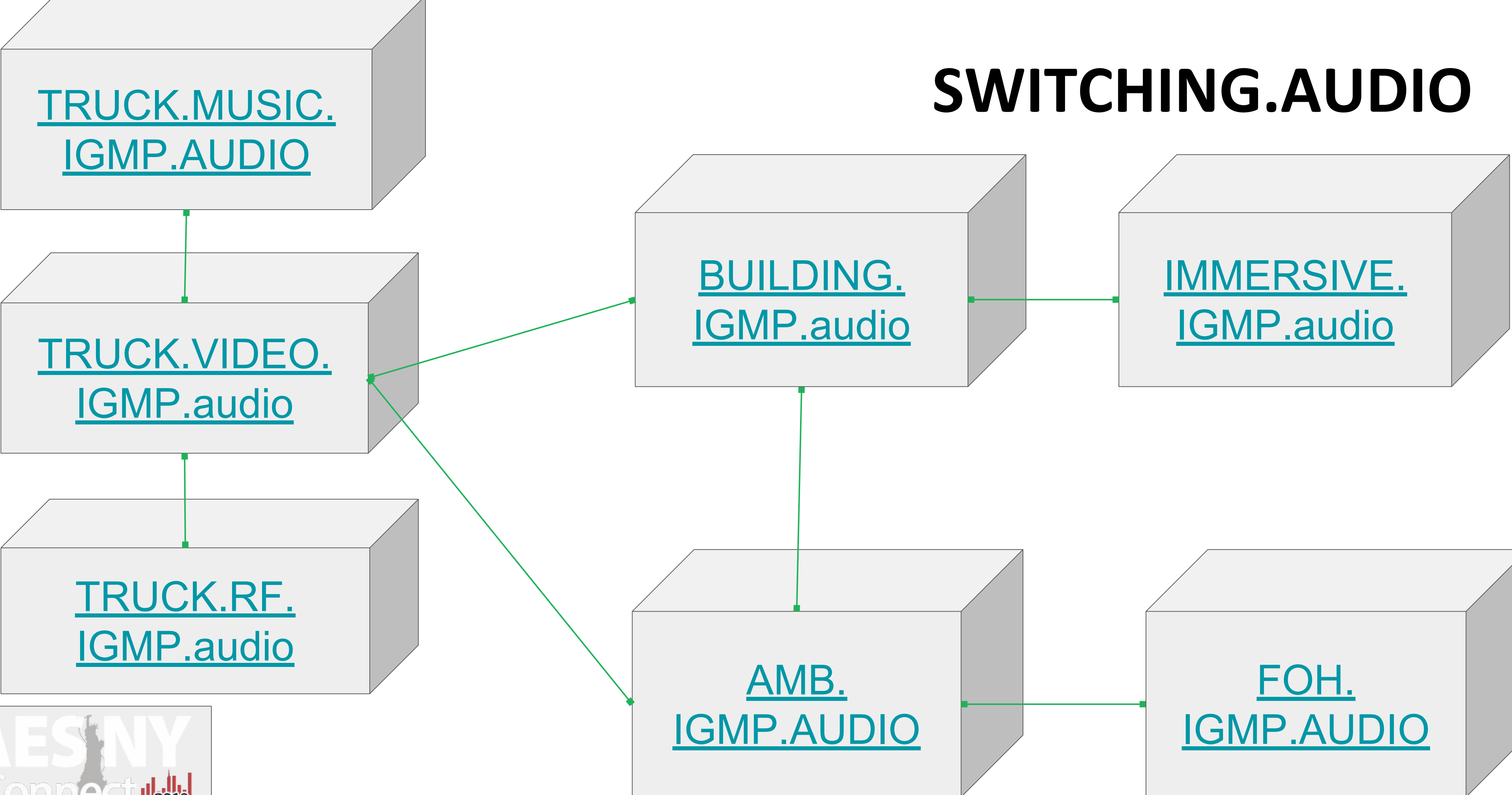


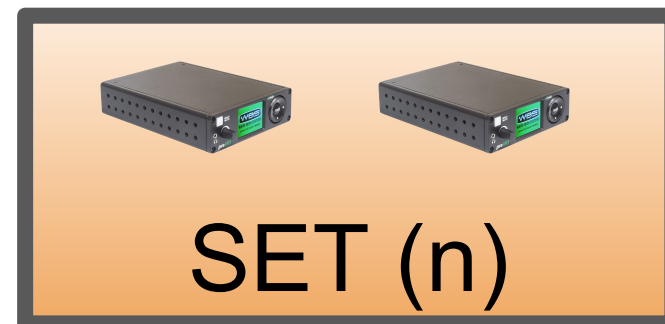
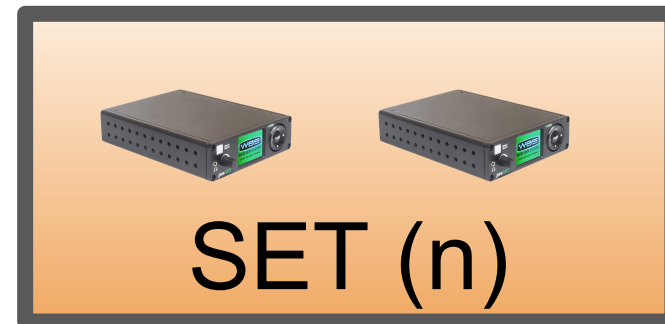
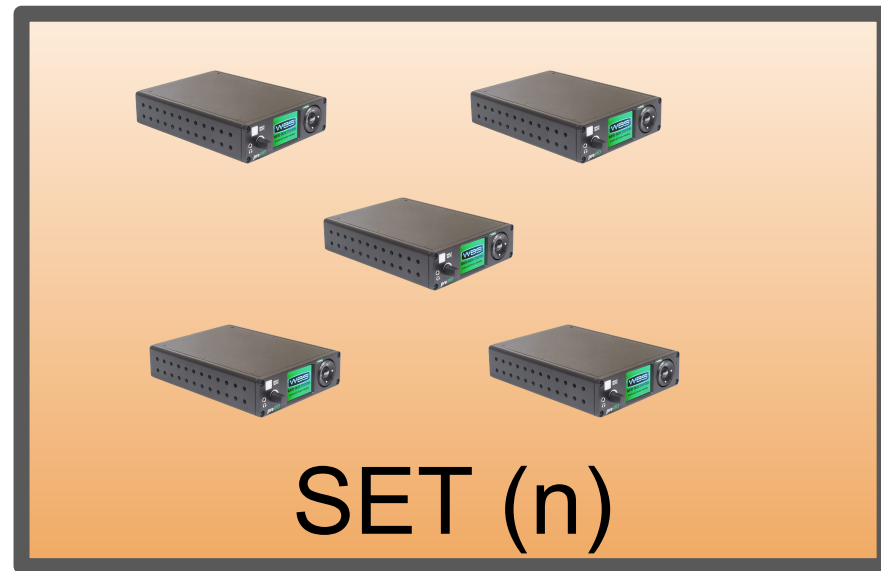


Networking.audio Ward-Beck.Systems

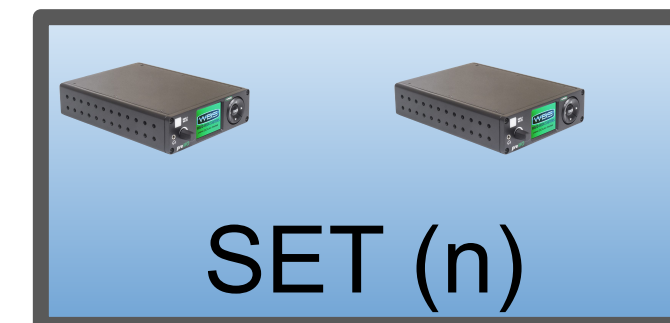
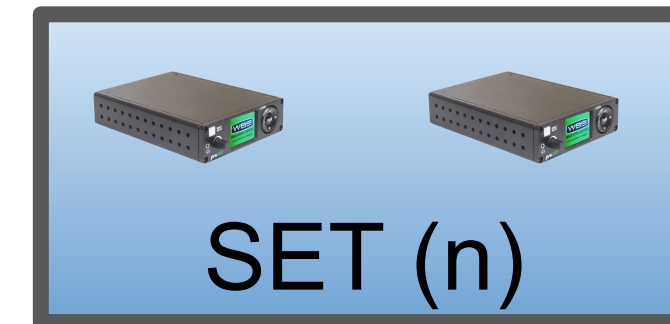
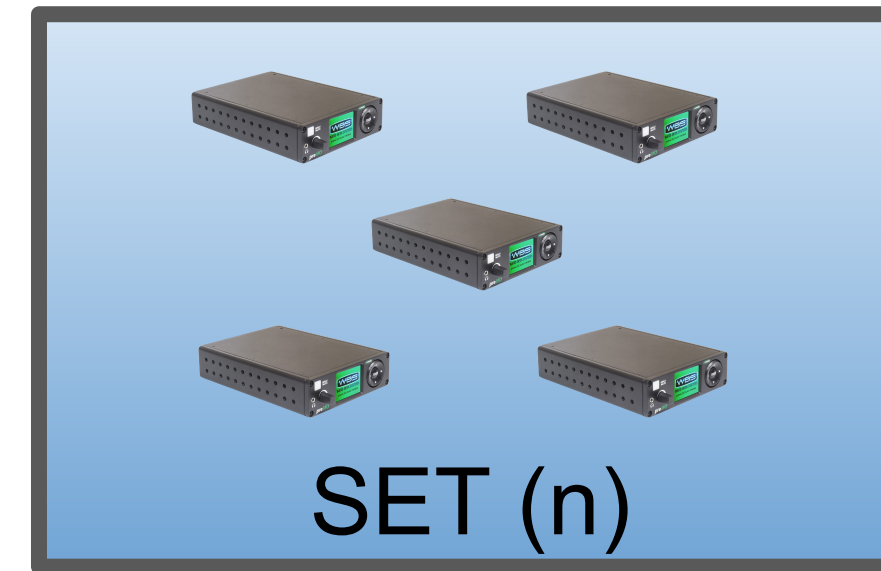


SWITCHING.AUDIO





AES from RF Mics + to IFB



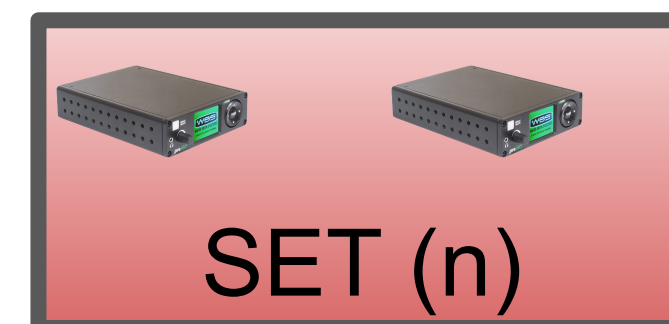
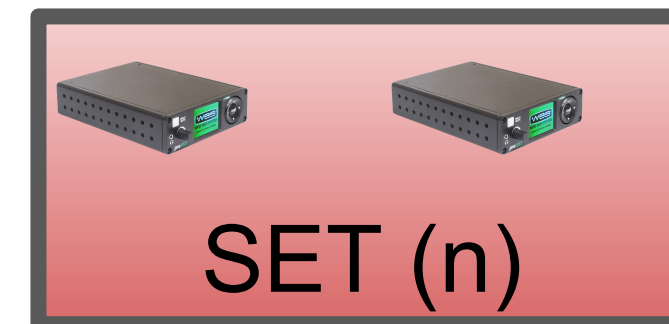
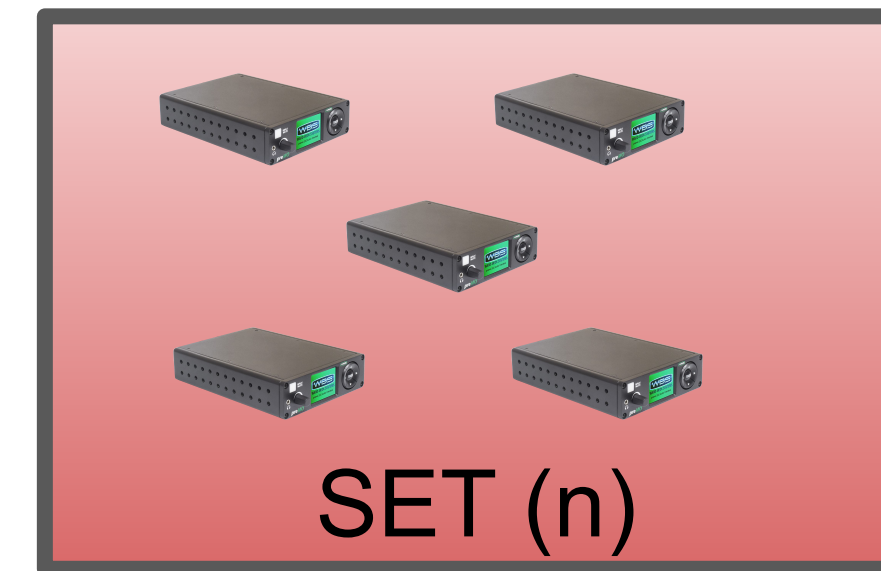
AES from RF Mics + to IFB

CRTL A

CRTL B

CRTL C

CRTL D



AES from RF Mics + to IFB

**Host RF
Co-Host RF
VO**

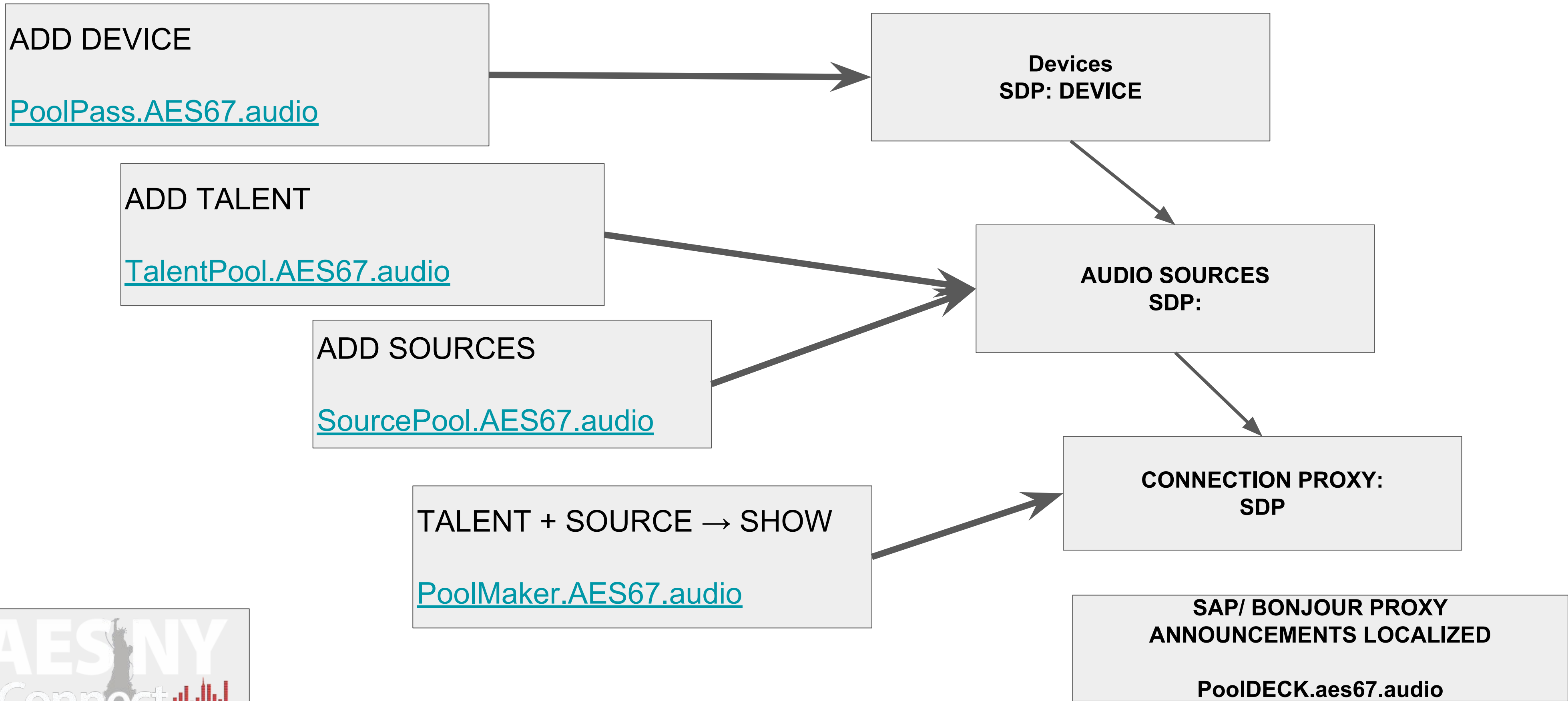
**OB
Ambience
Camera Mic**

**Transmission
Reception
Record**

**Guests
Backup**

**Production
Sources
Playback
Live Music**





AUDIOLAN AES67 Networking

19 devices found in network

MOBILE-32ME Ward-Beck Syst... 32ME-N	APK-AMS2-42-0... Ward-Beck Syst... AMS2-N	APK-BENCH-W... Ward-Beck Syst... 32ME-N	APK-WBS-AMS8 Ward-Beck Syst... AMS8-1AN	FRONT-ROOM-... Ward-Beck Syst... 32ME-N	FRONTTESTuN... 192.168.11.119	MOBILE-AMS-2X2 Ward-Beck Syst... AMS-2X2	MOBILE-AMS81 Ward-Beck Syst... AMS8-1AN	MOBILE-GUEST... Ward-Beck Syst... preMO-222	MOB... Ward preM
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MOBILE-32ME

Stream consumer | Stream provider | General settings | Advanced | Discard changes | Clear all | Apply all

Channel 1 Receiving

Name: RX via RAVENNA

Source stream: Front Room - DARS

Channel number: Channel 1

Show advanced settings

Manual SDP | Show current SDP > >>

Channel 2 Receiving

Name: RX via SAP

Source stream: sap:Front Room - DARS

Channel number: Channel 1

Show advanced settings

Manual SDP | Show current SDP > >>

Channel 3 Receiving

Name: RX via Manual SDP

```

v=0
o=- 4 0 IN IP4 192.168.11.109
s=Front Room - DARS
c=IN IP4 239.1.11.109/1
t=0 0
a=clock-domain:PTPv2 0
m=audio 5004 RTP/AVP 98
a=rtpmap:98 L24/48000/8
a=recvonly
a=framecount:48
a=sync-time:0

```

Normal Mode | Channel 1 >



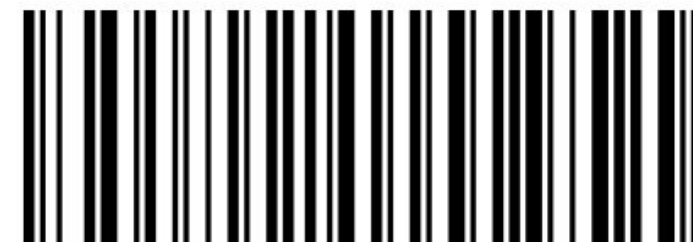
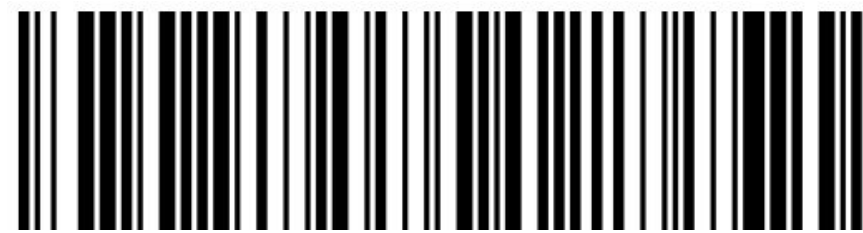
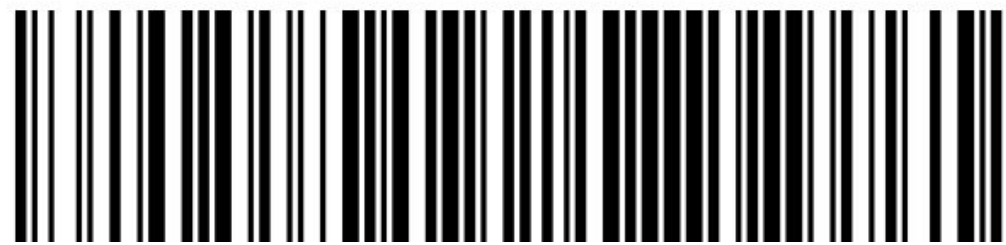
RAVENNA



Now with AES67

Dante™





TALENT ID



POSITION ID



SHOW ID



SDP

session DESCRIPTION PROTOCOL

v=0 v= (protocol version number, currently only 0)

o=- 2 0 IN IP4 192.168.110.178 (originator and session identifier : username, id, version number, network address)

s=WardBeck 32ME s= (session name : mandatory with at least one UTF-8-encoded character)

t=0 0 t= (time the session is active)

a=clock-domain:PTPv2 0 a=* (attribute Clock version and domain)

m=audio 50000 RTP/AVP 98 m= (media name and transport port and IP address / RTP profile 98)

c=IN IP4 239.30.178.1/100 c=* (connection information/TTL)

a=rtpmap:98 L24/48000/8 a=* (attribute RTP profile / Bit Rate / Sample Rate / Channels)

a=framecount:48 a=* (attribute)

a=sync-time:0 a=* (attribute required by ST2110-30)

a=ptime:1 a=* (attribute: Packet Time)

a=ts-refclk:ptp=IEEE1588-2008:EC-46-70-FF-FE-00-8F-C8:0 a=* (attribute)

a=mediack:direct=0 a=* (attribute)



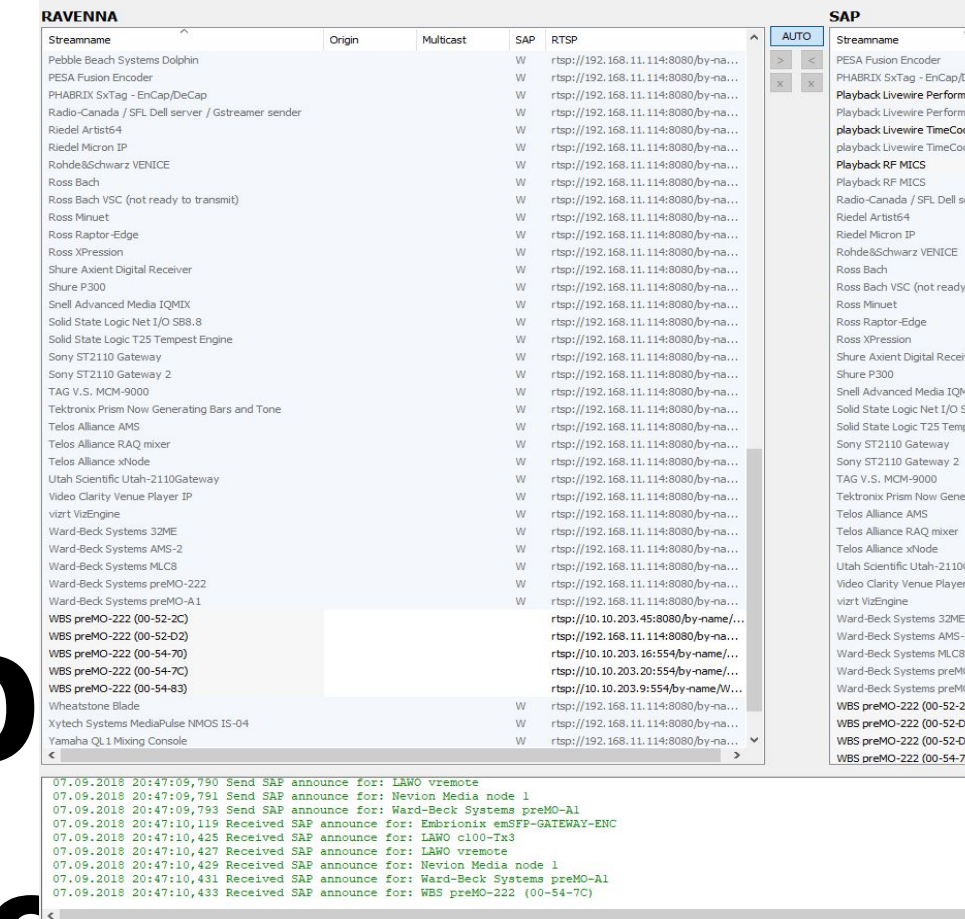
Extended SDP

a=OCA:1000:1.1.3:OcaBlock:0:1:BLK_Library=Library
a=OCA:1001::OcaLibrary:0:1e6:Application= 222
a=OCA:1002::OcaLibrary:0:1e6:Preset= 57575
a=OCA:1003::OcaLibrary:0:1e6:Microphone=23452345

a=OCA:10000:1.1.3:OcaBlock:0:5:preAMP 1=Kick Drum
a=OCA:10001:1.1.1.4:OcaSwitch:0:1:Phantom=1
a=OCA:10002:1.1.1.4:OcaSwitch:0:1:Phase_Invert=0
a=OCA:10003:1.1.1.4:OcaSwitch:0:1:Input(MIC/LINE)=0
a=OCA:10005:1.1.1.5:OcaGain:0:63:Pre Amp Gain=45
a=OCA:10100:1.1.3:OcaBlock:0:3:DSP Input 1=2
a=OCA:10101:1.1.1.4:OcaSwitch:0:1:HPF Enable=1

SDP: Commo Language

a=OCA:1000=Library
a=OCA:1001= 222
a=OCA:1002=57575
a=OCA:1003= 23452345



RAVENNA

Streamname	Origin	Multicast	SAP	RTSP
Pebble Beach Systems Dolphin			W	rtsp://192.168.11.114:8080/by-na...
PESA Fusion Encoder			W	rtsp://192.168.11.114:8080/by-na...
PHABRIX SxTag - EnCap/DeCap			W	rtsp://192.168.11.114:8080/by-na...
Radio-Canada / SFL Dell server / Gstreamer sender			W	rtsp://192.168.11.114:8080/by-na...
Riedel Artist64			W	rtsp://192.168.11.114:8080/by-na...
Riedel Micron IP			W	rtsp://192.168.11.114:8080/by-na...
Rohde&Schwarz VENICE			W	rtsp://192.168.11.114:8080/by-na...
Ross Bach			W	rtsp://192.168.11.114:8080/by-na...
Ross Bach VSC (not ready to transmit)			W	rtsp://192.168.11.114:8080/by-na...
Ross Minuet			W	rtsp://192.168.11.114:8080/by-na...
Ross Raptor-Edge			W	rtsp://192.168.11.114:8080/by-na...
Ross XPression			W	rtsp://192.168.11.114:8080/by-na...
Shure Axient Digital Receiver			W	rtsp://192.168.11.114:8080/by-na...
Shure P300			W	rtsp://192.168.11.114:8080/by-na...
Snell Advanced Media IQMIX			W	rtsp://192.168.11.114:8080/by-na...
Solid State Logic Net I/O SB8.8			W	rtsp://192.168.11.114:8080/by-na...
Solid State Logic T25 Tempest Engine			W	rtsp://192.168.11.114:8080/by-na...
Sony ST2110 Gateway			W	rtsp://192.168.11.114:8080/by-na...
Sony ST2110 Gateway 2			W	rtsp://192.168.11.114:8080/by-na...
TAG V.S. MCM-9000			W	rtsp://192.168.11.114:8080/by-na...
Tektronix Prism Now Generating Bars and Tone			W	rtsp://192.168.11.114:8080/by-na...
Telos Alliance AMS			W	rtsp://192.168.11.114:8080/by-na...
Telos Alliance RAQ mixer			W	rtsp://192.168.11.114:8080/by-na...
Telos Alliance xNode			W	rtsp://192.168.11.114:8080/by-na...
Utah Scientific Utah-2110Gateway			W	rtsp://192.168.11.114:8080/by-na...
Video Clarity Venue Player IP			W	rtsp://192.168.11.114:8080/by-na...
vizrt VizEngine			W	rtsp://192.168.11.114:8080/by-na...
Ward-Beck Systems 32ME			W	rtsp://192.168.11.114:8080/by-na...
Ward-Beck Systems AMS-2			W	rtsp://192.168.11.114:8080/by-na...
Ward-Beck Systems MLC8			W	rtsp://192.168.11.114:8080/by-na...
Ward-Beck Systems preMO-222			W	rtsp://192.168.11.114:8080/by-na...
Ward-Beck Systems preMO-A1			W	rtsp://192.168.11.114:8080/by-na...
WBS preMO-222 (00-52-2C)				rtsp://10.10.203.45:8080/by-name/...
WBS preMO-222 (00-52-D2)				rtsp://192.168.11.114:8080/by-na...
WBS preMO-222 (00-54-70)				rtsp://10.10.203.16:554/by-name/...
WBS preMO-222 (00-54-7C)				rtsp://10.10.203.20:554/by-name/...
WBS preMO-222 (00-54-83)				rtsp://10.10.203.9:554/by-name/W...
Wheatstone Blade			W	rtsp://192.168.11.114:8080/by-na...
Xytech Systems MediaPulse NMOS IS-04			W	rtsp://192.168.11.114:8080/by-na...
Yamaha QL1 Mixing Console			W	rtsp://192.168.11.114:8080/by-na...

SAP

Streamname	Origin	Multicast	RAV
PESA Fusion Encoder	192.168.17	239.31.176.1/1	
PHABRIX SxTag - EnCap/DeCap	192.168.21...	239.31.184.1/1	
Playback Livewire Performance	10.10.203.6	239.2.203.6/1	
Playback Livewire Performance	10.10.203.6	239.2.203.6/1	W
playback Livewire TimeCode	10.10.203.6	239.1.203.6/1	
playback Livewire TimeCode	10.10.203.6	239.1.203.6/1	W
Playback RF MICS	10.10.203.6	239.3.203.6/1	
Playback RF MICS	10.10.203.6	239.3.203.6/1	W
Radio-Canada / SFL Dell server / Gstreamer sender	192.168.21...	239.31.201.1/1	
Riedel Artist64	192.168.62	239.32.35.1/1	
Riedel Micron IP	192.168.9.32	239.32.32.1/1	
Rohde&Schwarz VENICE	192.168.9.50	239.32.50.1/1	
Ross Bach	192.168.62	239.32.56.1/1	
Ross Bach VSC (not ready to transmit)	192.168.62	239.32.60.1/1	
Ross Minuet	192.168.62	239.32.58.1/1	
Ross Raptor-Edge	192.168.9.61	239.32.61.1/1	
Ross XPression	192.168.9.65	239.32.65.1/1	
Shure Axient Digital Receiver	192.168.62	239.32.83.1/1	
Shure P300	192.168.62	239.32.85.1/1	
Snell Advanced Media IQMIX	192.168.9.88	239.32.88.1/1	
Solid State Logic Net I/O SB8.8	192.168.62	239.32.96.1/1	
Solid State Logic T25 Tempest Engine	192.168.62	239.32.97.1/1	
Sony ST2110 Gateway	192.168.9.	239.32.104.1/1	
Sony ST2110 Gateway 2	192.168.9.	239.32.104.2/1	
TAG V.S. MCM-9000	192.168.22...	239.32.112.1/1	
Tektronix Prism Now Generating Bars and Tone	192.168.9.	239.32.123.2/1	
Telos Alliance AMS	192.168.62...	239.32.131.1/1	
Telos Alliance RAQ mixer	192.168.62...	239.32.129.1/1	
Telos Alliance xNode	192.168.62...	239.32.128.1/1	
Utah Scientific Utah-2110Gateway	192.168.22...	239.32.136.1/1	
Video Clarity Venue Player IP	192.168.30	239.32.144.1/1	
vizrt VizEngine	192.168.9.	239.32.152.1/1	
Ward-Beck Systems 32ME	192.168.30...	239.32.160.1/1	
Ward-Beck Systems AMS-2	192.168.30...	239.32.185.1/1	
Ward-Beck Systems MLC8	192.168.30...	239.32.186.1/1	
Ward-Beck Systems preMO-222	192.168.30...	239.32.187.1/1	
Ward-Beck Systems preMO-A1	192.168.30...	239.32.188.1/1	
WBS preMO-222 (00-52-2C)	192.168.11...	239.1.11.136/1	
WBS preMO-222 (00-52-D2)	10.10.203.21	239.1.203.21/1	
WBS preMO-222 (00-52-D2)	10.10.203.21	239.1.203.21/1	
WBS preMO-222 (00-54-70)	10.10.203.16	239.1.203.16/1	

LOC.

Streamname	Multicast	Source	RAV	SAP
Nevion Media node 3	239.31.134.1/1	SDP	A	A
NewTek NC1 ip IO	239.31.136.1/1	SDP	A	A
Nextera Video Gateway Codec	239.31.144.1/1	SDP	A	A
PacketStorm AA and AV alignment test	239.31.152.1/1	SDP	A	A
PacketStorm ST 2022-7	239.31.153.1/1	SDP	A	A
Pebble Beach Systems Dolphin	239.31.168.1/1	SDP	A	A
PESA Fusion Encoder	239.31.176.1/1	SDP	A	A
PHABRIX SxTag - EnCap/DeCap	239.31.184.1/1	SDP	A	A
Radio-Canada / SFL Dell server / Gstreamer sender	239.31.201.1/1	SDP	A	A
Riedel Artist64	239.32.35.1/1	SDP	A	A
Riedel Micron IP	239.32.32.1/1	SDP	A	A
Riedel Micron IP	239.32.33.1/1	SDP		
Rohde&Schwarz VENICE	239.32.50.1/1	SDP	A	A
Ross Bach	239.32.56.1/1	SDP	A	A
Ross Bach VSC (not ready to transmit)	239.32.60.1/1	SDP	A	A
Ross Minuet	239.32.58.1/1	SDP	A	A
Ross Raptor-Edge	239.32.61.1/1	SDP	A	A
Ross XPression	239.32.65.1/1	SDP	A	A
Shure Axient Digital Receiver	239.32.83.1/1	SDP	A	A
Shure P300	239.32.85.1/1	SDP	A	A
Snell Advanced Media IQMIX	239.32.88.1/1	SDP	A	A
Solid State Logic Net I/O SB8.8	239.32.96.1/1	SDP	A	A
Solid State Logic T25 Tempest Engine	239.32.97.1/1	SDP	A	A
Sony ST2110 Gateway	239.32.104.1/1	SDP	A	A
Sony ST2110 Gateway 2	239.32.104.2/1	SDP	A	A
TAG V.S. MCM-9000	239.32.112.1/1	SDP	A	A
Tektronix Prism Now Generating Bars and Tone	239.32.123.2/1	SDP	A	A
Tektronix Prism Now Generating Bars and Tone	239.32.124.2/1	SDP		
Telos Alliance AMS	239.32.131.1/1	SDP	A	A
Telos Alliance RAQ mixer	239.32.129.1/1	SDP	A	A
Telos Alliance xNode	239.32.128.1/1	SDP	A	A
Utah Scientific Utah-2110Gateway	239.32.136.1/1	SDP	A	A
Video Clarity Venue Player IP	239.32.144.1/1	SDP	A	A
vizrt VizEngine	239.32.152.1/1	SDP	A	A
Ward-Beck Systems 32ME	239.32.160.1/1	SDP	A	A
Ward-Beck Systems AMS-2	239.32.185.1/1	SDP	A	A
Ward-Beck Systems MLC8	239.32.186.1/1	SDP	A	A
Ward-Beck Systems preMO-222	239.32.187.1/1	SDP	A	A
Ward-Beck Systems preMO-A1	239.32.188.1/1	SDP	A	A
Wheatstone Blade	239.32.176.5	SDP	A	A

```

07.09.2018 20:47:09,790 Send SAP announce for: LAWO vremote
07.09.2018 20:47:09,791 Send SAP announce for: Nevion Media node 1
07.09.2018 20:47:09,793 Send SAP announce for: Ward-Beck Systems preMO-A1
07.09.2018 20:47:10,119 Received SAP announce for: Embrionix emSFP-GATEWAY-ENC
07.09.2018 20:47:10,425 Received SAP announce for: LAWO c100-Tx3
07.09.2018 20:47:10,427 Received SAP announce for: LAWO vremote
07.09.2018 20:47:10,429 Received SAP announce for: Nevion Media node 1
07.09.2018 20:47:10,429 Received SAP announce for: Ward-Beck Systems preMO-A1
07.09.2018 20:47:10,429 Received SAP announce for: WBS preMO-222 (00-54-7C)
    
```



The RAVENNA-2-SAP Converter is freeware developed by ALC NetworkX to help connecting AES67

Physical Location



CITY:Building:Floor:Room:Rack



Model Number

Manufacturer



MAC Address



Geo Positional Location





Image Front + Back




Contact Email
Contact Phone

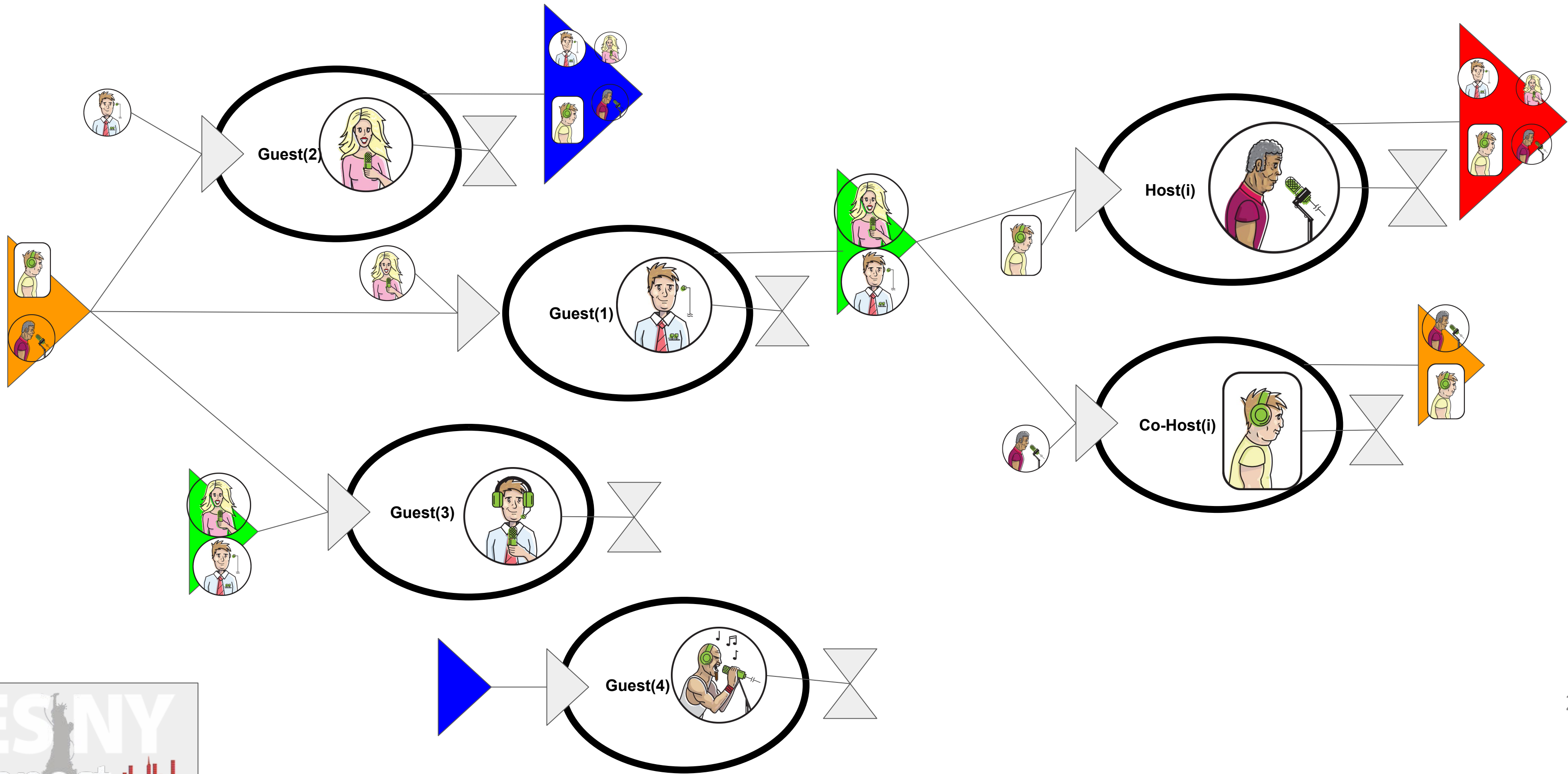
Leaf Switch Name

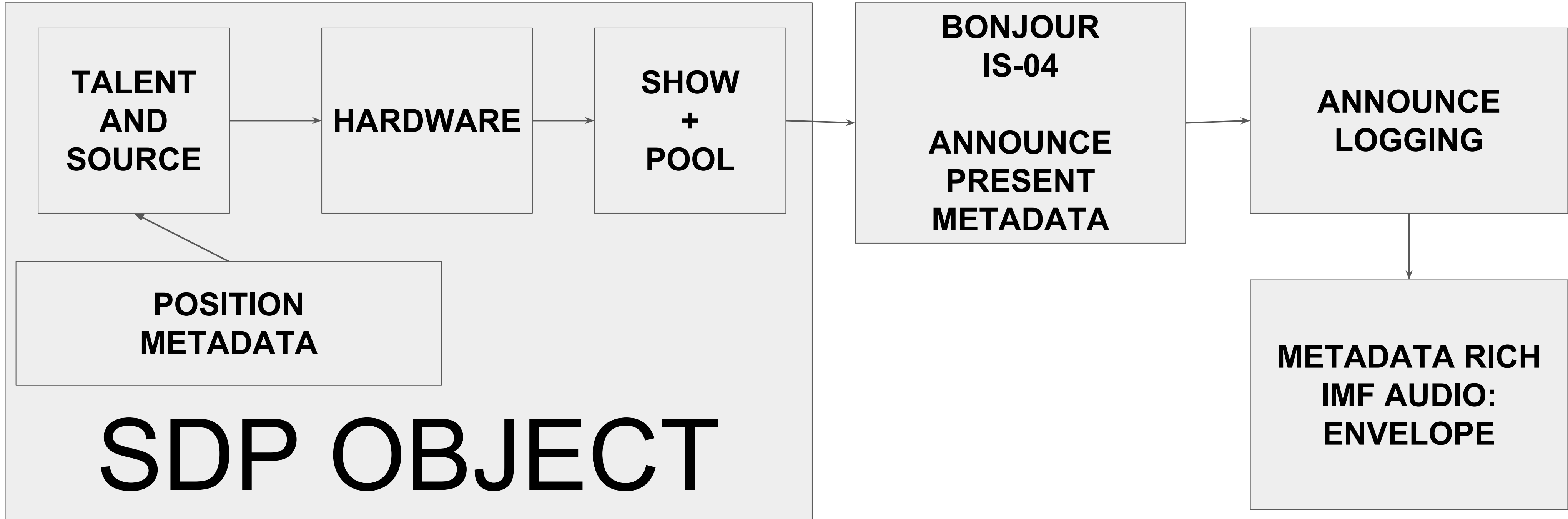


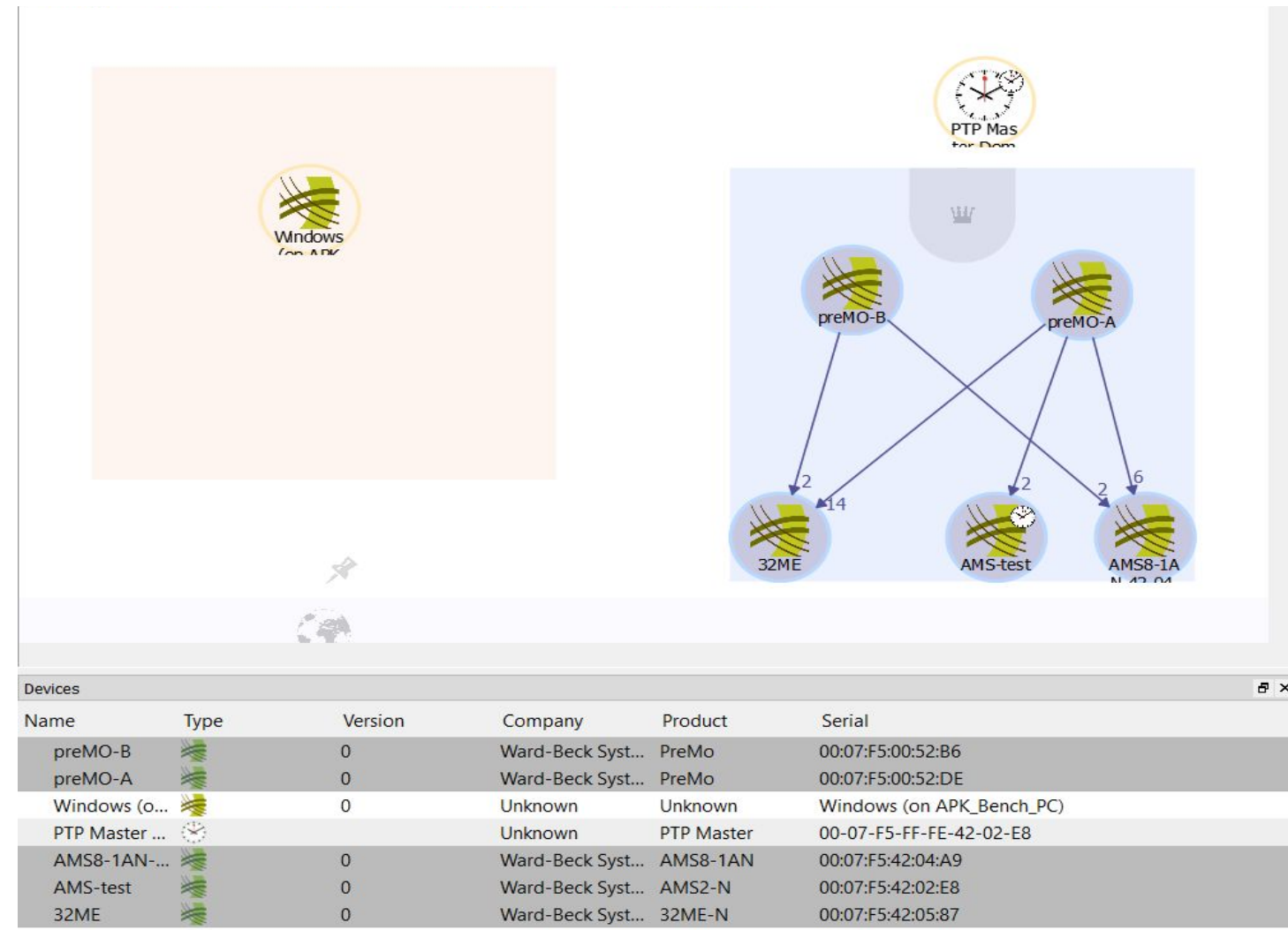
Leaf Switch Port #



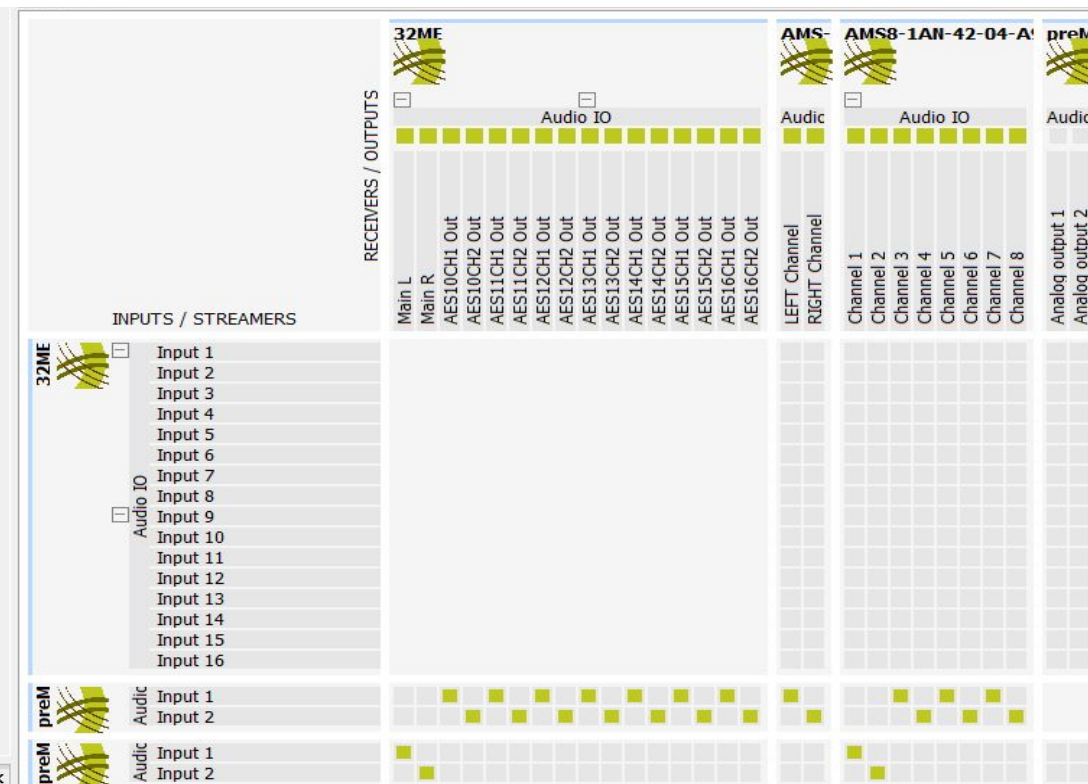






Name	Type	Version	Company	Product	Serial
preMO-B		0	Ward-Beck Syst...	PreMo	00:07:F5:00:52:B6
preMO-A		0	Ward-Beck Syst...	PreMo	00:07:F5:00:52:DE
Windows (O...		0	Unknown	Unknown	Windows (on APK_Bench_PC)
PTP Master ...			Unknown	PTP Master	00-07-F5-FF-FE-42-02-E8
AMS8-1AN-...		0	Ward-Beck Syst...	AMS8-1AN	00:07:F5:42:04:A9
AMS-test		0	Ward-Beck Syst...	AMS2-N	00:07:F5:42:02:E8
32ME		0	Ward-Beck Syst...	32ME-N	00:07:F5:42:05:87



RECEIVERS / OUTPUTS

32ME Audio IO

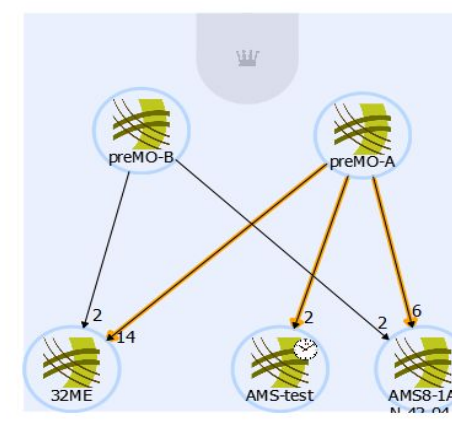
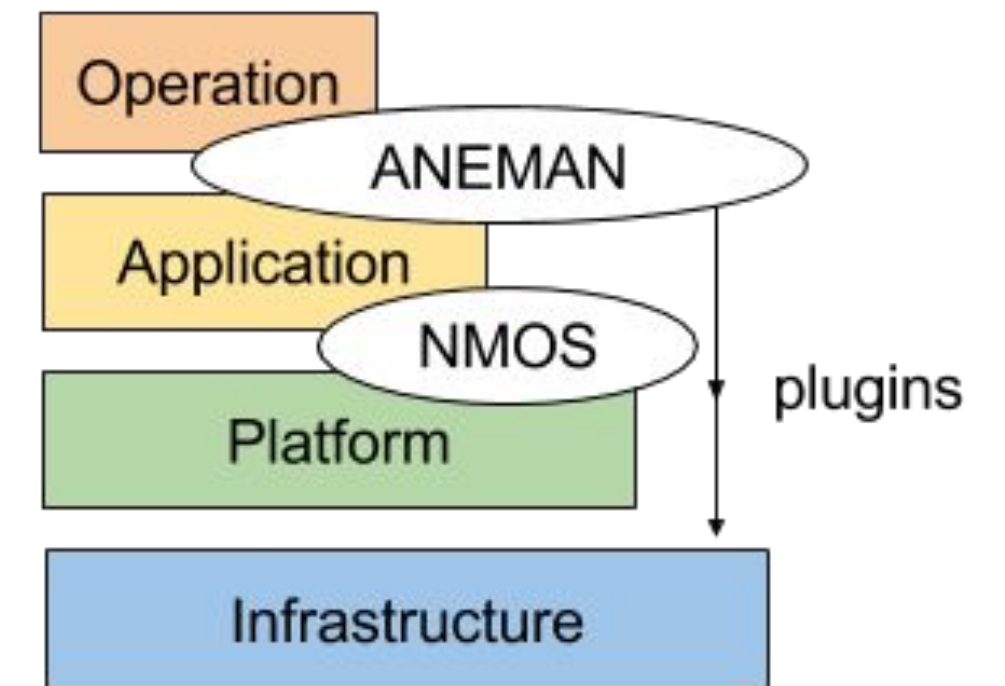
AMS8-1AN-42-04-A Audic

preM Audic

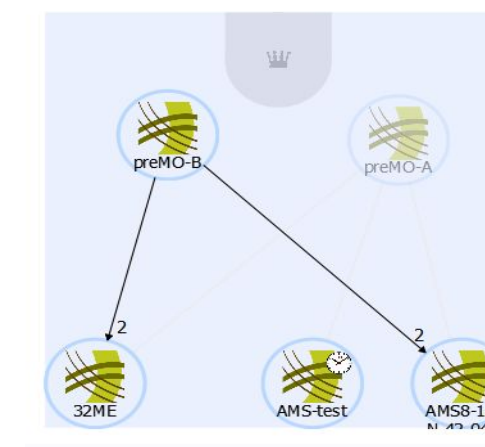
INPUTS / STREAMERS

32ME Input 1-16

preM Audic Input 1-2



Connection Change



Broken Connection

Bell Media Studios

MUCH!



Dejero





The logo for the iHeartRadio Music Awards 18 is centered in the upper portion of the image. It features a red heart with white radio waves emanating from it, positioned to the left of the text. The text "iHeart" is in white, "RADIO" is in a smaller white font, and "MUSIC AWARDS 18" is in a large, bold, white font with a slight shadow effect. The background of the logo is a dark purple and blue gradient with diagonal lines.



The AES NY Connect 2018 logo is located in the bottom left corner. It features the AES logo (a shield with "AUDIO" above and "ES" below) to the left of the text "AES NY" in a large, bold, white font. Below "AES NY" is the word "Connect" in a smaller white font, followed by "2018" in a white font. The background of the logo is white with a faint silhouette of New York City.

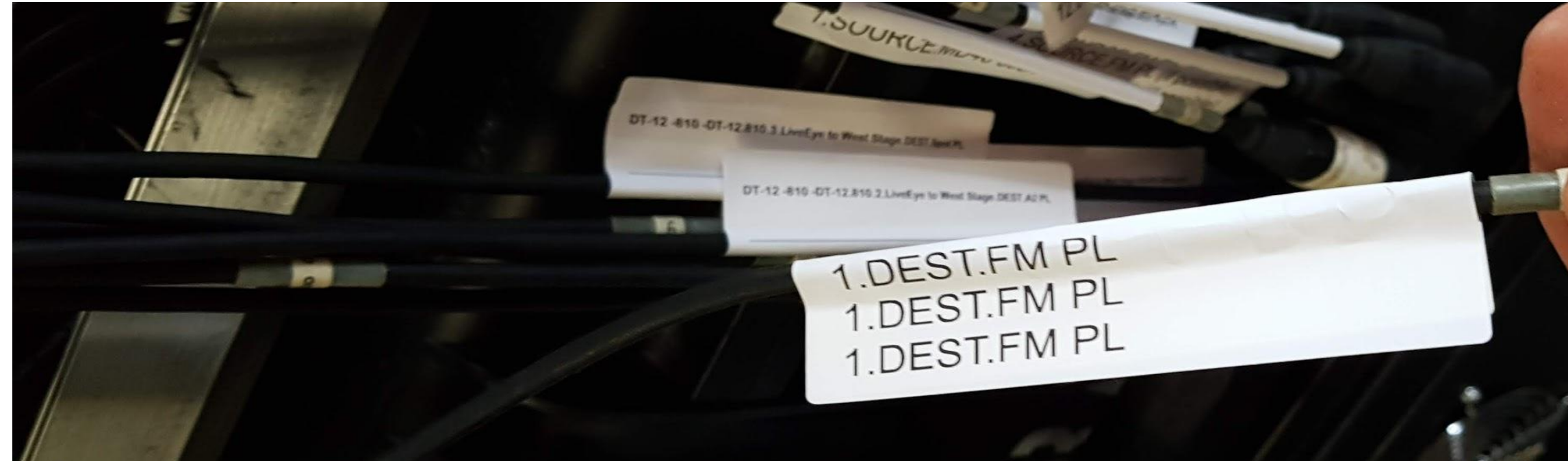
**Host RF
Co-Host RF
VO**

**OB
Ambience
Camera Mic**

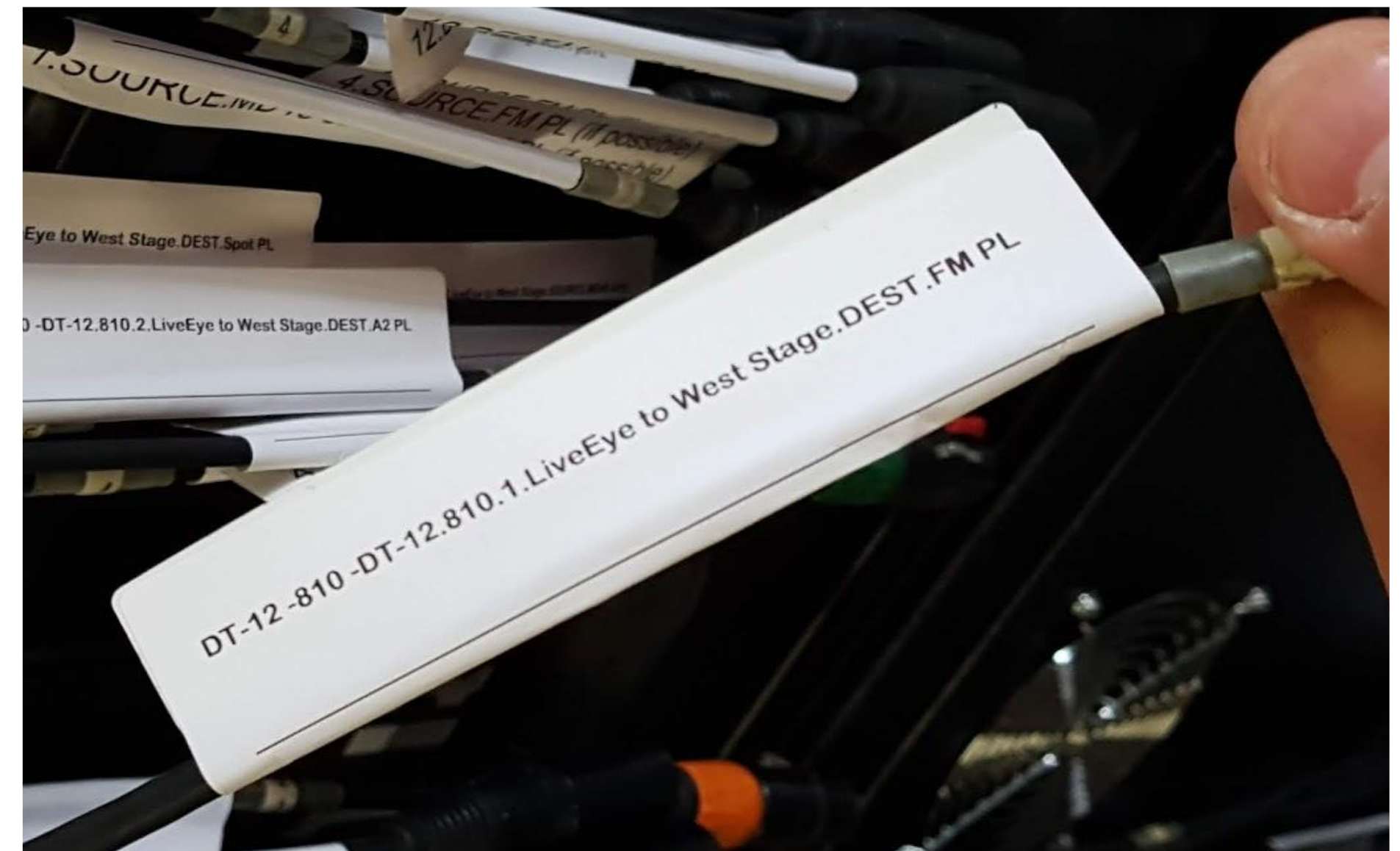
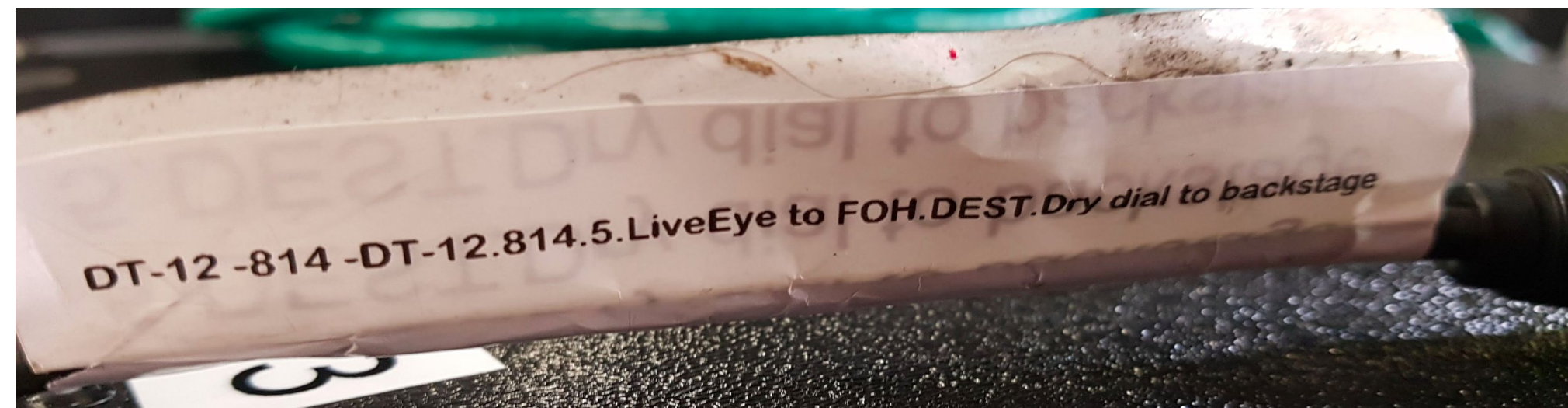
**Transmission
Reception
Record**

**Guests
Backup**

**Production
Sources
Playback
Live Music**



Leveraging The Data



ATSC 3.0

**LIVE
IMMERSIVE
MIXING**



Thinking Small

(3) 24" X 24" X 24"

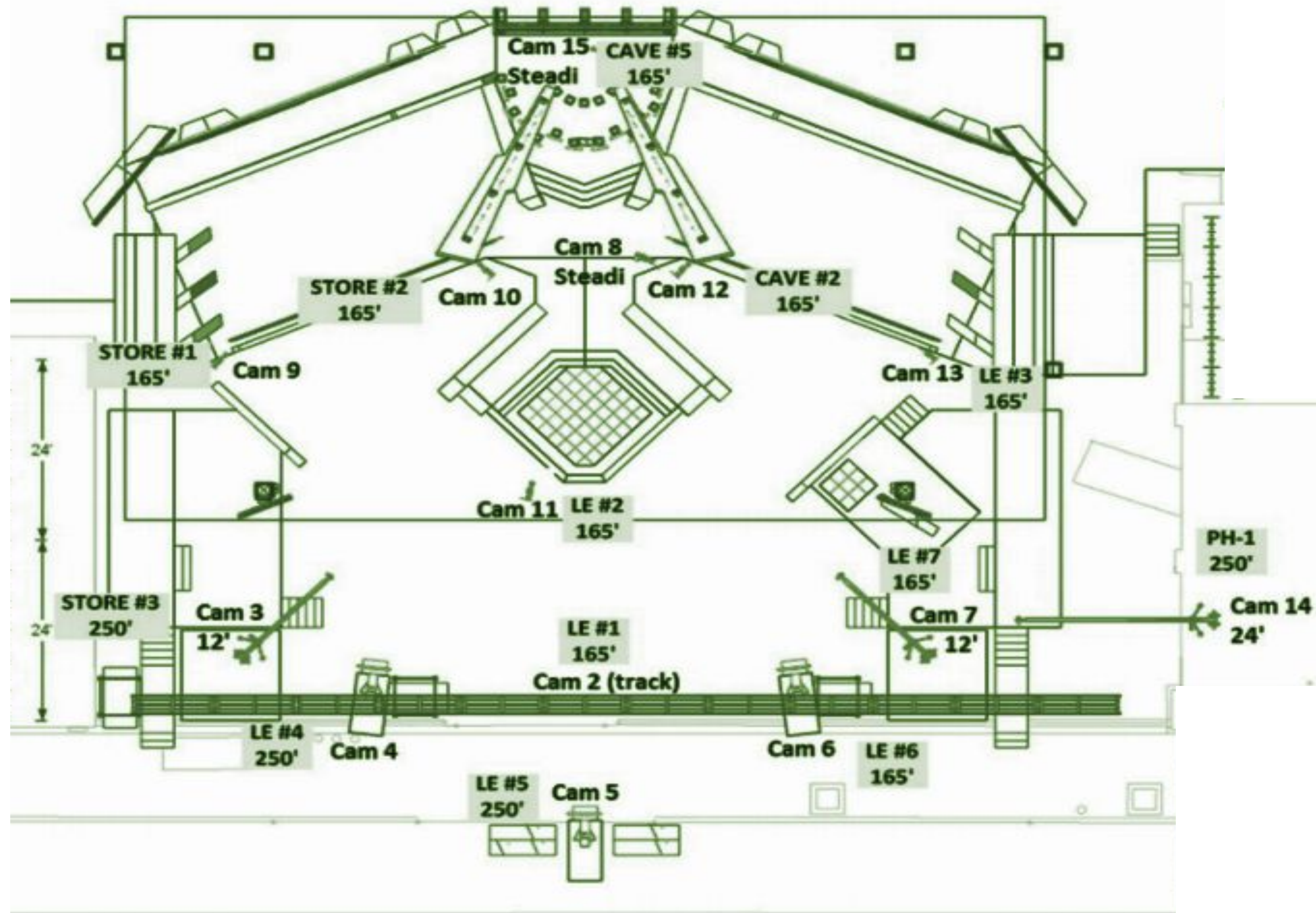
+

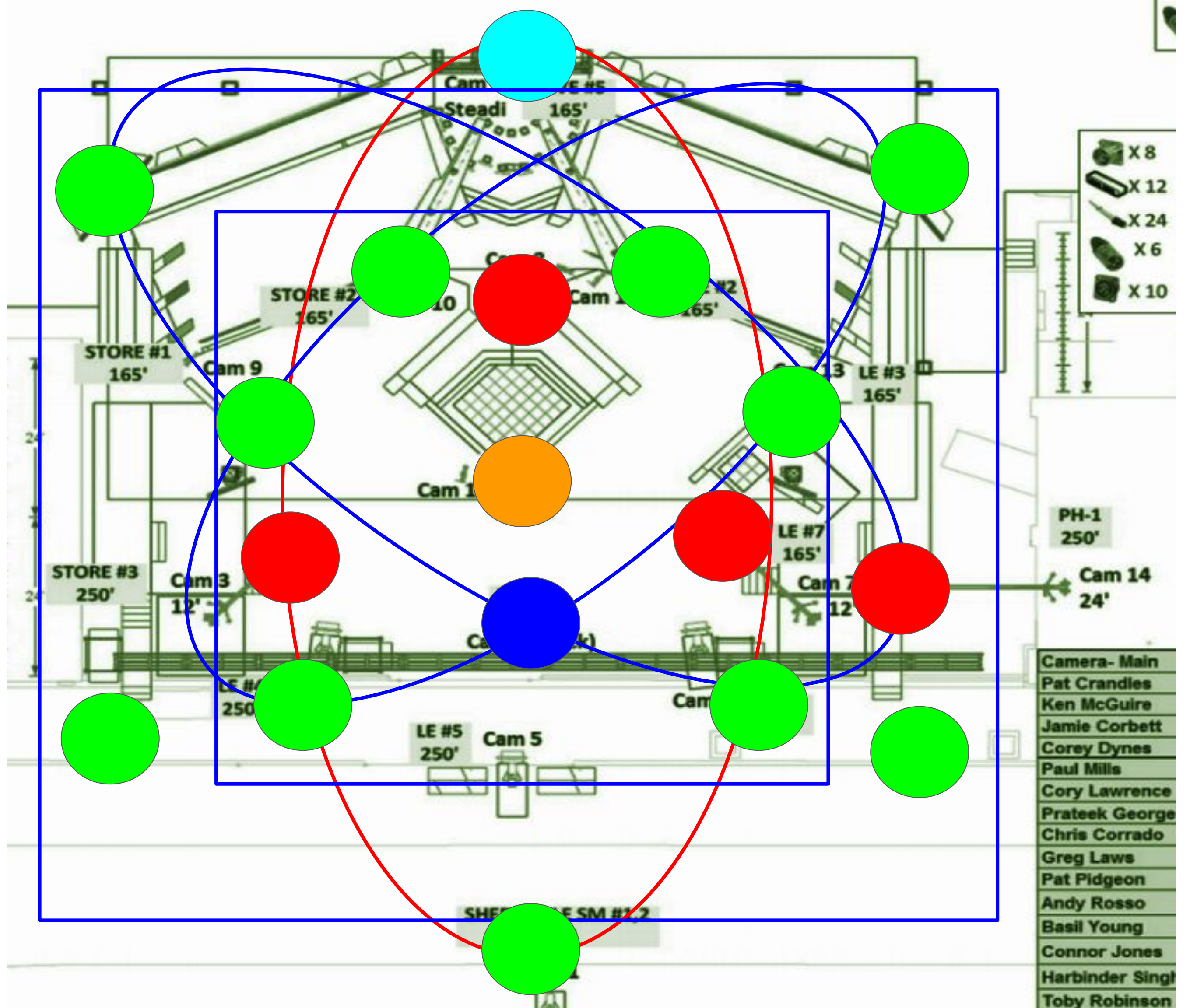
(4) Laptops



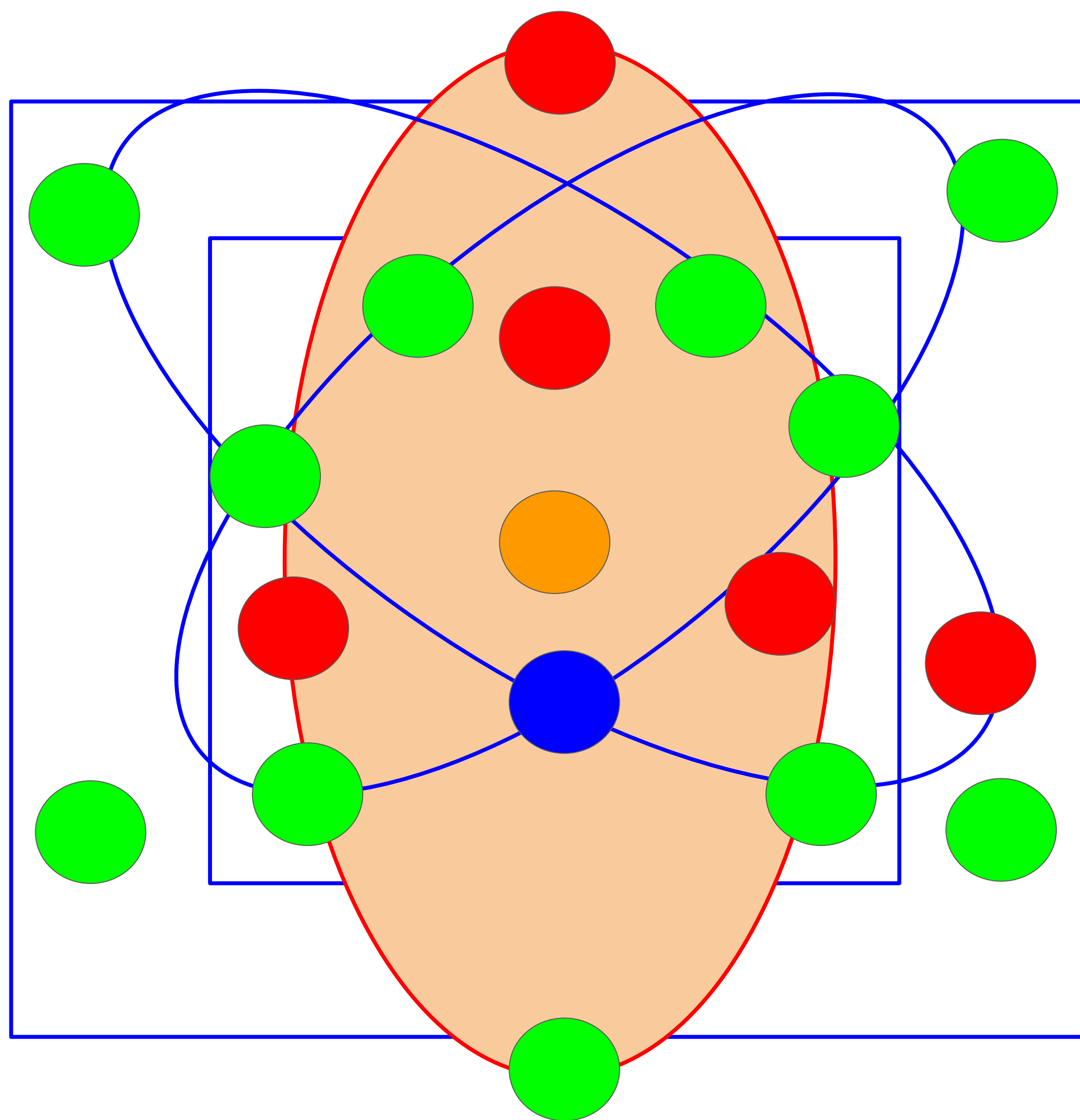
CAM - Locations

- Cam 1 - Super Wide
- Cam 2 - Track
- Cam 3 - East Jib
- Cam 4 - East Wide
- Cam 5 - Mid Center
- Cam 6 - West Wide
- Cam 7 - West Jib
- Cam 8 - Stedi Center
- Cam 9 - West Pit West
- Cam 10 - West Pit East
- Cam 11 - Center pit
- Cam 12 - East pit west
- Cam 13 - East Pit East
- Cam 14 - Roof
- Cam 15 - Back Stage

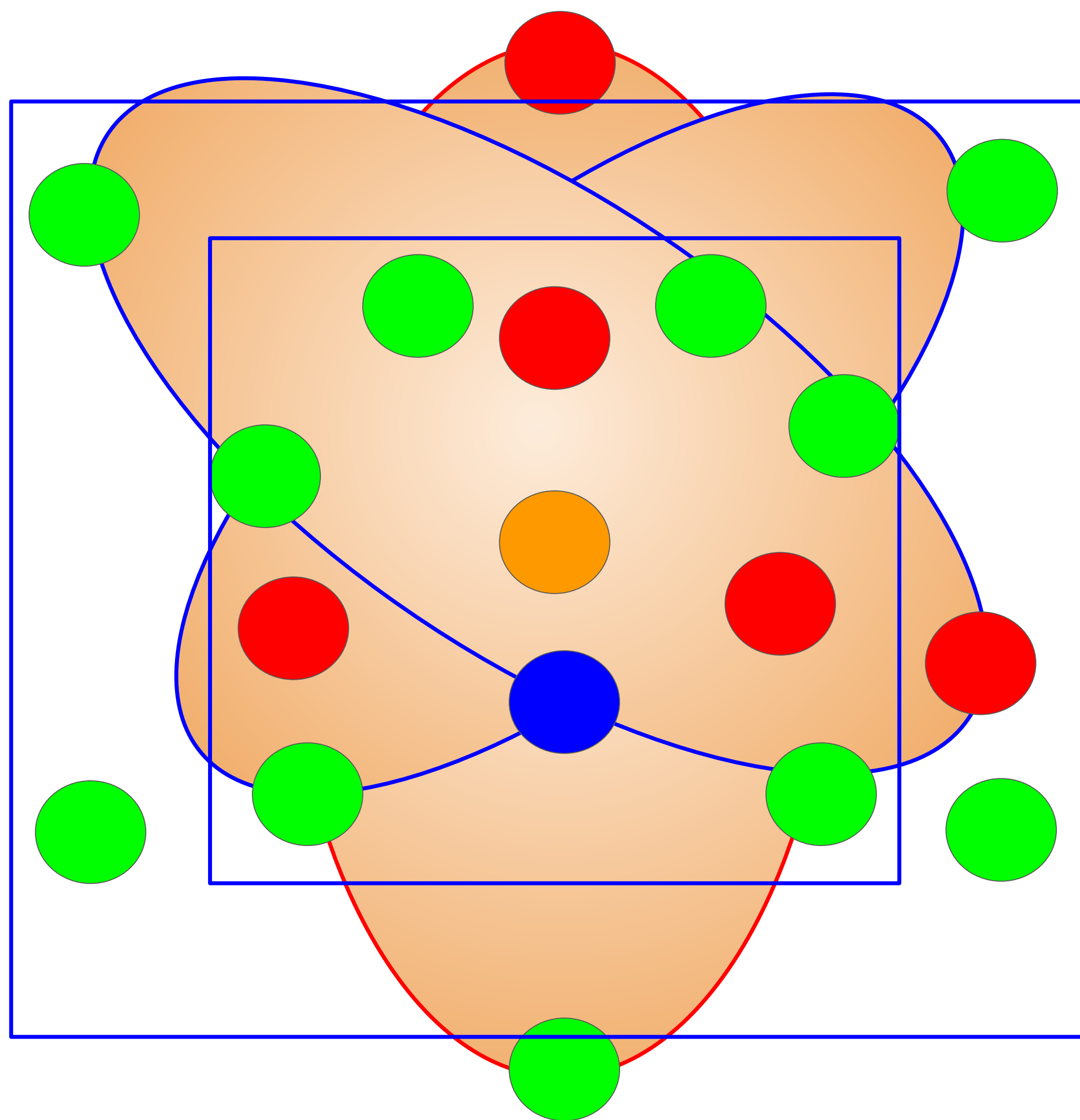




CENTER.POOL

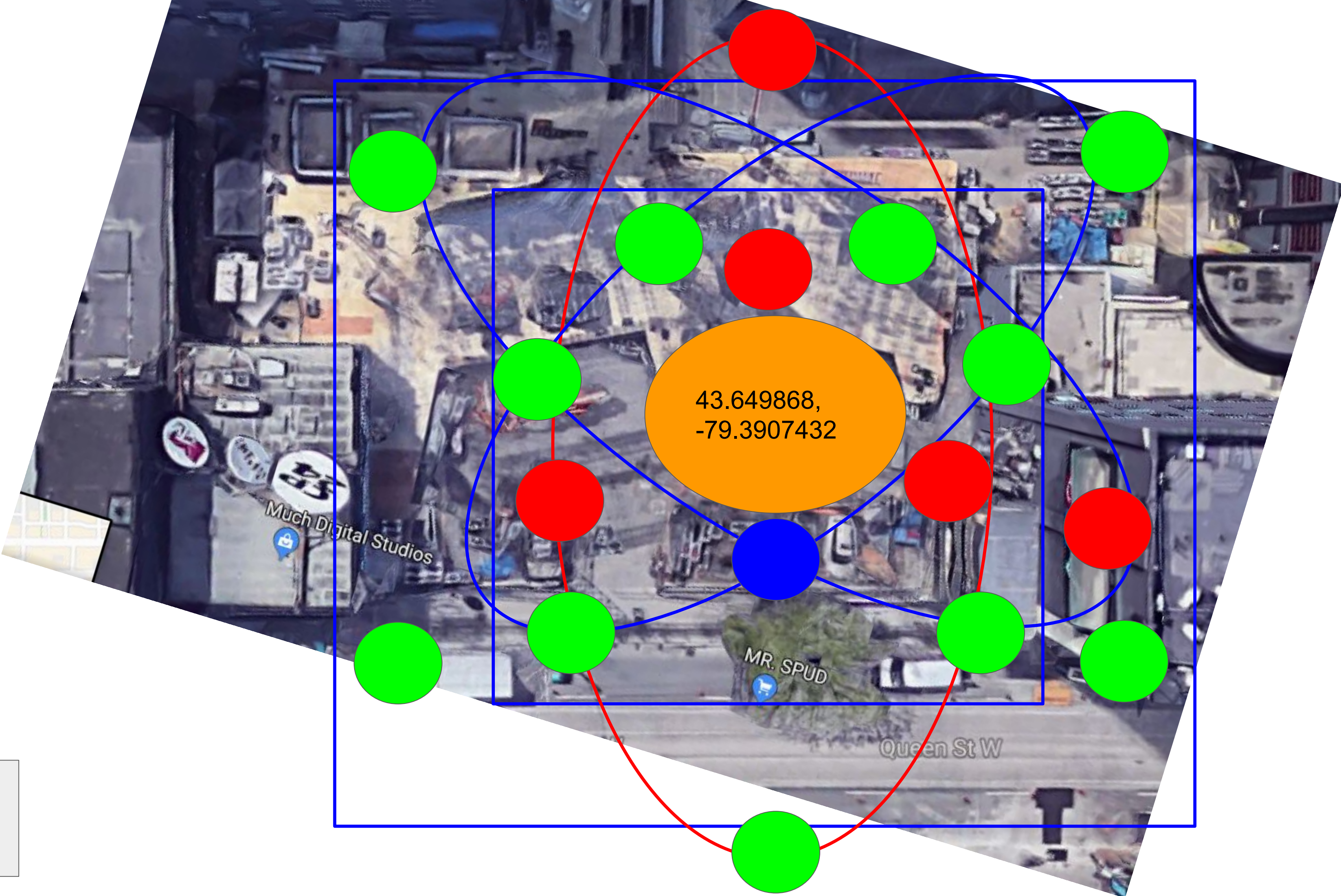


EVENT.POOL

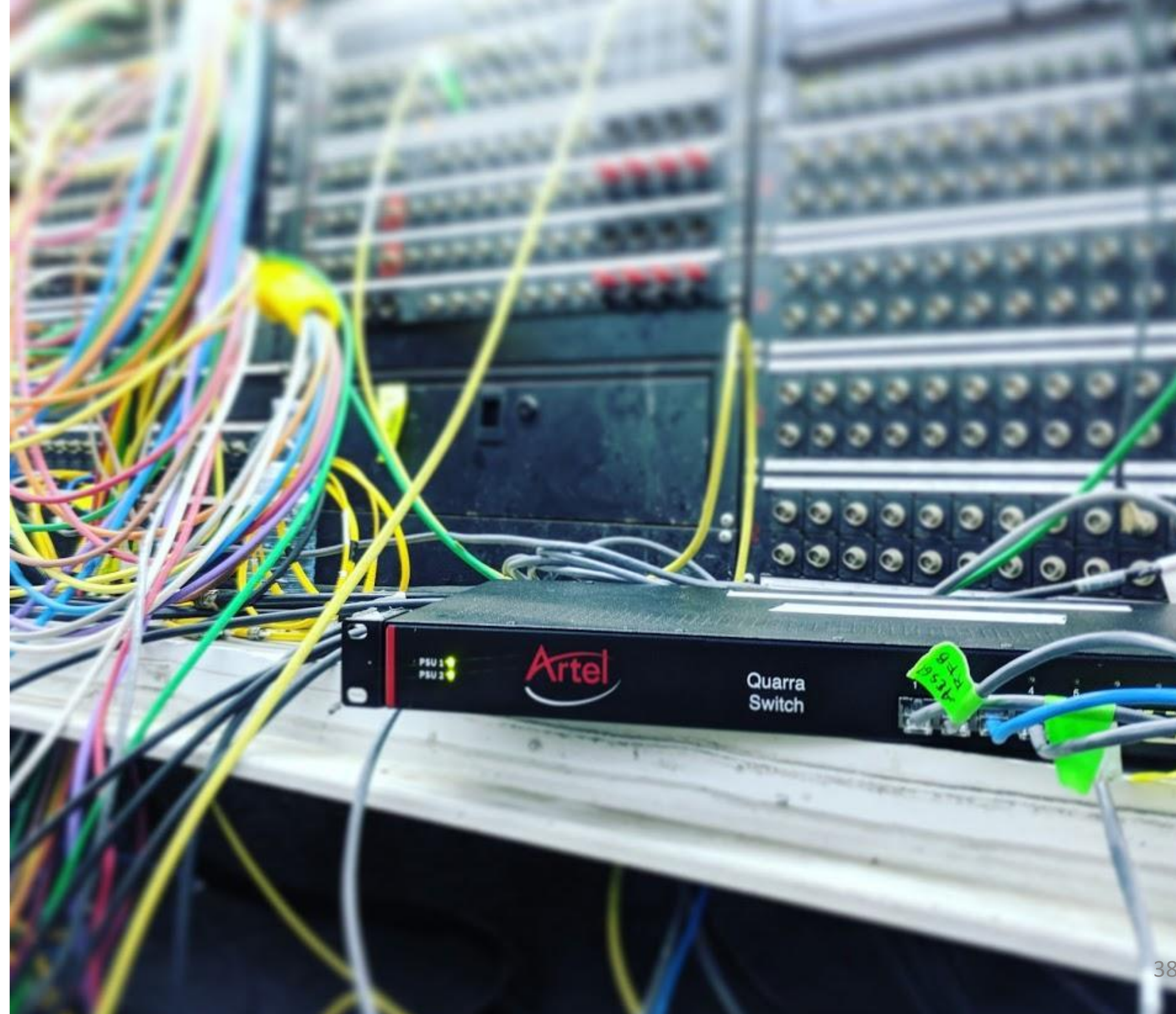


**POSITION
+
BEARING**

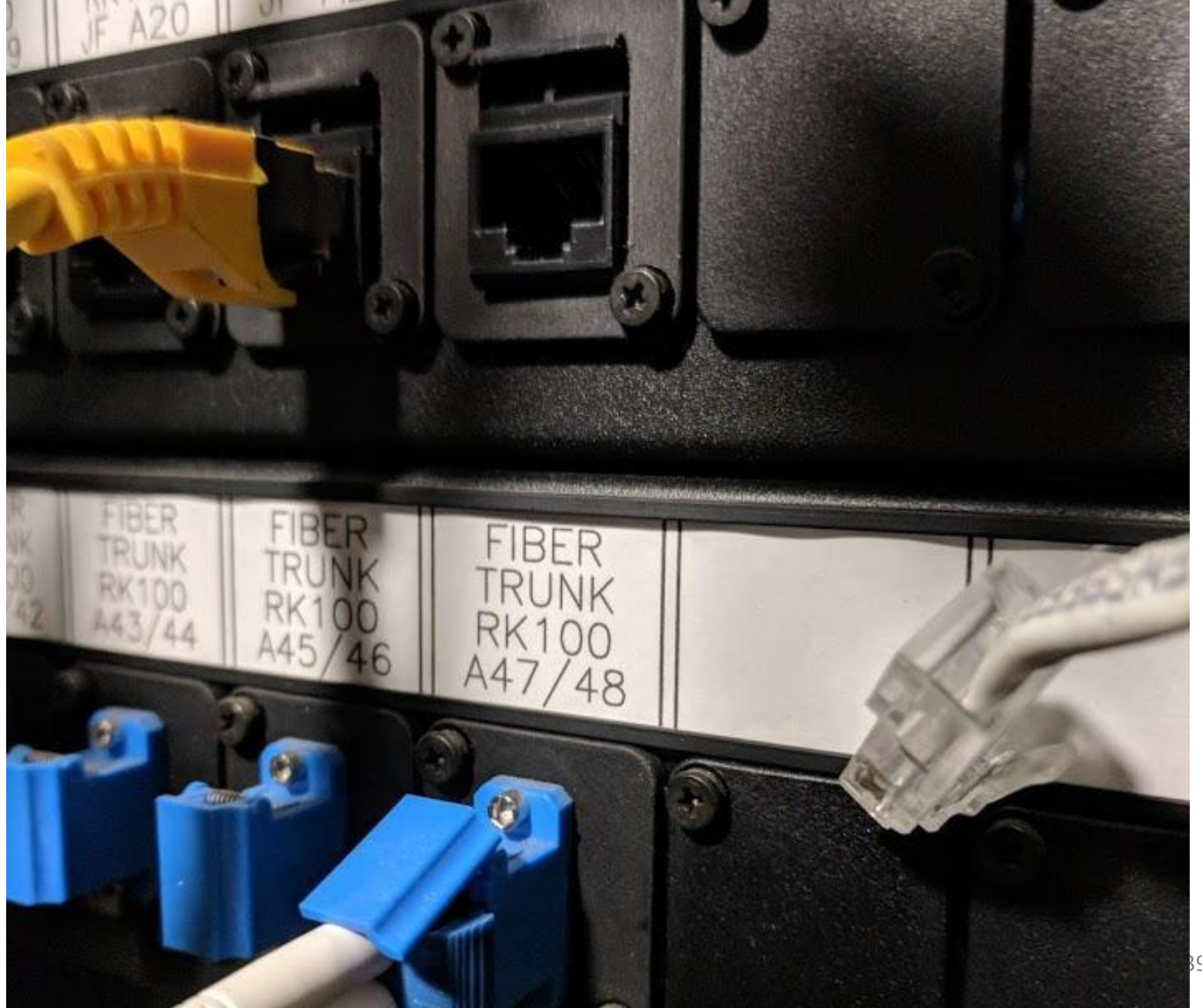
AES70



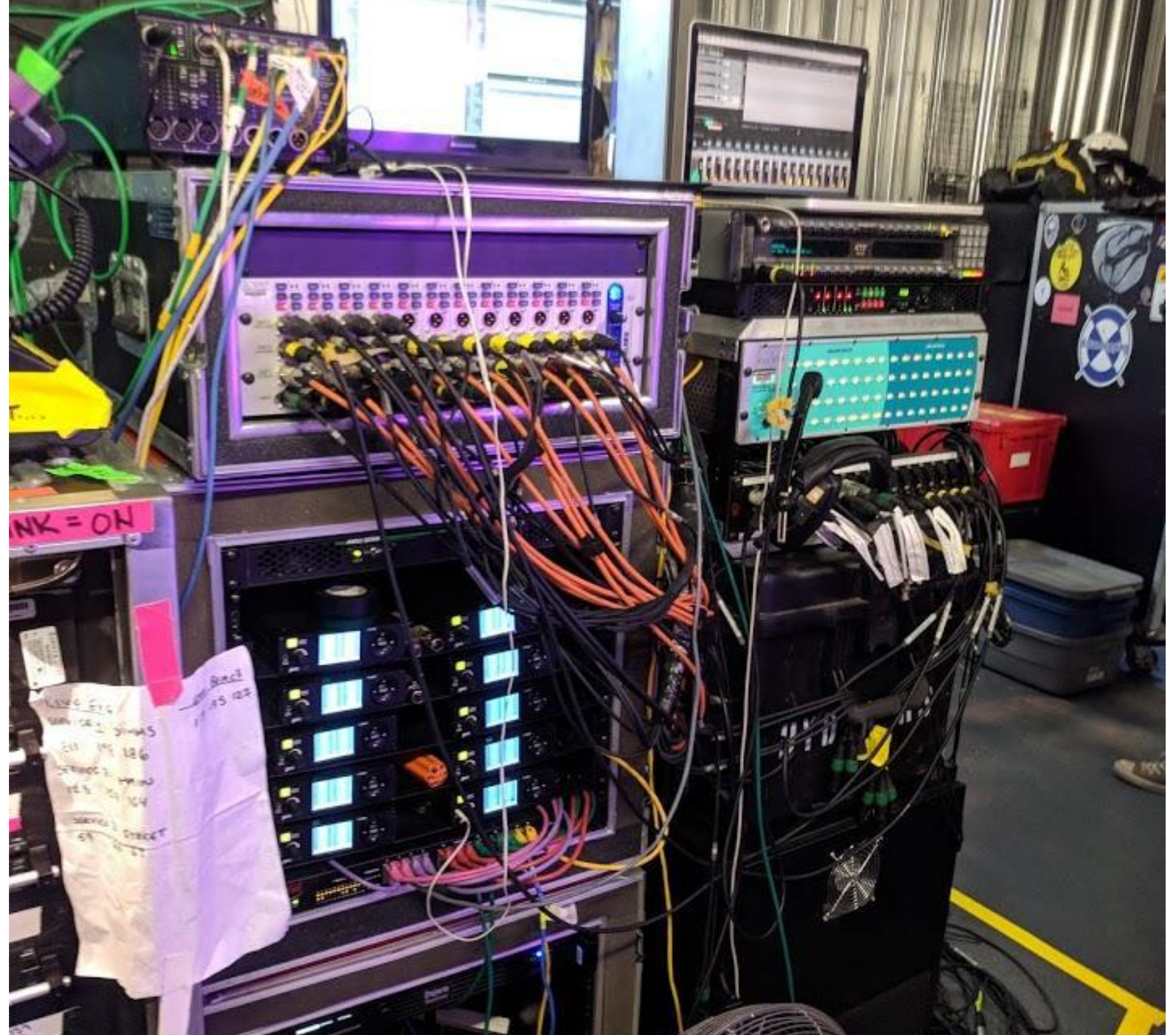
SWITCHING.AUDIO

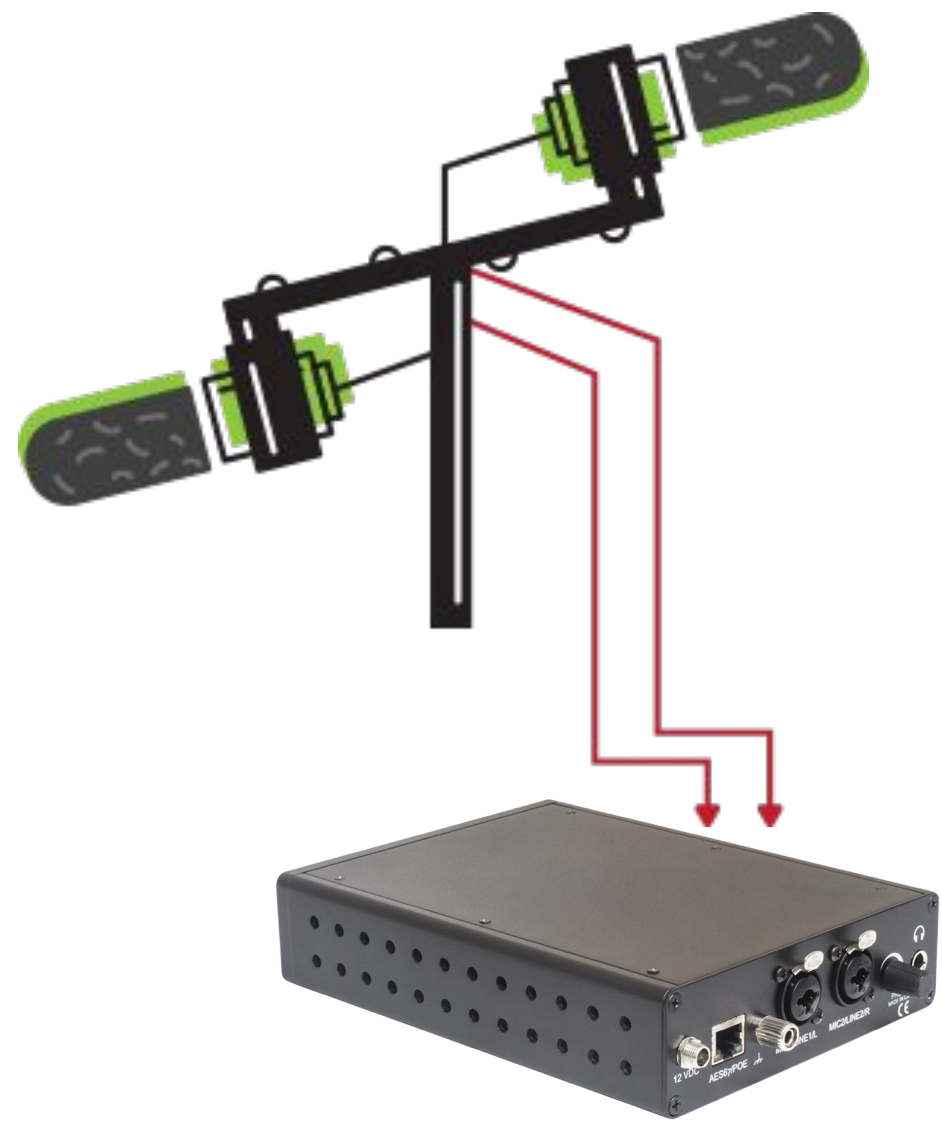


Leveraging Building Infrastructure



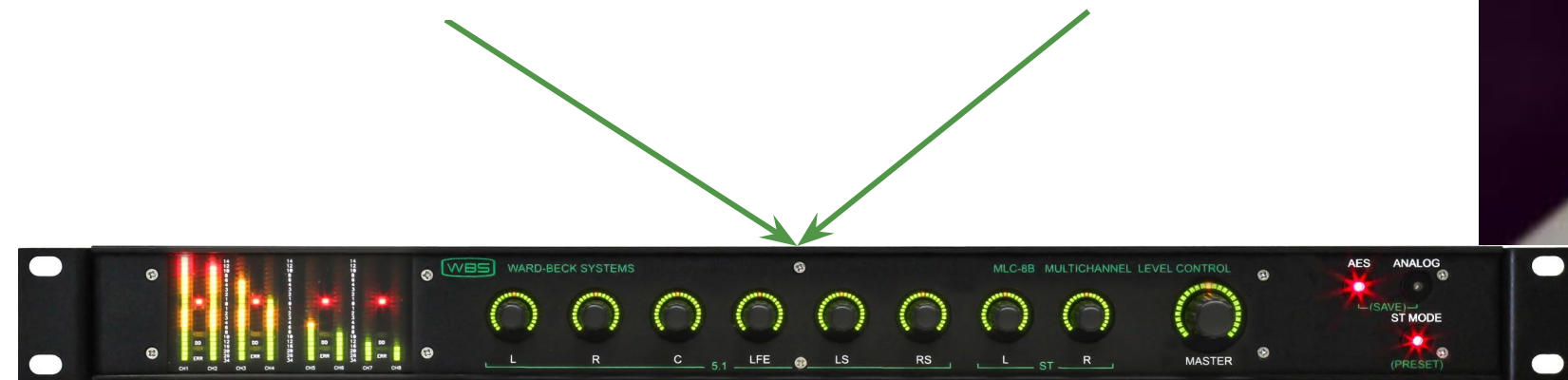
Resilient Execution



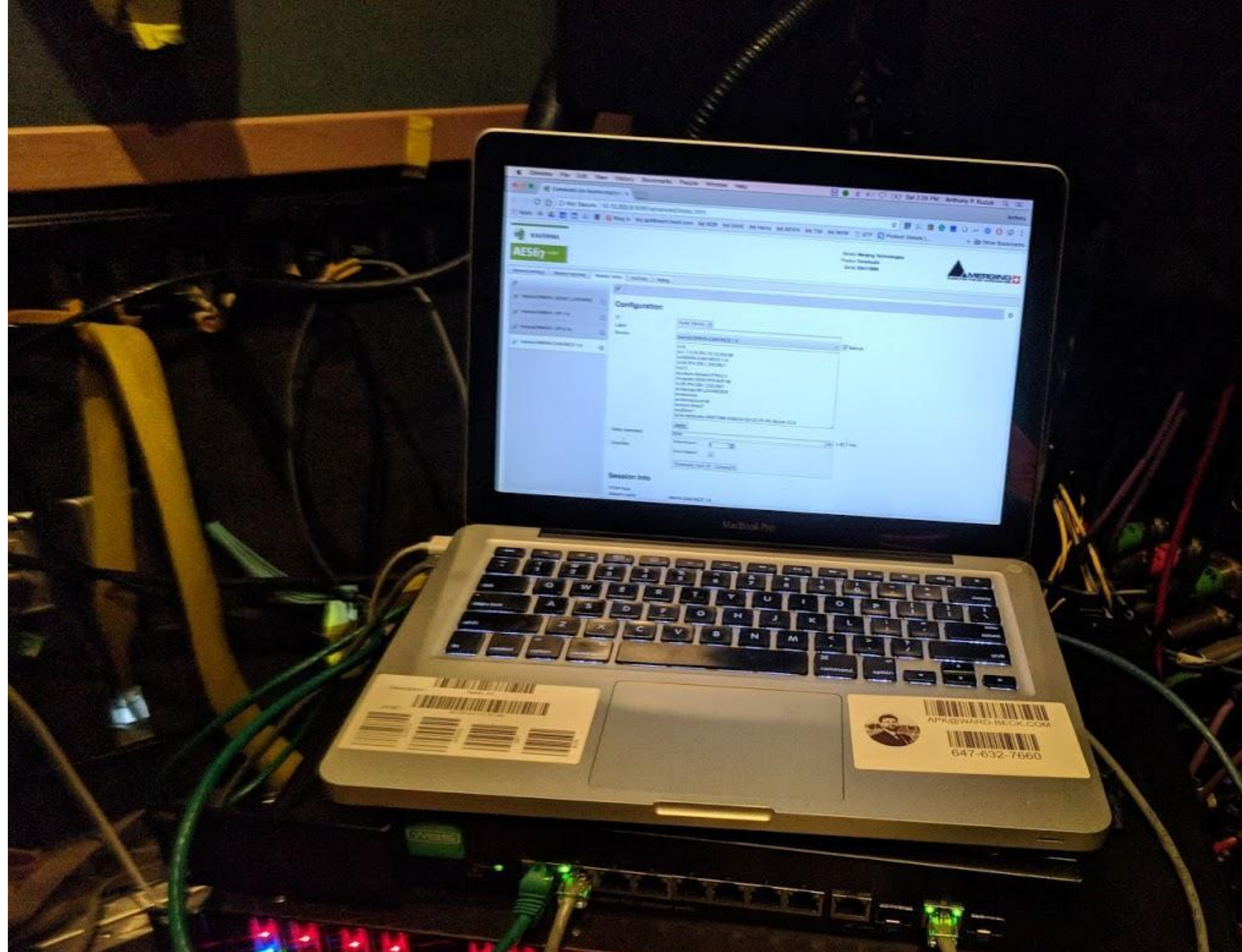


CCU AES OUT

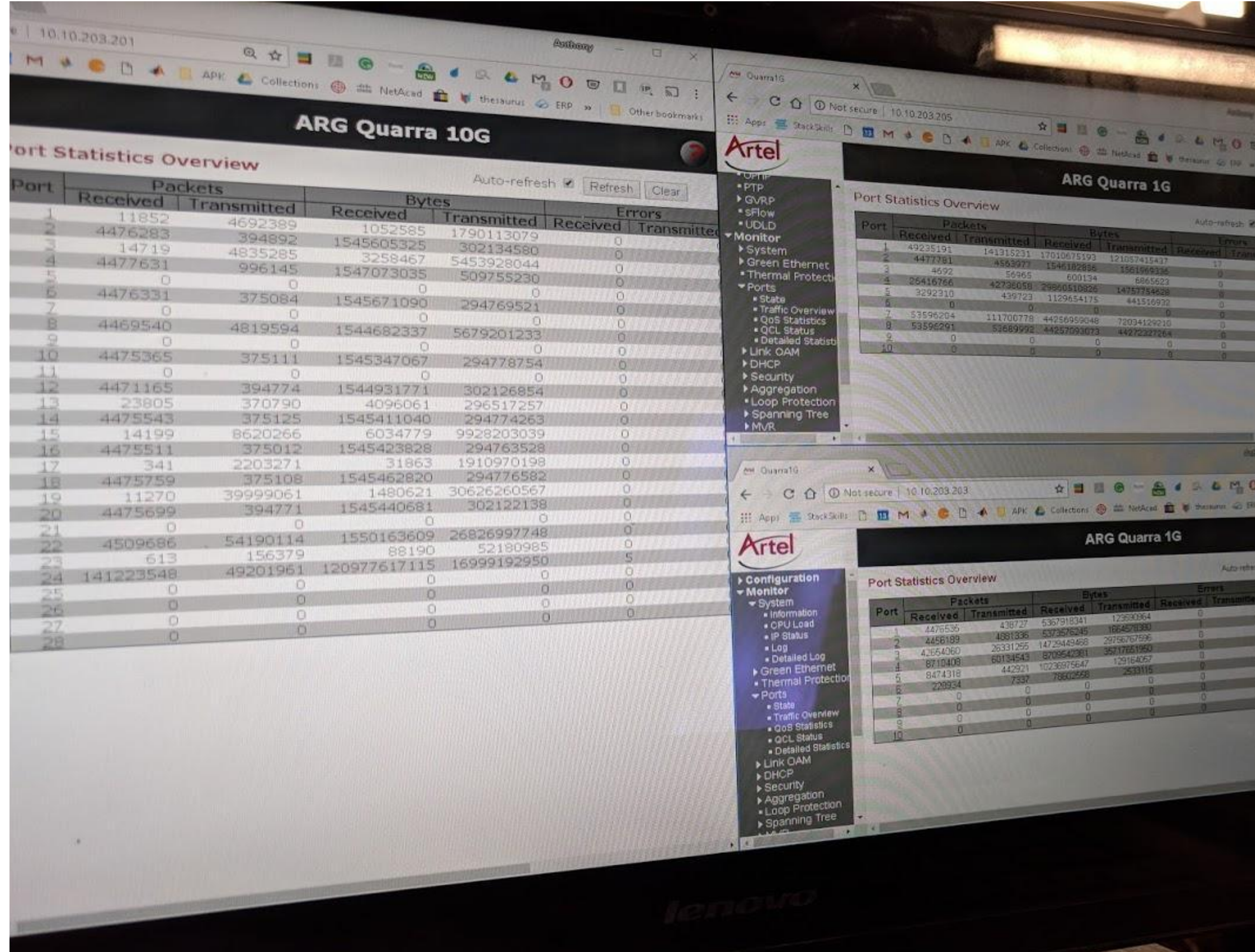




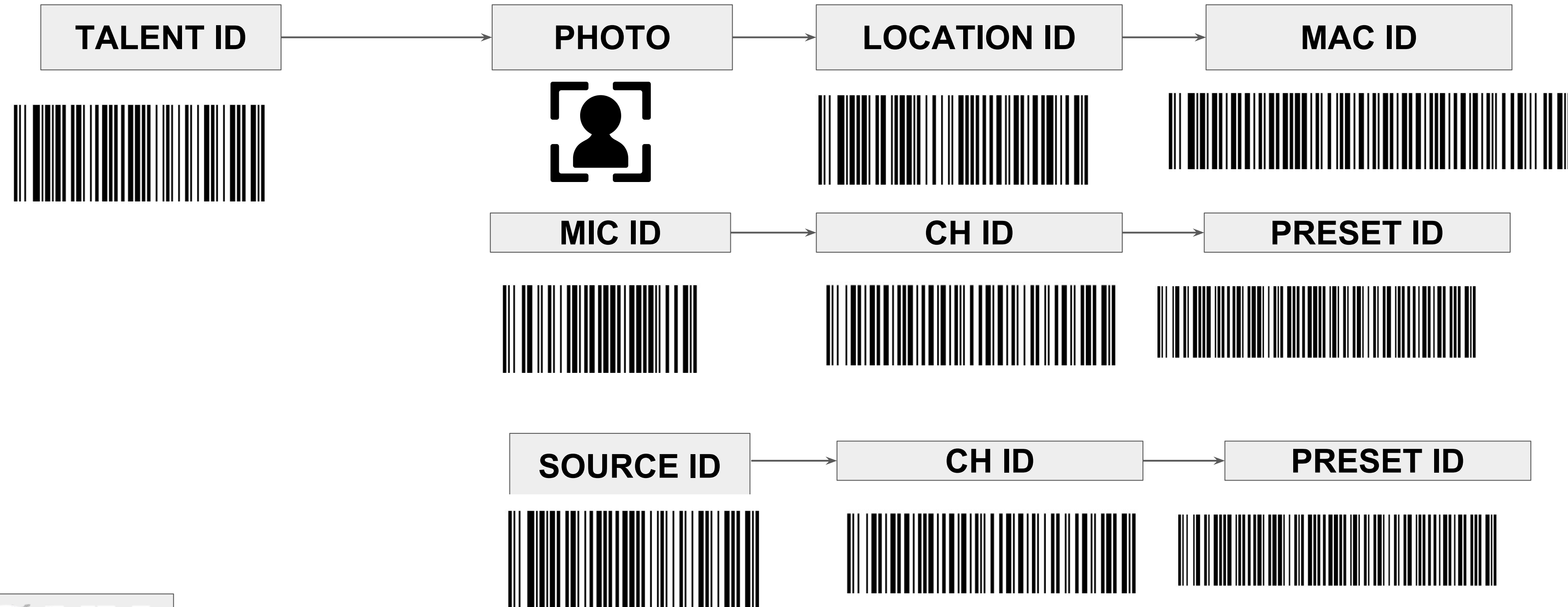
- **Virtual Sound Card**
- **Virtual Machine**
- **100 Chan Record**
- **Sync LTC.AES67**

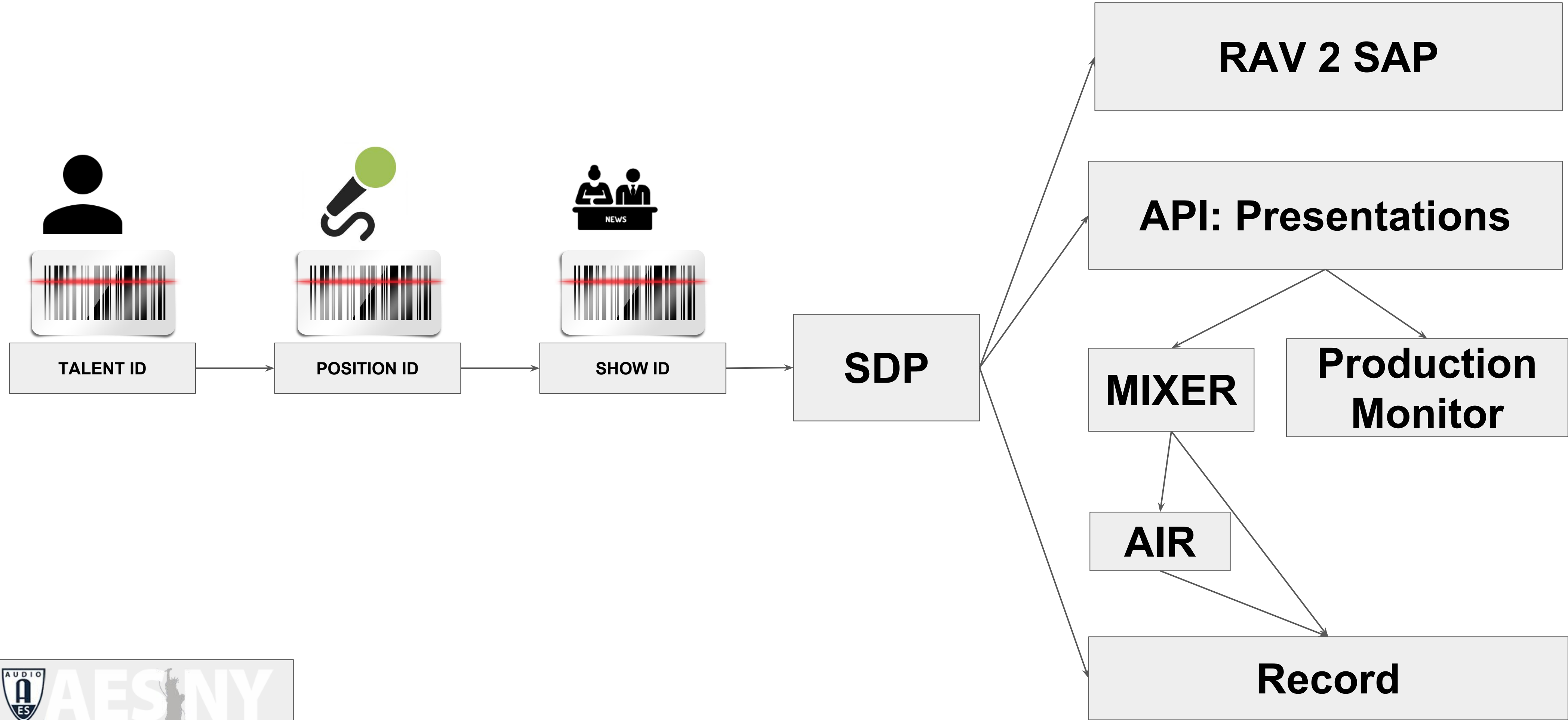


MONITORING
 – SWITCH
 – PORTS
 – TRUNKS
 – PTP



TALENT POOL / SOURCE POOL





Thank You



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IP Audio Product Manager

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www.Ward-Beck.Systems

TorontoAES.org

Vice-Chair

