RAVENNA 2020 Webinar Series

How RAVENNA & AES67 enable Innovation

Tue, June 2, 2020
15:00 h (CEST)

Bill Rounopoulos, Ross Video

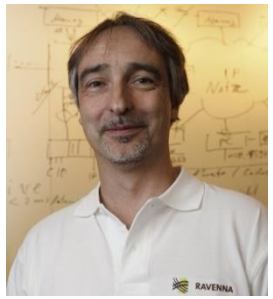
Nicolas Sturmel, Merging

Andreas Hildebrand, ALC NetworX

MERGING AUDIO FOR THE NETWORKING AGE

ROSS LIVING LIVE!

ALC NetworX



Andreas Hildebrand, RAVENNA Technology Evangelist

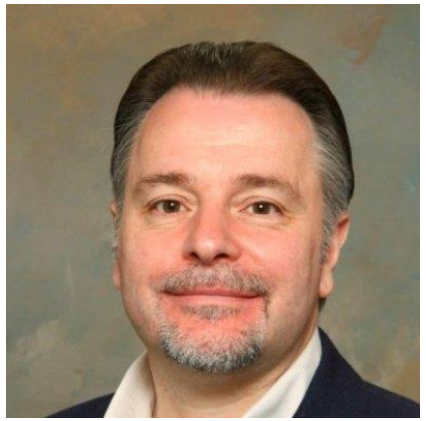
- more than 25 years in the professional audio / broadcasting industry
- graduate diploma in computer science
- R&D, project & product management experience
- member of AES67 TG and ST2110 DG

ALC NetworX GmbH, Munich / Germany

- established 2008
- R&D center
- developing & promoting RAVENNA
- Partnerships with > 40 manufacturers

RAVENNA

- IP media networking technology
- designed to meet requirements of professional audio / broadcasting applications
- open technology approach, license-free
- fully AES67-compliant (*built-in*)



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Nicolas Sturmel

Media Network and Interoperability Expert

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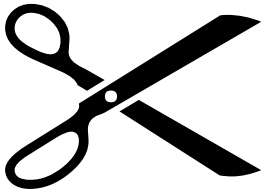

Bill Rounopoulos

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Ross Video

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ROSS LIVING LIVE!

✓Pros

Proprietary technology offer advantages such as **ease-of-use** and the avoidance of interoperability issues.

✗Cons

But do these technologies always offer the right tool for the job?

- What if I need to manage both audio and video signals simultaneously?
- Or what if I require encryption?

Different markets have different requirements

LATENCY & SCALE

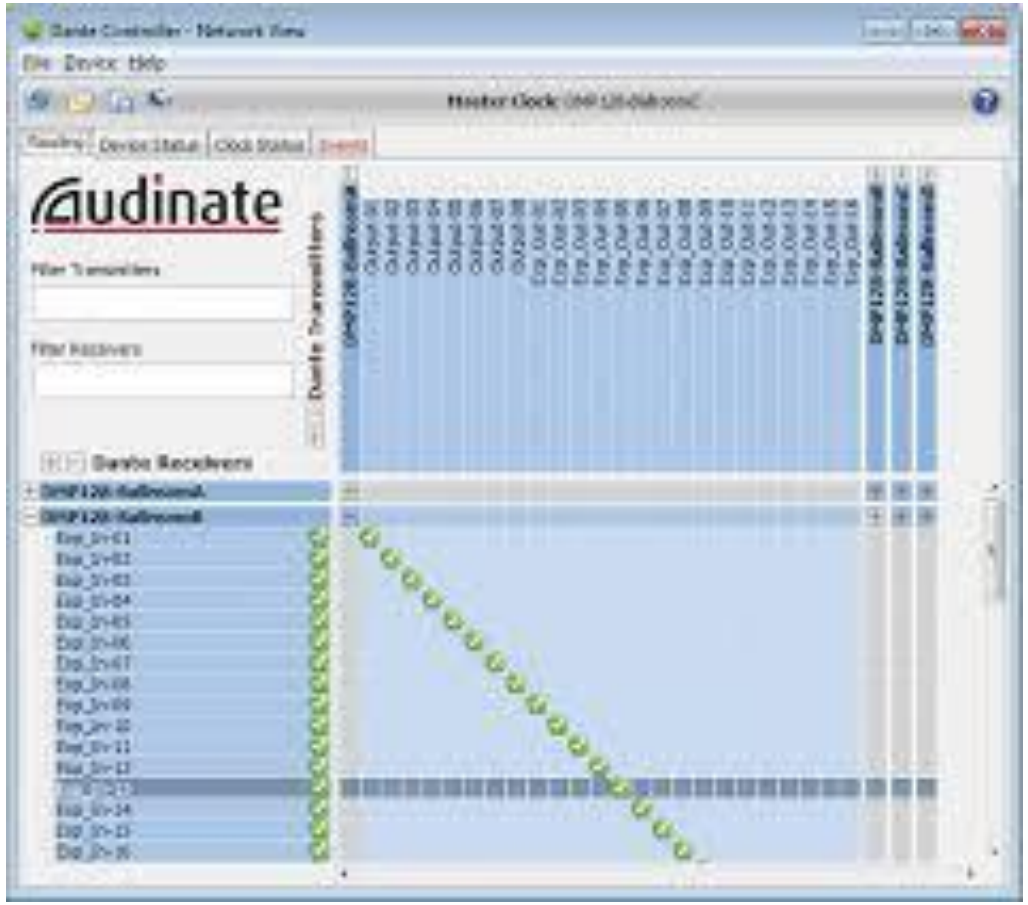
SUPPLY CHAIN RESILIENCE

SIGNAL MIX

SECURITY

USER SOPHISTICATION

Is one tool always the right tool for the job?



Monopolies

- Stifle Innovation
- Reduced set of applications addressed
- Benefits accrue to small number

Free Markets

- Address a wider set of needs and applications
- Drive greater innovation
- Can be counted on to develop the right tool for the job

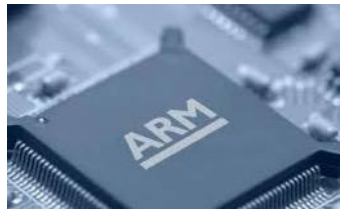
The RAVENNA & AES67 ecosystem features multiple vendors innovating using core networking technology from multiple suppliers, such as Ross, ALC Networx, Archwave, Digigram, Directout, Merging or their own internal solutions.

Additionally, the ST2110 AIMS alliance features broadcasters & media companies (Disney, BBC, NBCU, Globo, CBC) leveraging equipment from member suppliers innovating with core networking technology made possible through open standards.

- 25 years ago, when Linux was still in its infancy, it was hard to use and limited in capability.
- But it was open and free to innovate
- Who guessed then how Linux would evolve?

Microsoft

US ATC 24,000 flights/ day



Top 10 Supercomputers

85% of smartphones

50% of global fin. transactions

Google

amazon web services™

MERGING AUDIO FOR THE NETWORKING AGE

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ALC NetworX

Microsoft's Embrace of Open Source

Microsoft currently ranks as the world's top open source contributor, measured by number of employees active on GitHub. TechRupublic 07/05/19

"We do think it's a new day. This is the world in which Microsoft is collaborating with Google on a Chromium open-source project. We just think that's good for all of us. We think the innovation that happens when people work together far outweighs any of the things you give up in doing it in a closed way."

The Verge interview 19/05/20

Jared Spataro , Corporate VP for Microsoft 365

RAVENNA/ AES67/ ST2110 Innovation Examples

The Challenge:

- Broadcasters want to transport audio across a continental network
- Network latencies up to 500msec

Innovation:

- Implementation of a network latency compensation mechanism leveraging the larger WAN buffers in fully compliant AES67/ 2110-30 solutions
- Handles up to 500msec of latency

Innovation: Uncompromising Performance

CALREC

The Challenge:

- Quickly transition very wide product range to IP
- Help navigate the complicated multi-format IP Landscape in audio (AES67, 2110-30 …)

Innovation:

- Highest-performance, robust and extremely flexible ST 2110 audio networking solution
- 512 channels, 96kHz, 125 µs packet time and up to 80 channels per stream

bach

BACH openModule

Innovation: Dante to ST 2110 Router

AC HUGEL

The Challenge:

- Support a standards-based SMPTE ST 2110 solution on existing products.

Innovation:

- Fully compliant AES67/ ST2110 solution that drops into existing hardware
- 64 channels/ 8 streams, 125µs packet time, NMOS IS-04, Dante/ SAP
- Enabled 128 x 128 Dante to fully compliant AES67 ST 2110-30 router in 1RU

bach

BACH Liberty Module

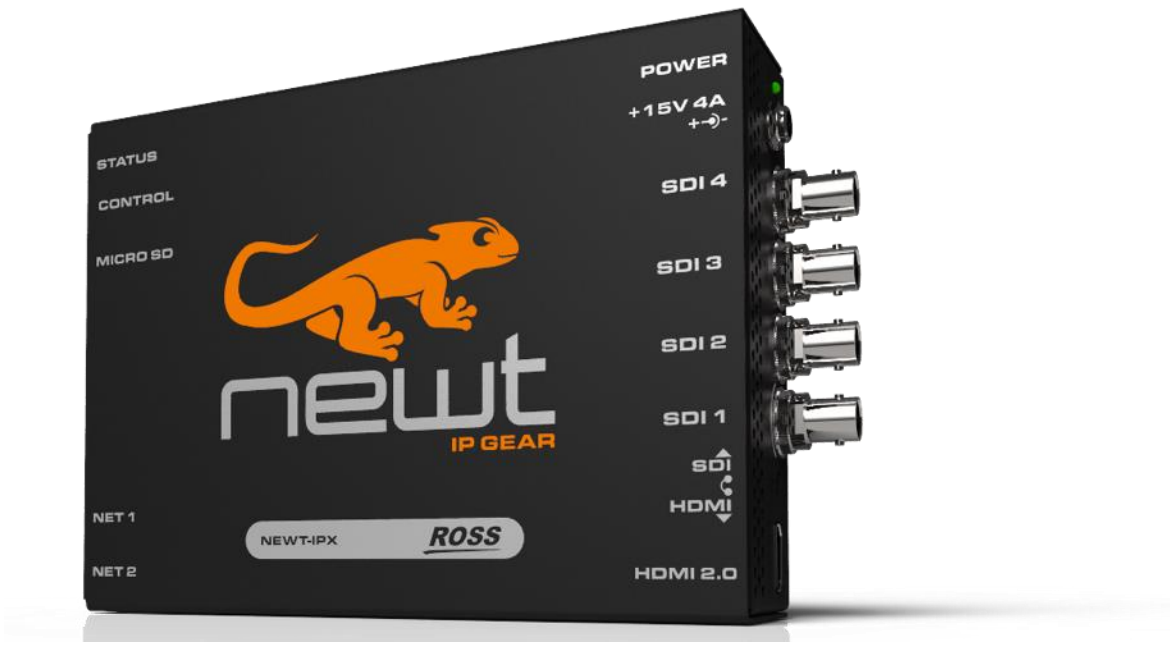
AES67/ 2110 Live Video & Audio in Compact Form

The Challenge:

- Transport audio with live video on same wire over IP network

Innovation:

- Another example of full ST 2110 in action: video and audio on same wire
- Key enabler is AES67 PTP synchronization based on 1588v2 that utilizes time stamping



The Challenge:

- An standards-based Audio-over-IP solution with open control that is customizable to fit unique workflow

Innovation:

- Open JSON API allowing the use of the customer's UI and control system
- Addition of specific clock signals enabled better internal synchronization of wireless equipment

Innovation: Greater Integration & Lower System Cost

YELLOWTEC

The Challenge:

- Address more markets with support for LW+, Ravenna, Ember+
- Need small port count AES67 ST 2110 solution with open control
- Replace expensive AES67 partner box w/ solution that supports MADI

Innovation:

- Integrated solution with open control supporting LW+, Ember+, Ravenna
- MADI to AES67 bridge for easy integration into their existing product

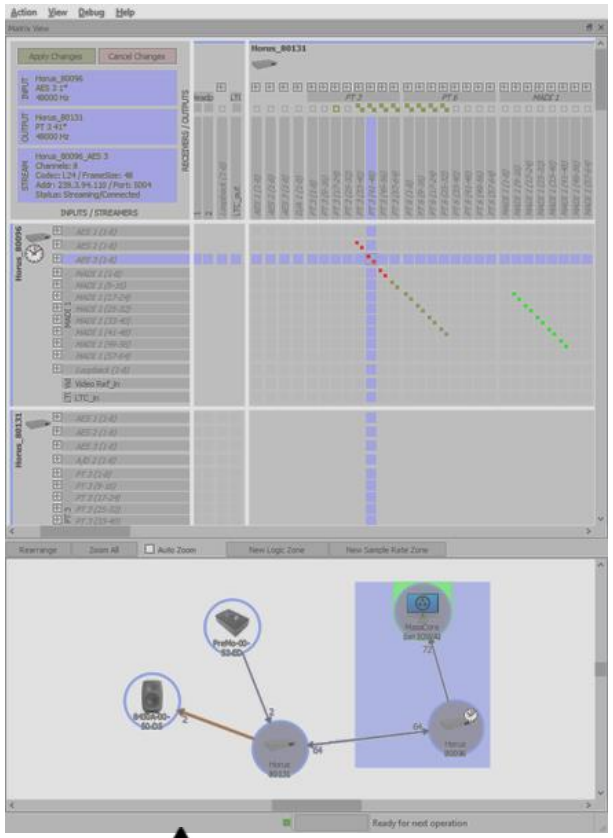
ANEMAN Audio Network Manager

The Challenge:

- A simple and open centrailzed audio network manager that is protocol agnostic.

Innovation:

- ANEMAN a simple, open and free controller created by Merging & Digigram
- Works w/ any manufacturer via plug-in
- ANEMAN engine framework will be fully open-sourced to drive further innovation



ROSS LIVING LIVE! · MERGING AUDIO FOR THE NETWORKING AGE · DirectOut TECHNOLOGIES · ARCHWAVE · cymatic audio · WBS WARD-BECK SYSTEMS · GENELEC · NEUMANN.BERLIN

Innovation: Broadcast-Ready Audio Converter

STUDIO TECHNOLOGIES INC.

The Challenge:

- Address a new market by expanding reach of products into broadcast.
- Requirement for an integrated standards-based 2110 solution that was not available in a Dante solution.

Innovation:

- Fully standards compliant 16-channel AES67 ST 2110-30 RAVENNA-based solution via SoC that supports flexible ST 2022-7 glitch-less redundancy

bach MINUET

Innovation: Futureproofed Roadmap via Standards

ZIGEN

The Challenge:

- Need for a cost-effective, low channel count audio networking solution as a value-added feature that works with video now and in the future

Innovation:

- AES67 ST 2110 standards based 8-channel solution that works with video (HDMI) today and is ready for video and audio over IP in the future

RAVENNA AES67/ 2110 with Open Control

The Challenge:

- Easily control the transport of live audio and video across many different networks

Innovation:

- Raptor 6x6 HD-SDI to ST2110 gateway for Emmy-award winning openGear platform
- Open control with standards-based NMOS (IS-05) and popular EmBER+
- Open registration and discovery with NMOS (IS-04), RAVENNA and SAP

raptor IP GEAR

Innovation: Unparalleled performance & flexibility

STUDER by HARMAN

The Challenge:

- High performance, robust yet flexible AoIP solution running AES67/ ST 2110/ RAVENNA
- Support for variable sample rates and data formats including 32-bit AES/ EBU

Innovation:

- 512 ch. 64 streams, 125µs packet time, glitch-less stream and port redundancy (4 x 10GE)
- 16, 24-bits /sample including 32-bit transparent mode for AES transport configurable per stream & not limited to audio but can carry video and control data too.

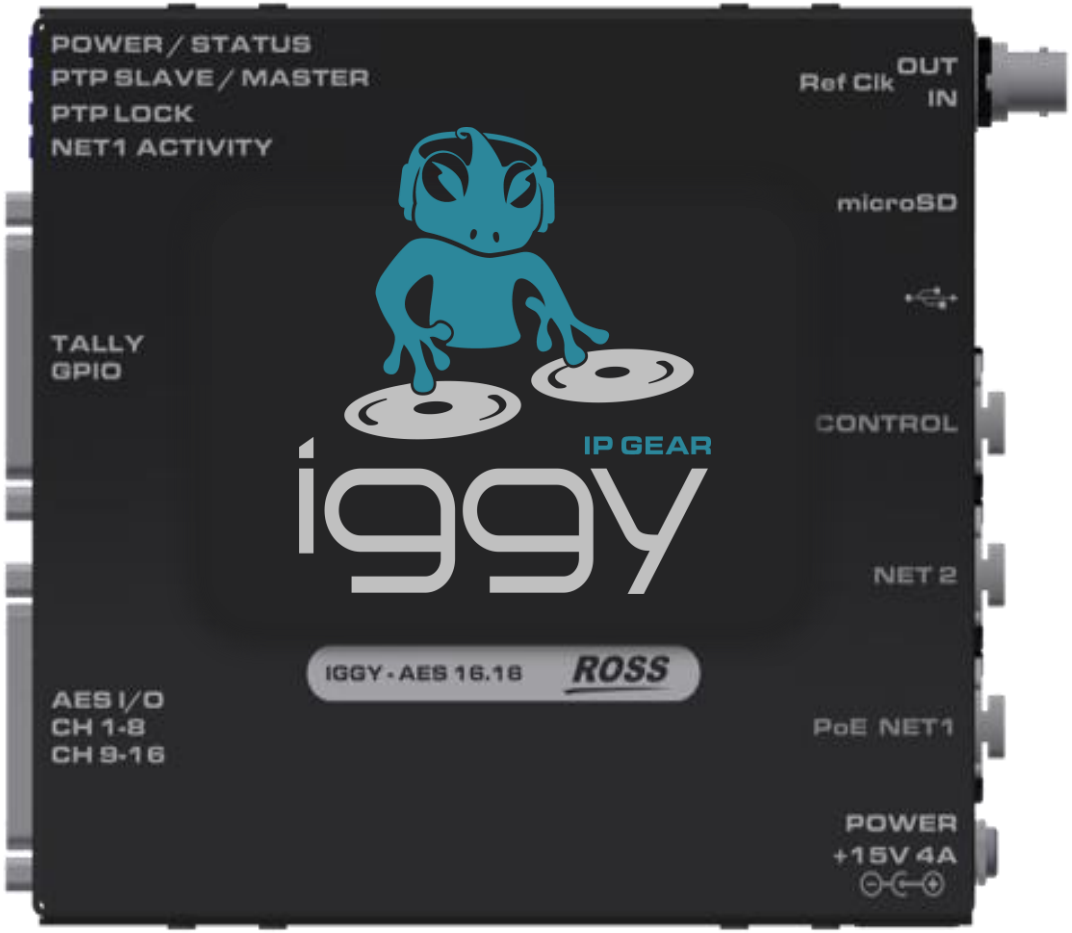
Innovation: Broad Audio-Over-IP Interoperability

The Challenge:

- A proven audio networking solution based on open technologies that seamlessly interfaces with existing customer broadcast equipment

Innovation:

- A broadly interoperable compact AES67/ ST 2110 audio-over-IP bridge
- Natively adapts to any environment: RAVENNA, SAP, EmBER+, and DashBoard
- 2022-7 hitless protection switching
- Same BACH AoIP technology used by partner OEM developers



AES67 Low Latency Virtual Sound Card Development Platform

The Challenge:

- AES67 ST 2110 solution all in software on a COTS server for centralized audio processing

Innovation:

- AES67 ST 2110 AoIP solution in Linux running on a COTS platform supporting 64 channels requiring a single low-end Intel Xeon core.
- End-to-end latency of ~1msec making centralized audio processing a reality for OEM's
- Natively supports multiple protocols: RAVENNA, SAP, and EmBER+

BACH LVSC

More answers…

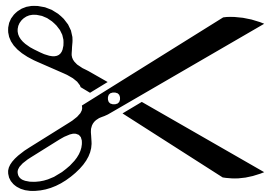
RAVENNA / AES67 / SMPTE ST 2110 Resources:

ROSS® LIVING LIVE!

www.rossvideo.com/ip-bridges-converters
www.rossvideo.com/bach

RAVENNA AES67 & ST 2110 built-in

www.ravenna-network.com/resources



Nicolas Sturmel, PhD

ENS Cachan, IRCAM, Paris VI and XI universities graduate
Member of the SC-02-12 (Audio Network) standard committee,
Especially active on AES67 testing, plug fests, dirty hands events
Passionate on both audio and network

Media Network and Interoperability expert at Merging Technologies
ANEMAN product owner
@nicolassturmel, www.linkedin.com/in/nicolassturmel

Merging Technologies

Designer of some of the best Analog to AES67 conversion
Editor of the Pyramix DAW
Celebrating 30 years in 2020 !

AES67, RAVENNA, ST2110: A new way of thinking the network

- Massive use of multicasting: delegates stream distribution entirely to the network (switches)
- Open standards: the information on how it works is not under NDA

Contrary to Dante, switches and their configuration are an essential part of the Network

PTP

STP IGMP

QoS VLAN

IP Routing

ARP DHCP

LLDP

Thankfully, on most small and some medium network, a simple switch configuration file does the trick

AES67, RAVENNA, ST2110: And when the network is configured…

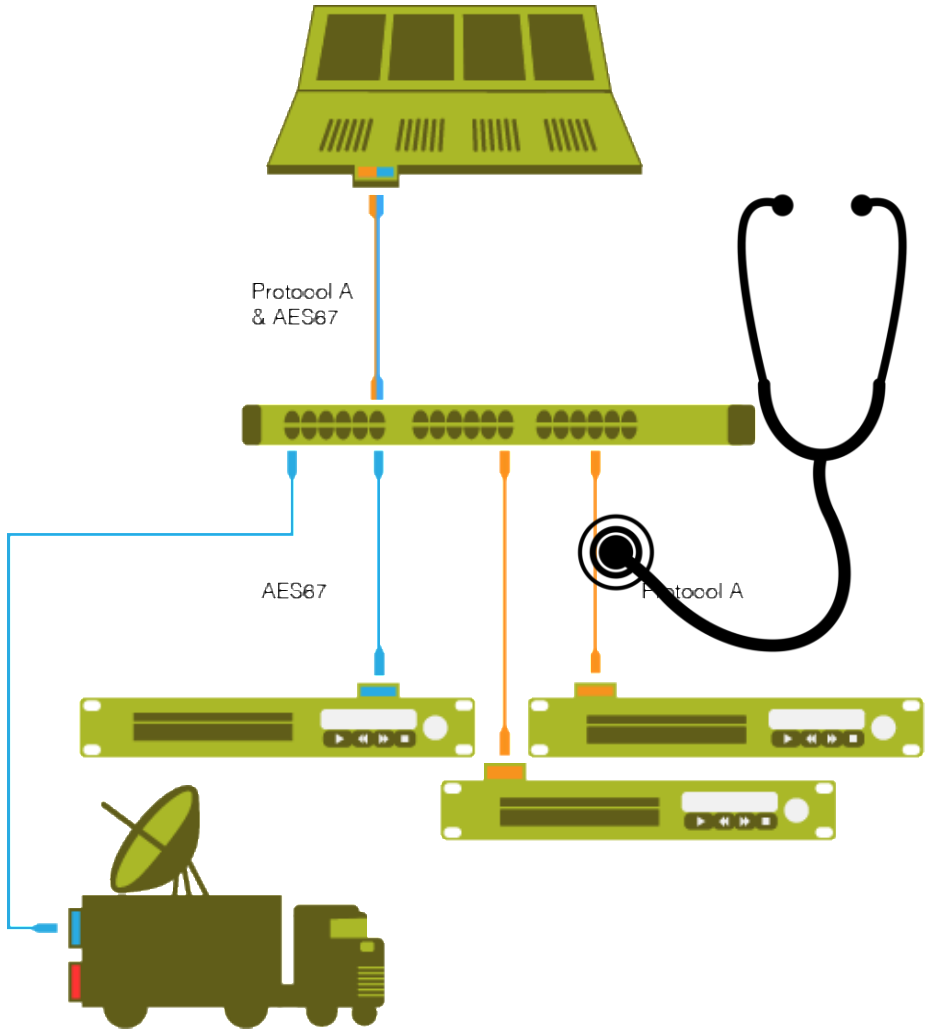
Although most of the time everything works right, you may encounter some problems now and then…

- What input is connected to what output ?
- Why do I have no sound ?
- Why is audio dropping ?
- Why this device doesn't receive the stream, while that one does ?
- How can I check that everything is ok ?

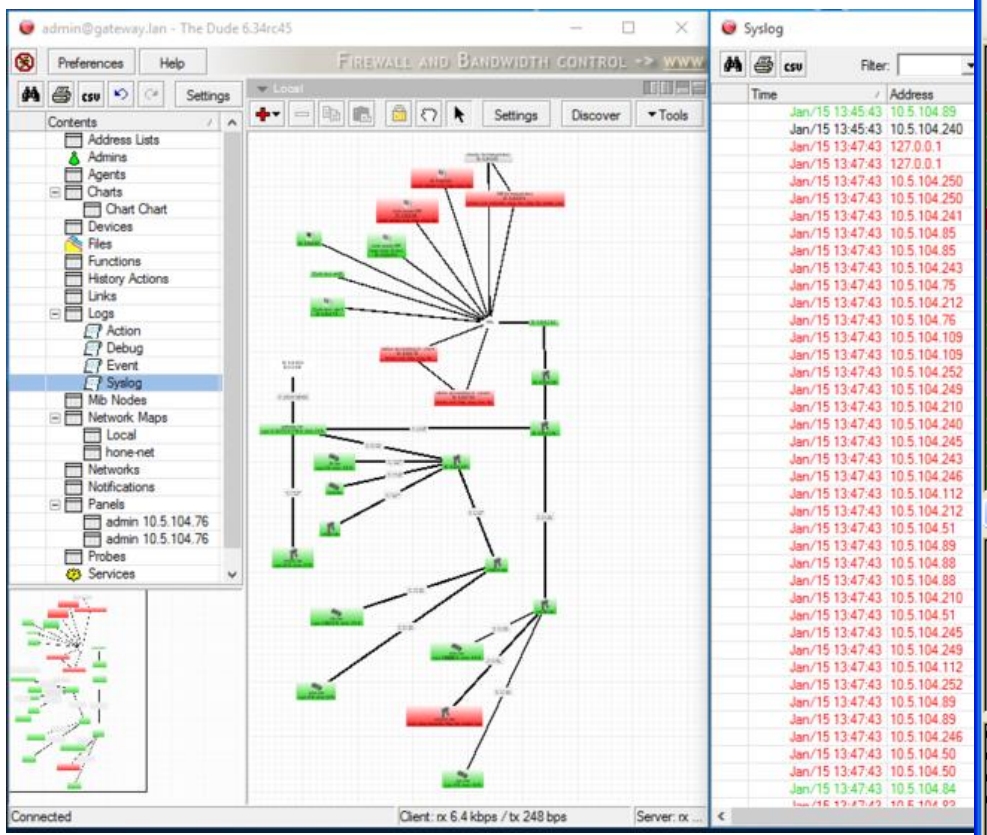
All those degrees of freedom are actually a strength

But with great power comes great responsibility, and actual strength is unveiled by the right tools to bend this freedom to the designer will.

The ideal tool



What we have


admin@gateway.lan - The Dude 6.34rc45
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Help
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Discover
Tools
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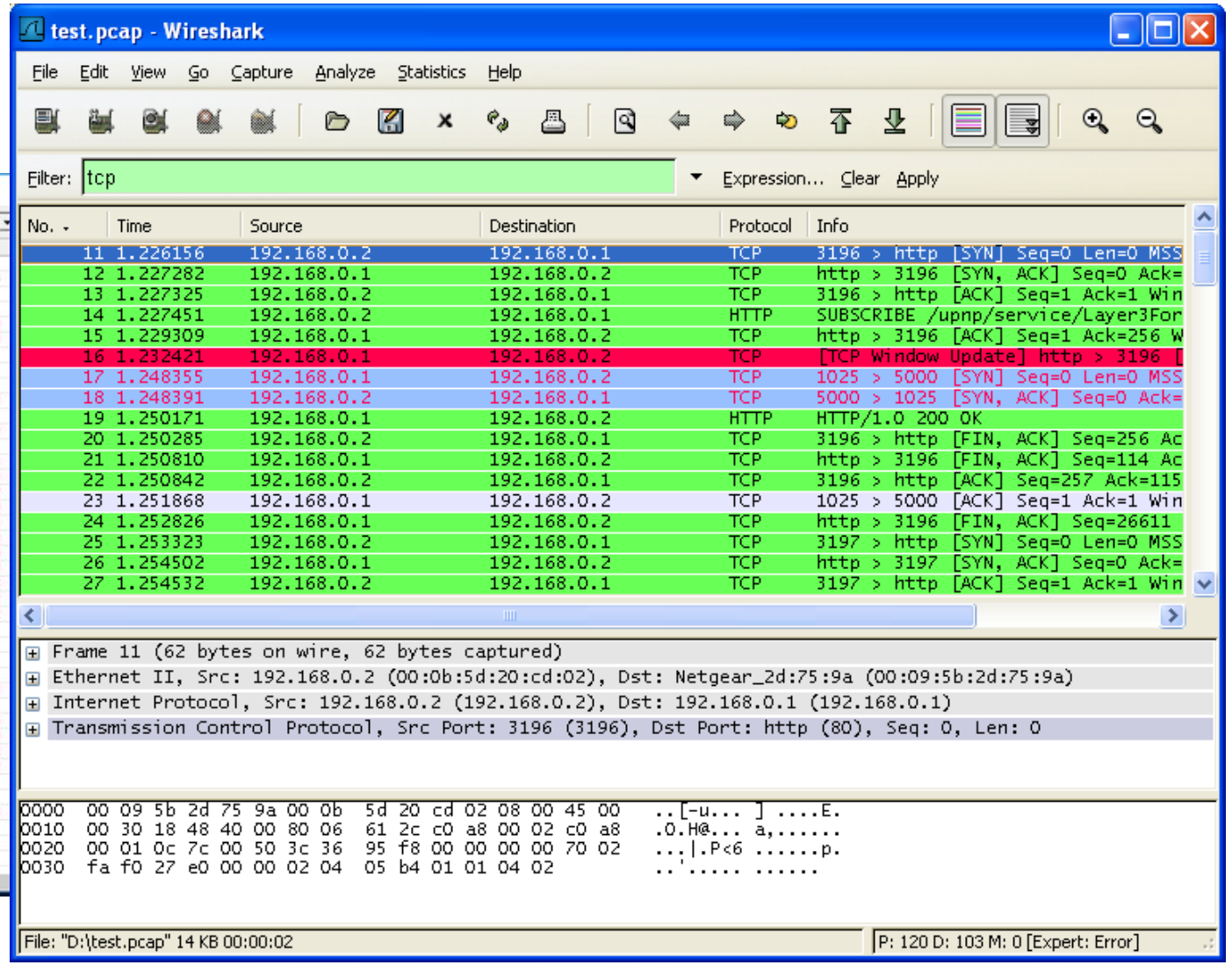

test.pcap - Wireshark
File Edit View Go Capture Analyze Statistics Help
Filter: tcp
Expression... Clear Apply
No. Time Source Destination Protocol Info
11 1.226156 192.168.0.2 192.168.0.1 TCP 3196 > http [SYN] Seq=0 Len=0 MSS
12 1.227282 192.168.0.1 192.168.0.2 TCP http > 3196 [SYN, ACK] Seq=0 Ack=
13 1.227325 192.168.0.2 192.168.0.1 TCP 3196 > http [ACK] Seq=1 Ack=1 Win
14 1.227451 192.168.0.2 192.168.0.1 HTTP SUBSCRIBE /upnp/service/Layer3For
15 1.229309 192.168.0.1 192.168.0.2 TCP http > 3196 [ACK] Seq=1 Ack=256 W
16 1.232421 192.168.0.1 192.168.0.2 TCP [TCP Window Update] http > 3196 [
17 1.248355 192.168.0.1 192.168.0.2 TCP 1025 > 5000 [SYN] Seq=0 Len=0 MSS
18 1.248391 192.168.0.2 192.168.0.1 TCP 5000 > 1025 [SYN, ACK] Seq=0 Ack=
19 1.250171 192.168.0.1 192.168.0.2 HTTP HTTP/1.0 200 OK
20 1.250285 192.168.0.2 192.168.0.1 TCP 3196 > http [FIN, ACK] Seq=256 Ac
21 1.250810 192.168.0.1 192.168.0.2 TCP http > 3196 [FIN, ACK] Seq=114 Ac
22 1.250842 192.168.0.2 192.168.0.1 TCP 3196 > http [ACK] Seq=257 Ack=115
23 1.251868 192.168.0.1 192.168.0.2 TCP 1025 > 5000 [ACK] Seq=1 Ack=1 Win
24 1.252826 192.168.0.1 192.168.0.2 TCP http > 3196 [FIN, ACK] Seq=26611
25 1.253323 192.168.0.2 192.168.0.1 TCP 3197 > http [SYN] Seq=0 Len=0 MSS
26 1.254502 192.168.0.1 192.168.0.2 TCP http > 3197 [SYN, ACK] Seq=0 Ack=
27 1.254532 192.168.0.2 192.168.0.1 TCP 3197 > http [ACK] Seq=1 Ack=1 Win
Frame 11 (62 bytes on wire, 62 bytes captured)
Ethernet II, Src: 192.168.0.2 (00:0b:5d:20:cd:02), Dst: Netgear_2d:75:9a (00:09:5b:2d:75:9a)
Internet Protocol, Src: 192.168.0.2 (192.168.0.2), Dst: 192.168.0.1 (192.168.0.1)
Transmission Control Protocol, Src Port: 3196 (3196), Dst Port: http (80), Seq: 0, Len: 0
0000 00 09 5b 2d 75 9a 00 0b 5d 20 cd 02 08 00 45 00 ..[-u...] ....E.
0010 00 30 18 48 40 00 80 06 61 2c c0 a8 00 02 c0 a8 .0.H@... a,......
0020 00 01 0c 7c 00 50 3c 36 95 f8 00 00 00 00 70 02 ...|.P<6 ......p.
0030 fa f0 27 e0 00 00 02 04 05 b4 01 01 04 02 ..'..... ......
File: "D:\test.pcap" 14 KB 00:00:02
P: 120 D: 103 M: 0 [Expert: Error]

Not really, for 10 years of RAVENNA tools have been proposed to ease the life of the media network operators

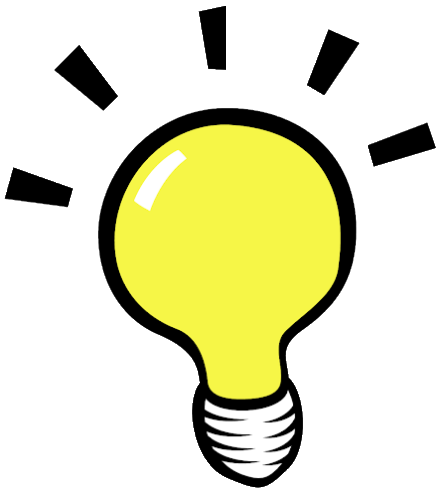
Here is the presentation of some of them, in a purely random order

All are free to get and use, used by many, and all (except the last two) developed by RAVENNA partners

All those tools are innovations in terms of user experience

But they also support the emergence of new ideas in terms of workflow

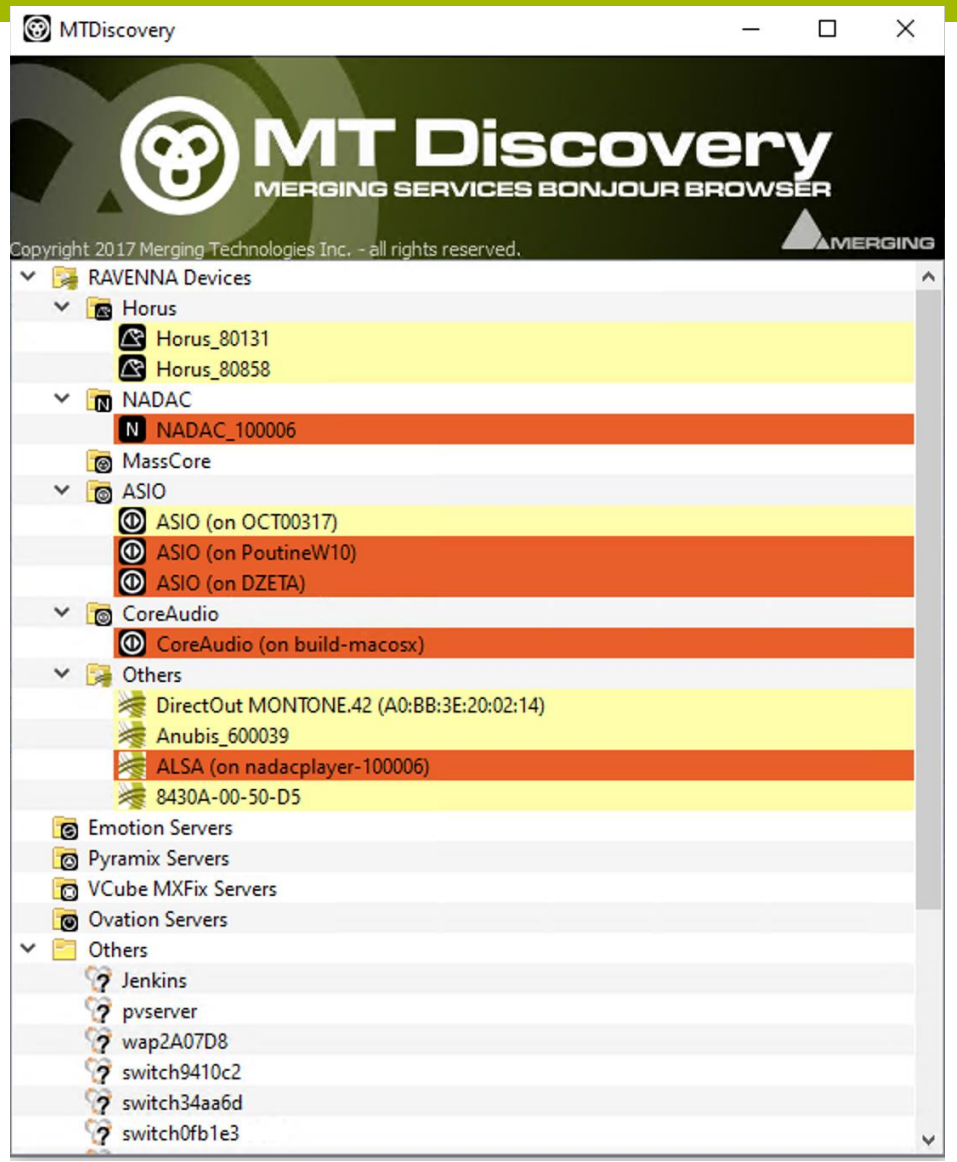
By freeing the designer from time spent in getting the right information, we allow him more time to design better and big systems.



Challenge: Auto IP or DHCP is good, but how do I find my equipment to connect to the configuration interface

Innovation: Use RAVENNA mDNS/bonjour in a software that displays the devices on the network(s)

How RAVENNA & AES67 enable Innovation

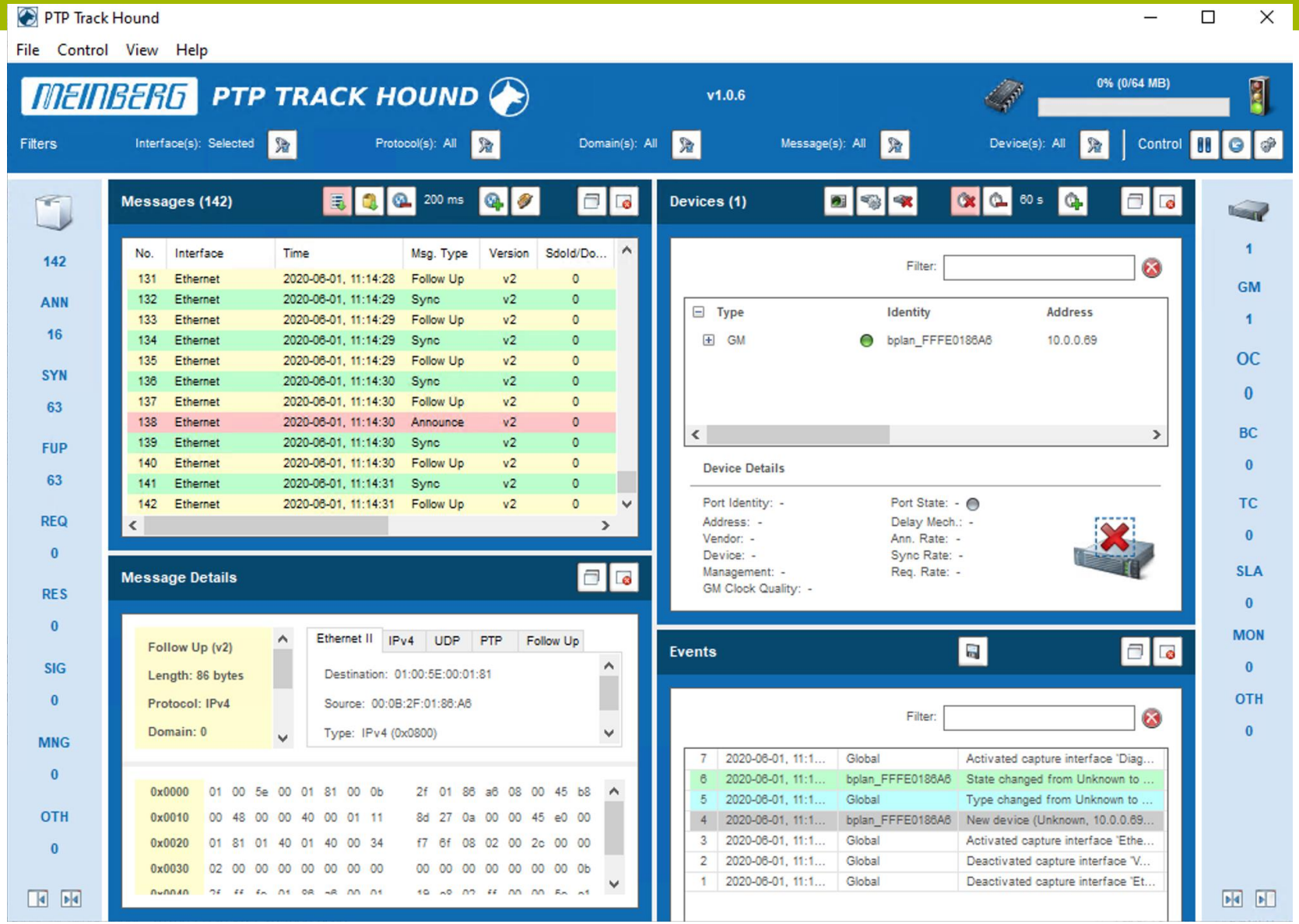


Challenge: How can I check PTP traffic on the network ?
Sort it in a human readable way ? Instead of relying on Wireshark's ptp filter

Innovation: Meinberg's PTP Track Hound, ptp analysis software

https://www.meinbergglobal.com/english/sw/ptp-track-hound.htm

How RAVENNA & AES67 enable Innovation

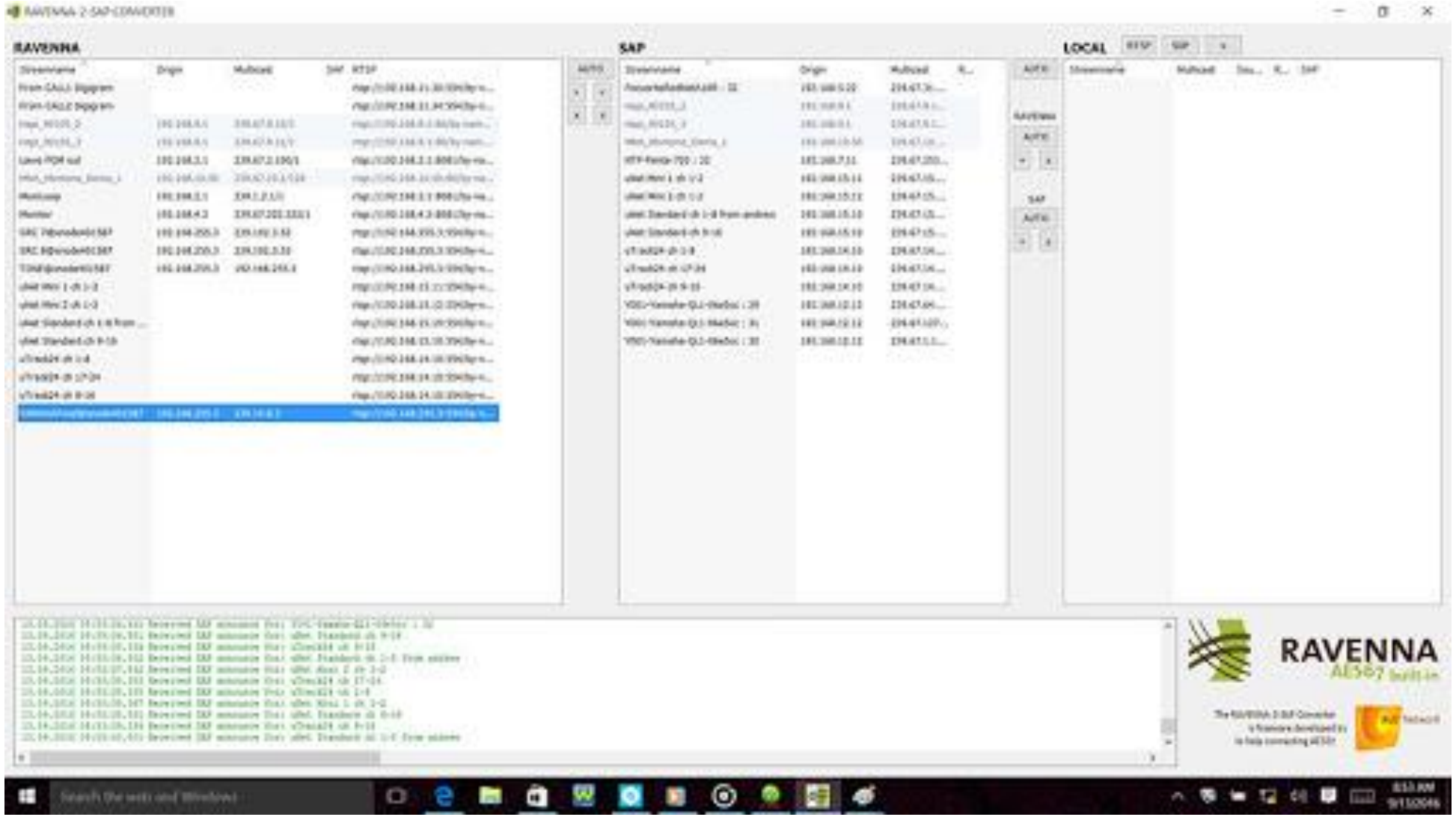


Challenge: Dante and RAVENNA have different way of discovering AES67 streams on the network. Plus, not all devices allow manual input of the SDP

Innovation: ALC NetworX's Rav2Sap

https://www.ravenna-network.com/aes67/rav2sap/

How RAVENNA & AES67 enable Innovation

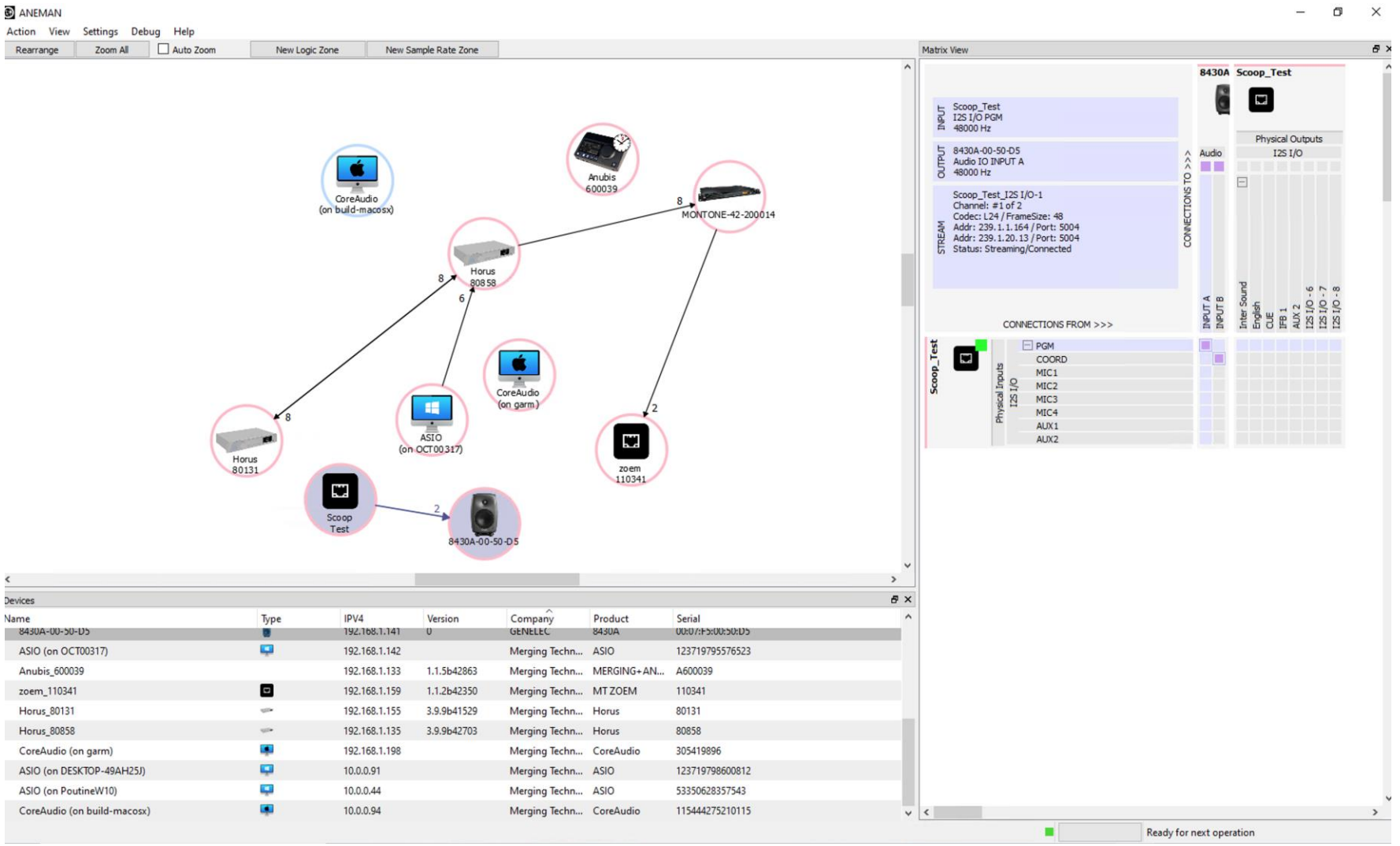


Challenge: I want a Dante controller for my RAVENNA/AES67 network

Innovation: Merging Technologies' ANEMAN (Audio NEtwork MANager)

https://www.aneman.net/

How RAVENNA & AES67 enable Innovation

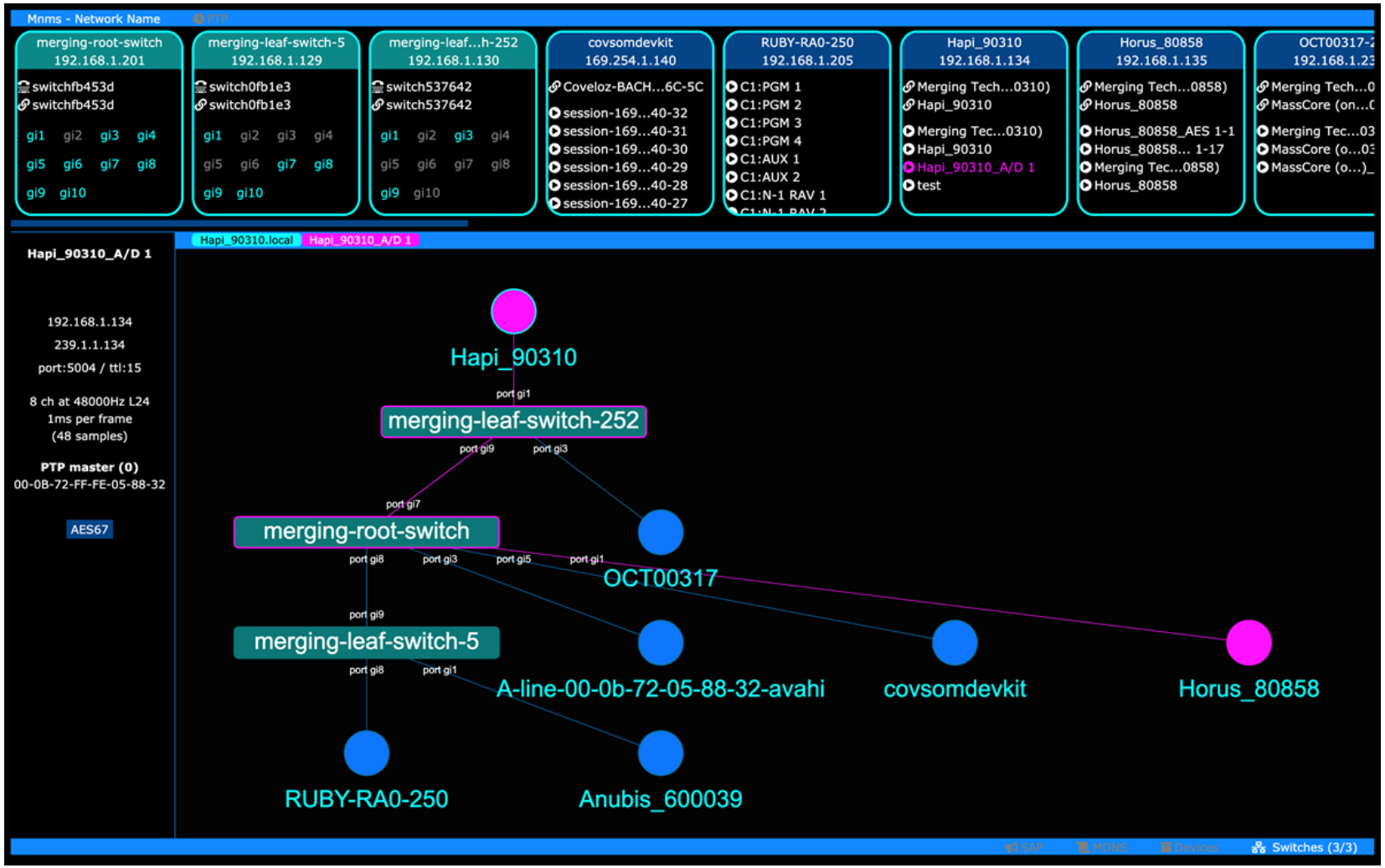


Challenge: I want to monitor my network, streams, bandwidth, hardware topology

Innovation: MNMS (Media Network Monitoring Services)

http://mnms.sturmel.com/

How RAVENNA & AES67 enable Innovation

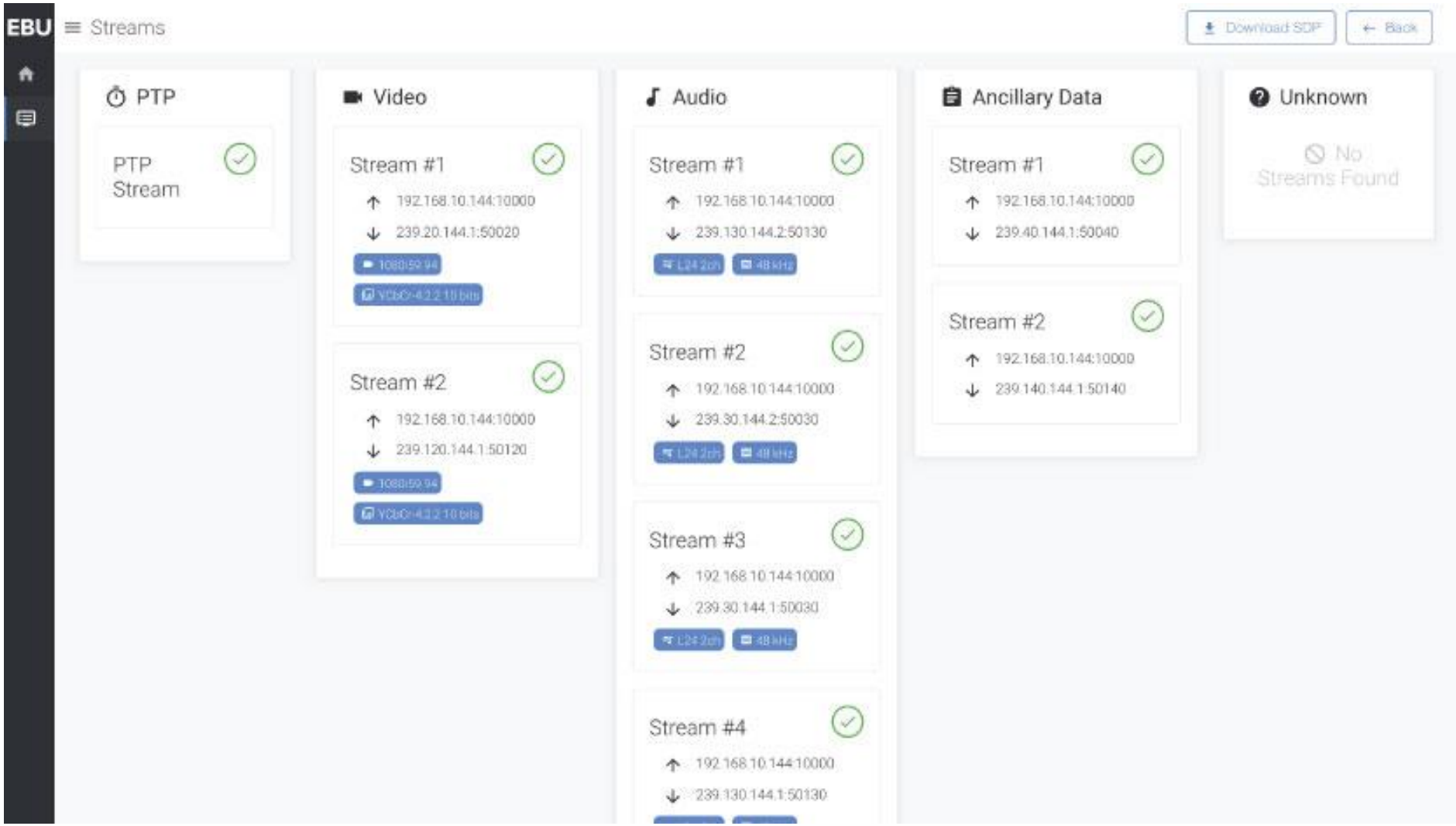


Challenge: How can I check the time accuracy and standard compliance of my devices and streams on the network ?

Innovation: EBU's LIST (Live IP Software Toolkit)

https://tech.ebu.ch/list

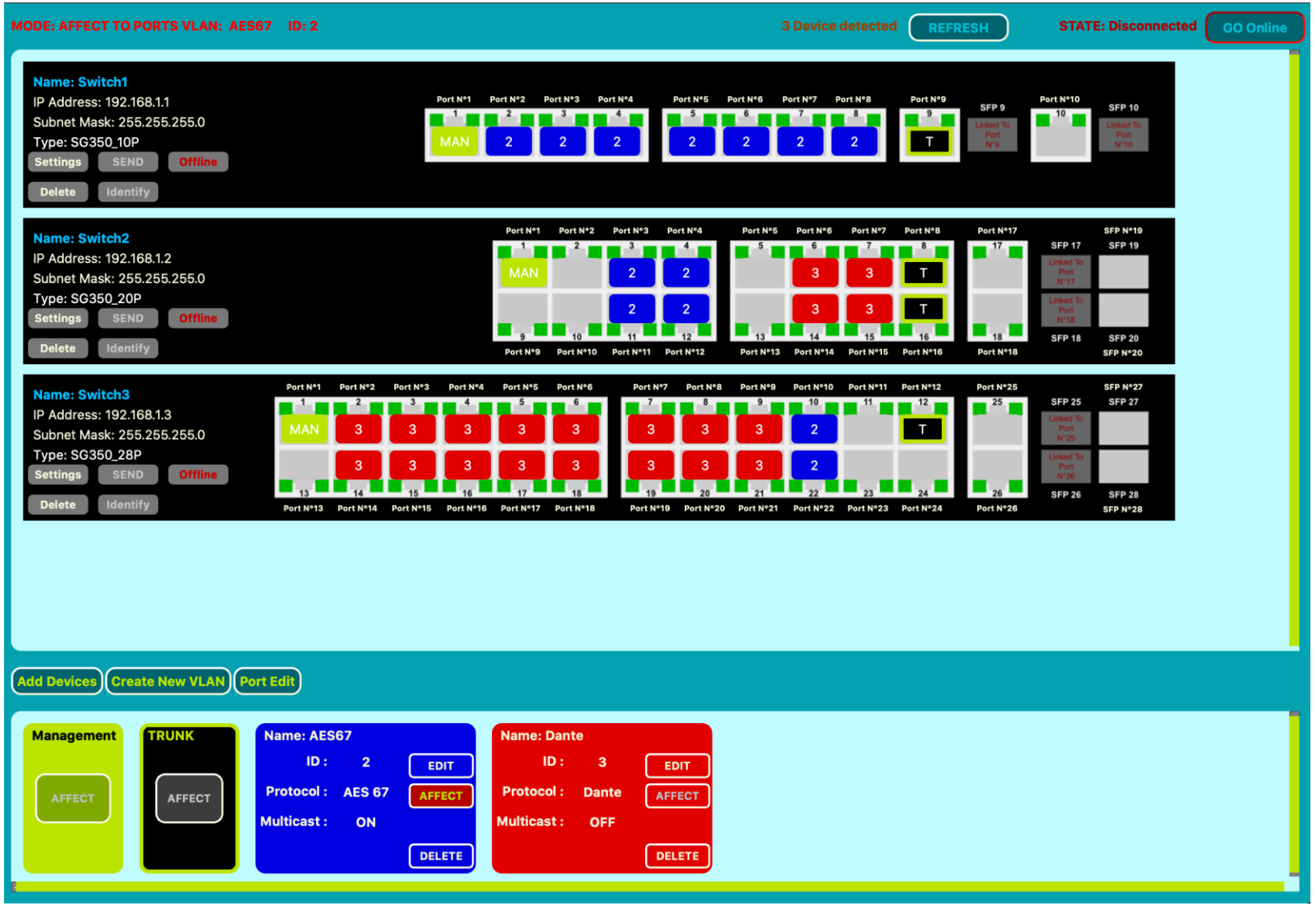
How RAVENNA & AES67 enable Innovation

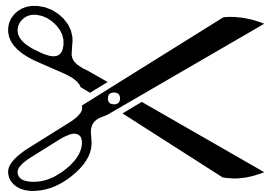


Challenge: I want to easily configure a multi-vlan, multi-switch setup.

Innovation: Many different vendor dependant solutions, one of them is worth showing though (in progress) from Jérémy Czaicki, student at the CFPTS

How RAVENNA & AES67 enable Innovation





Questions?

More answers...

RAVENNA / AES67 / SMPTE ST 2110 Resources:

RAVENNA AES67 & ST 2110 built-in

www.ravenna-network.com/resources

RAVENNA 2020 Webinar Series

AES67 & SMPTE ST 2110 Timing & Synchronization

Tue, June 9, 2020
15:00 h (CEST)

Daniel Boldt, Meinberg

Andreas Hildebrand, ALC NetworX

You've made it!

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