Monitoring audio streams in the IP network-based workflow

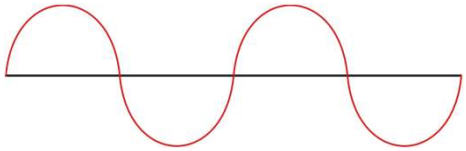
Aki Mäkivirta

AES145 New York, October 17-20, 2018

GENELEC®

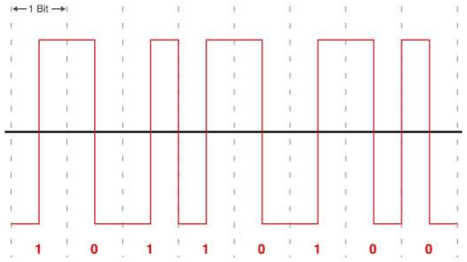
Why Audio Networking?

Higher quality signal



Analogue

Continuous voltage describes the audio signal



Digital

PCM STREAM

Sample values describes the audio signal

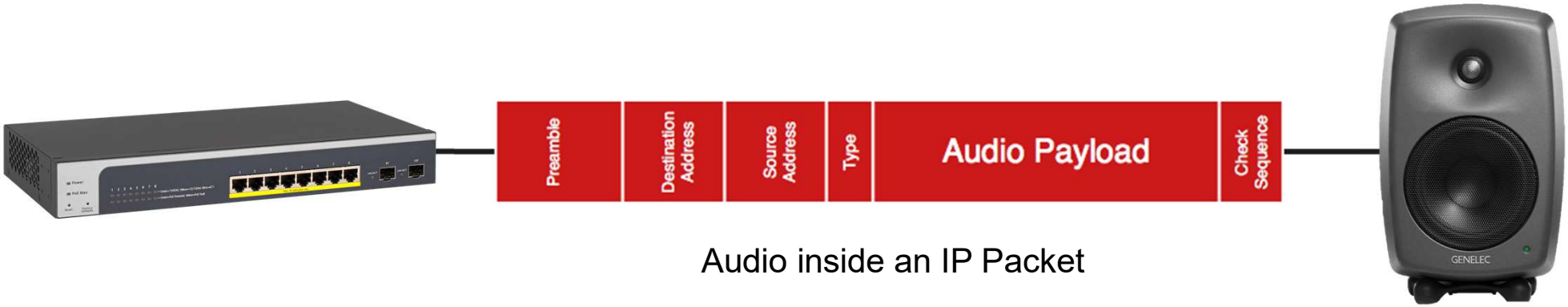
Networked

Packetized Audio over IP

Sample values in a sequence of packets describe the audio signal

Networking simplifies systems

- Audio over IP is the modern alternative to large multi-channel digital audio interconnections.
- Protocols such as RAVENNA, Dante and AVB are increasingly being used.
- IP connection directly on devices simplifies system design.



Audio inside an IP Packet

Increasing flexibility

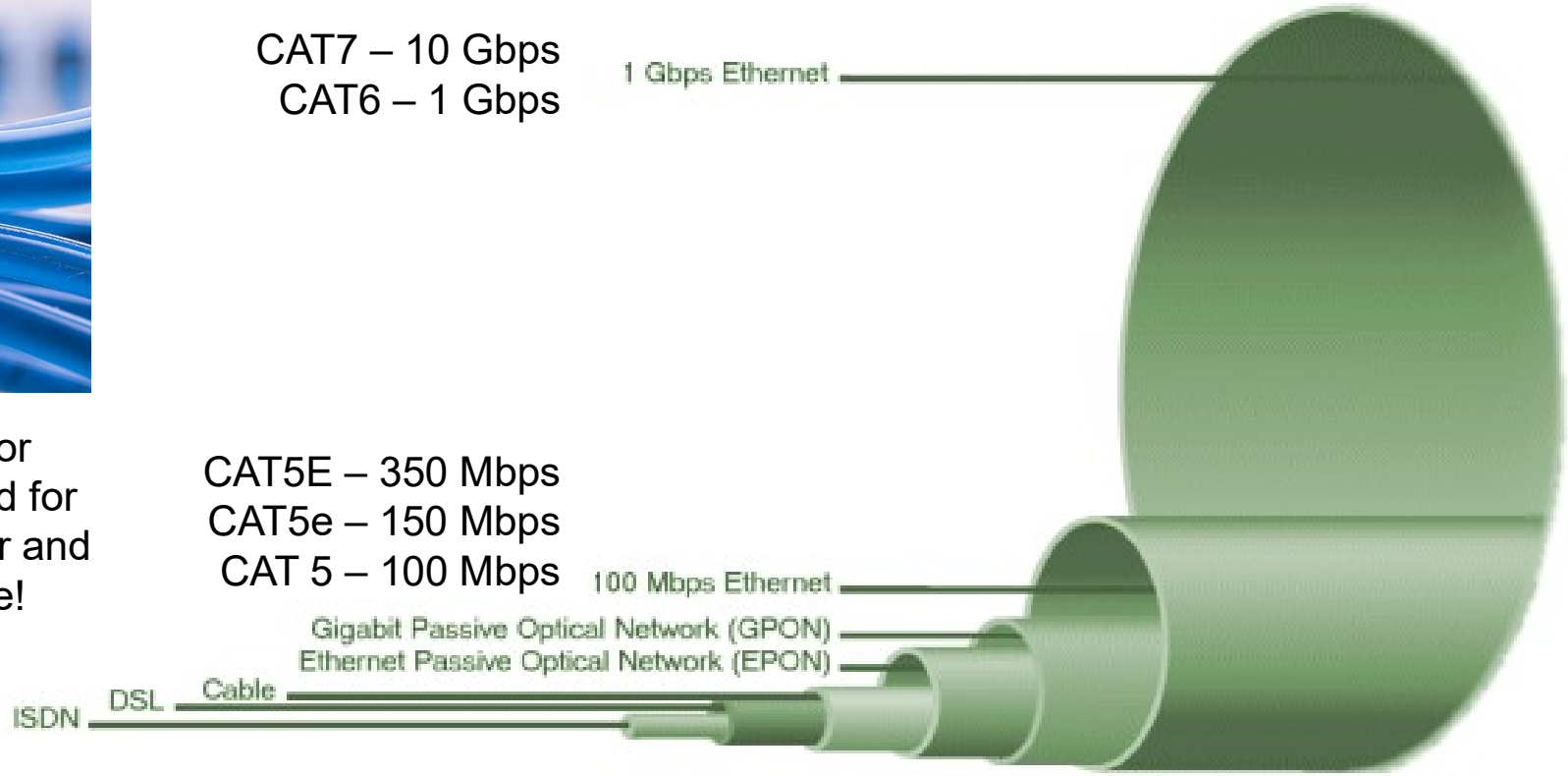
- Effectively unlimited number of audio channels – high channel count into one (low cost) cable
- Make signal run long distances
- Minimise end-to-end delay: latency 1ms or less
- Co-existing protocols: control + device monitoring + system management + other data on the same cable

Increasing bandwidth, standard CAT cabling

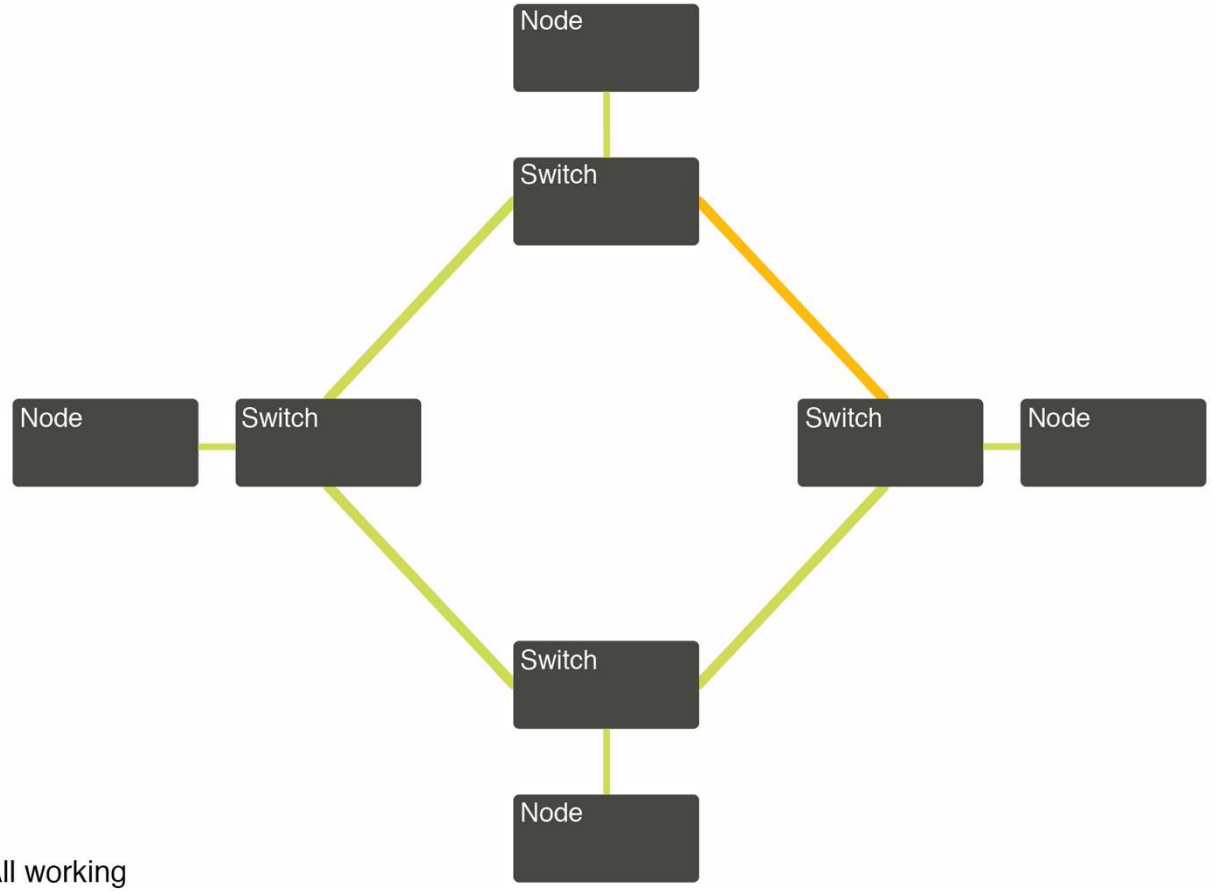
Category cabling is designed for high signal integrity and is used for structured cabling for computer and voice networks. It's everywhere!

CAT7 – 10 Gbps
CAT6 – 1 Gbps

CAT5E – 350 Mbps
CAT5e – 150 Mbps
CAT 5 – 100 Mbps



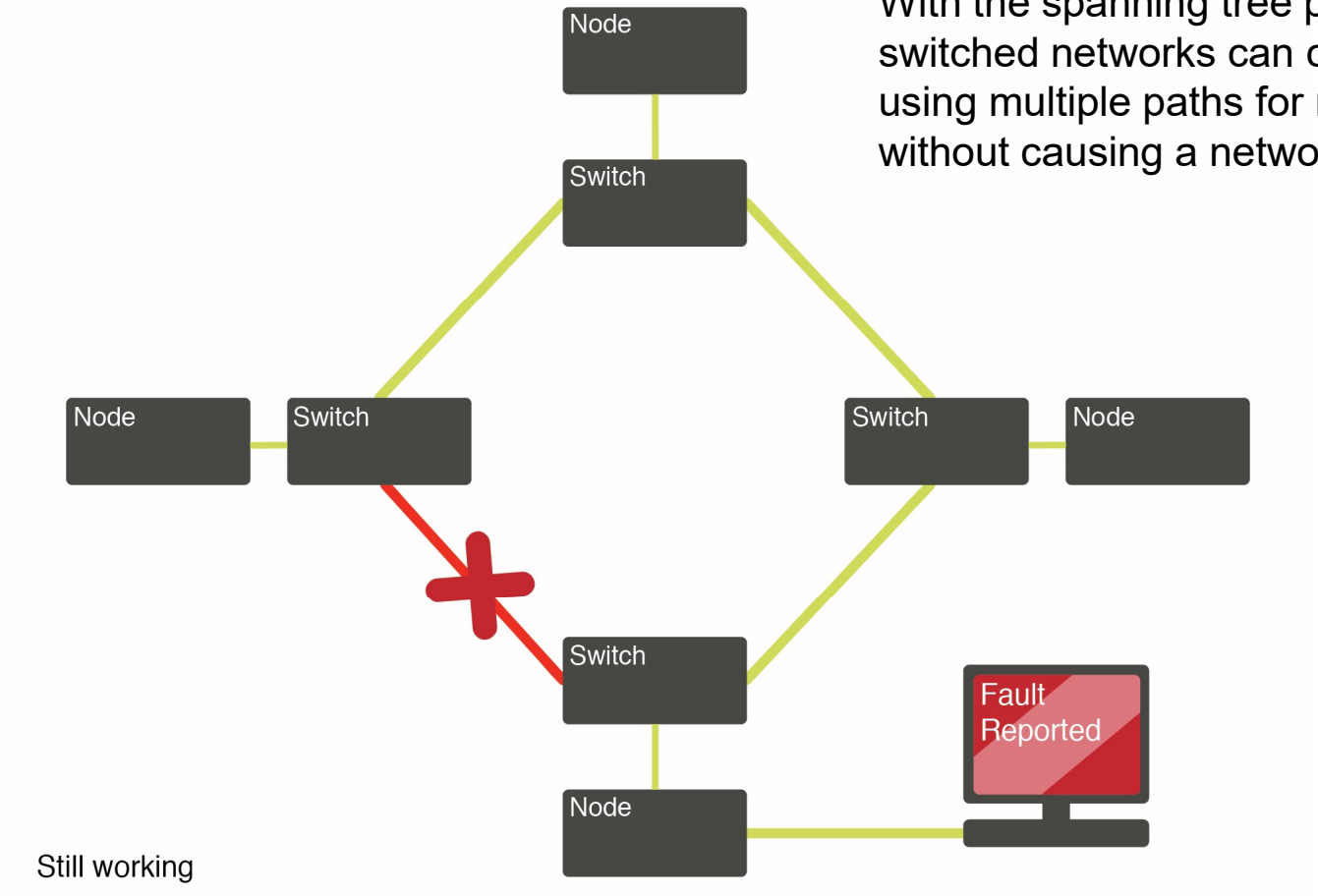
We have redundancy…



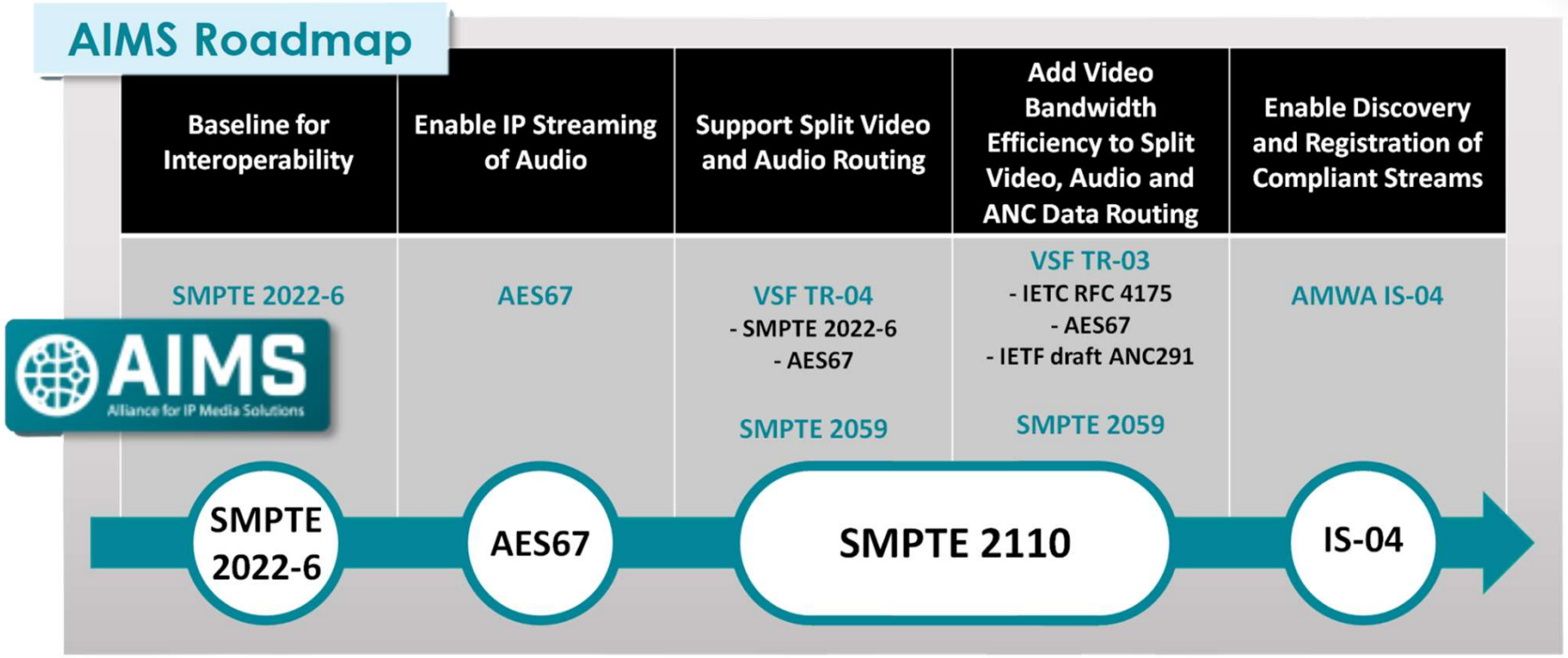
All working

…with Spanning Tree

With the spanning tree protocol (STP), switched networks can connect switches using multiple paths for redundancy without causing a network loop.



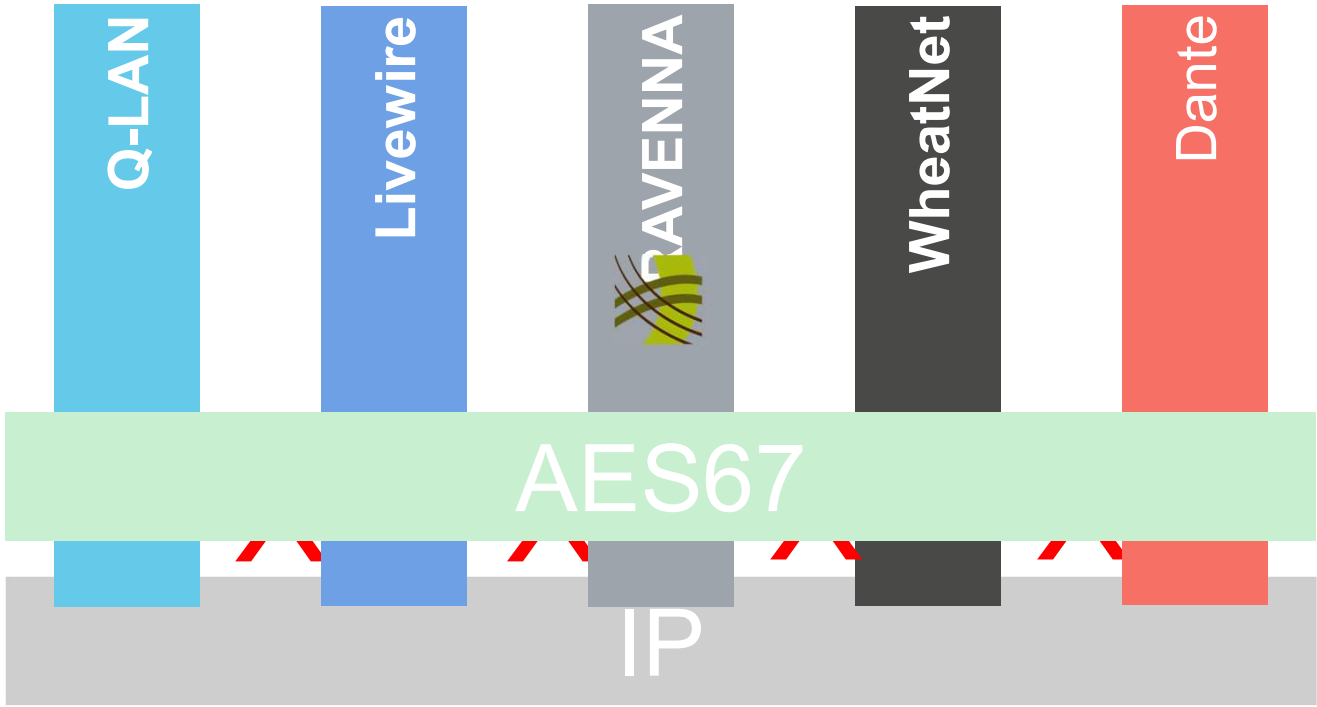

Networking Standards



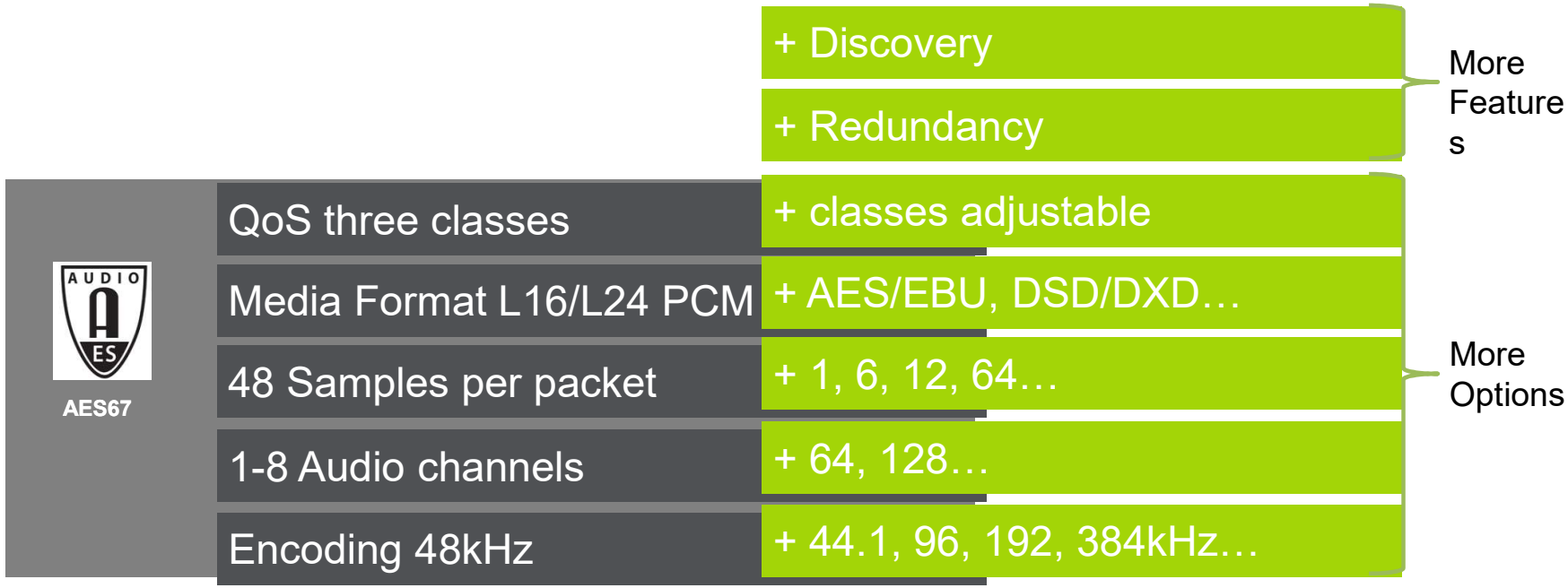
"The Alliance for IP Media Solutions (AIMS), is a non-profit trade alliance that promotes the open standards that broadcast and media companies use to move from legacy SDI systems to a virtualized, IP-based future"

https://www.aimsalliance.org/

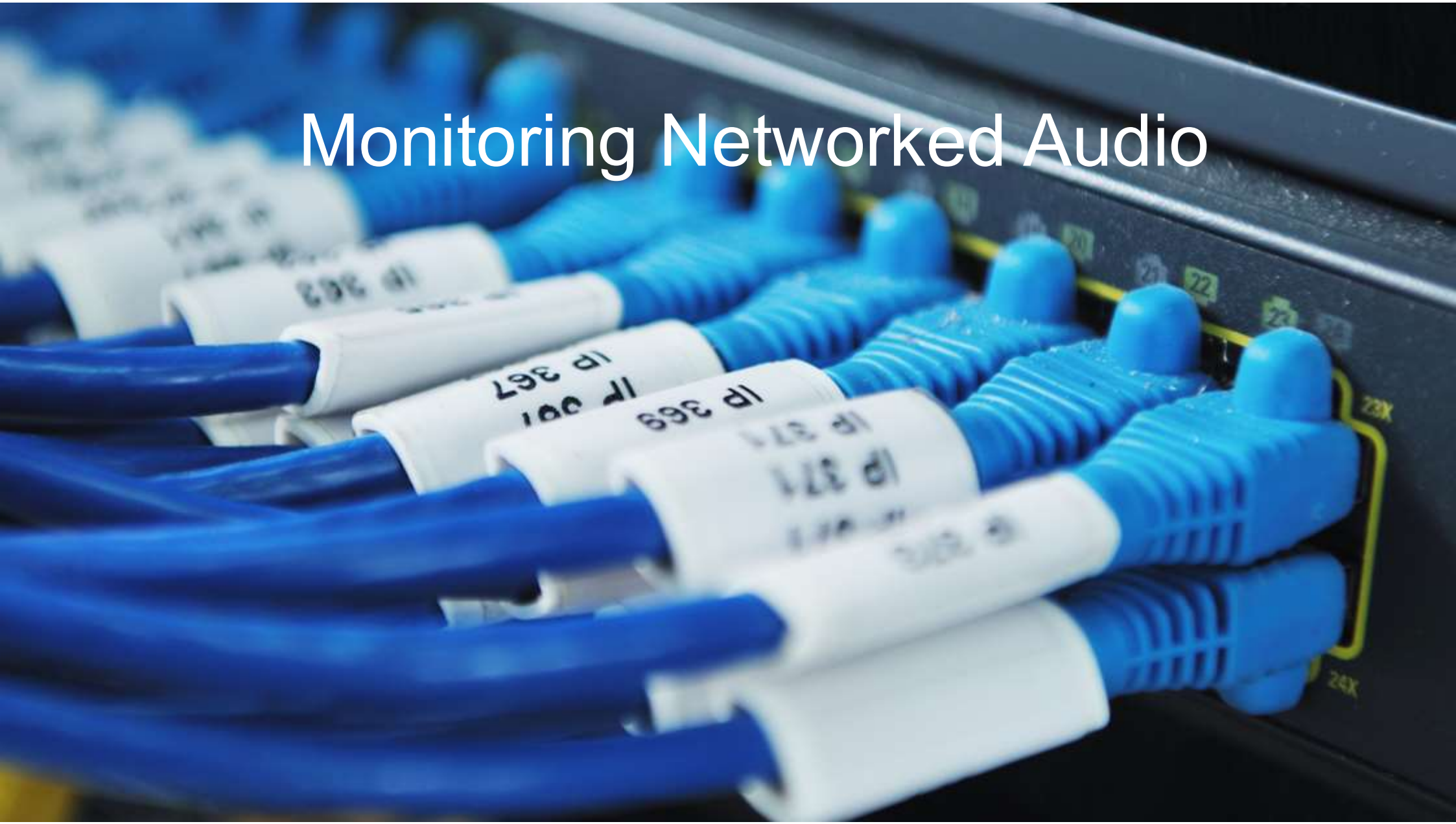
AES67 – AES Standard for Interoperability in High-performance Audio-over-IP Streaming



AES67 - RAVENNA

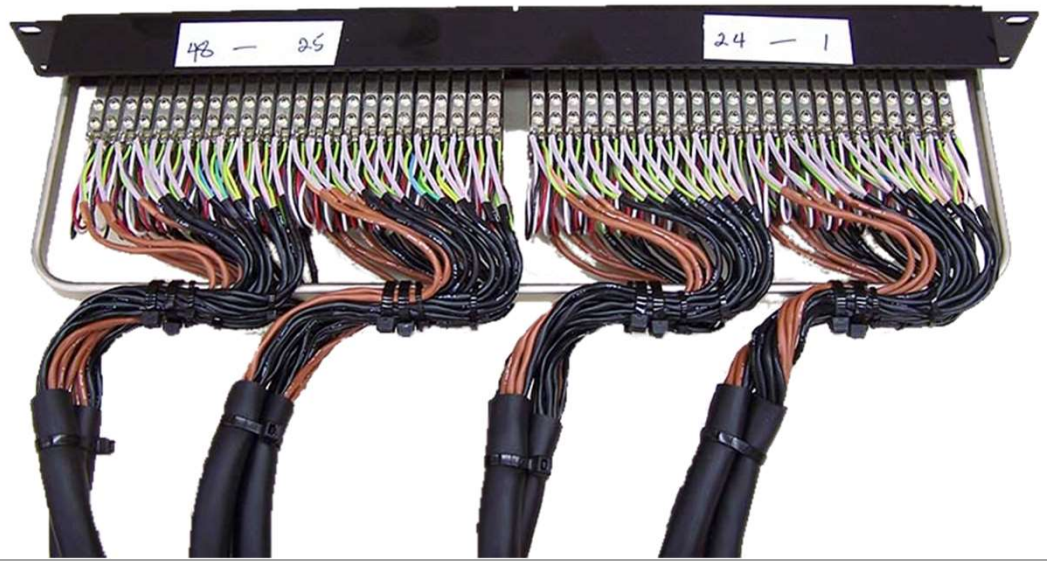


Some RAVENNA Partners


Monitoring Networked Audio

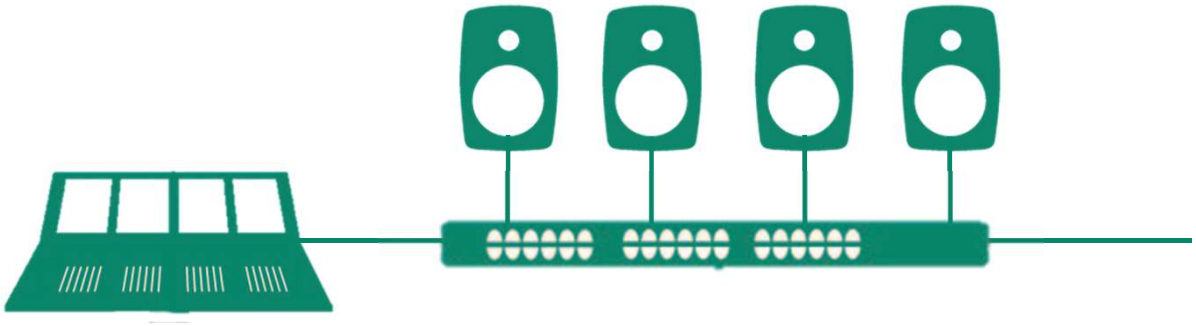
Connectivity, good old days

Batch bay, one-to-one physical links between devices in studio



Expensive, custom cabling requiring experts to build

Connectivity – IP Networking Simplicity



Fast build-up, full flexibility

- Physical cable layout uses standard CAT cabling. This makes installations easy and low-cost.
- Physical cable layout does not limit routing to devices, such as monitor loudspeakers.
- Routing is defined on logical (software) level.
- Physical cabling does not change when signal routings change.

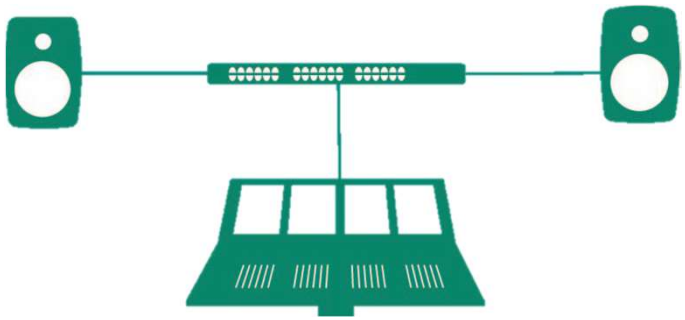
Genelec 8430A IP

- Direct monitoring of audio-over-IP streams
- Ravenna and AES67 compatible up to 96 kHz and 8 channel streams
- Smart Active Monitor (SAM™) compensates for room acoustics
- 1 x XLR analog input, 1 x RJ45 (etherCON) for AES67, 2 x RJ45 GLM control network
- 45 Hz – 23 kHz (-6 dB), ±1.5 dB (58 Hz - 20 kHz)
- HWD 299 x 189 x 178 mm, (12 x 7 x 7 in), with Iso-Pod™

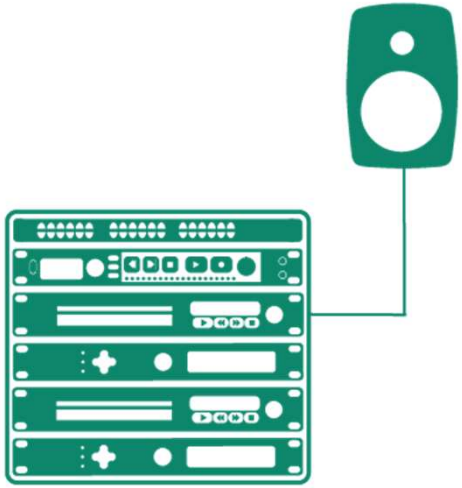
Device-to-device IP networking

- Maximum flexibility:
  - Keep the signal on the IP network as long as possible
  - Every monitor is a separate destination, instant reconfiguration of source
- Accurate synchronised playback across multiple devices
- Reduces costs – network is the router
- SAM™ and GLM™ enable every monitor to reproduce acoustically accurately the original source

Flexibility of Monitoring



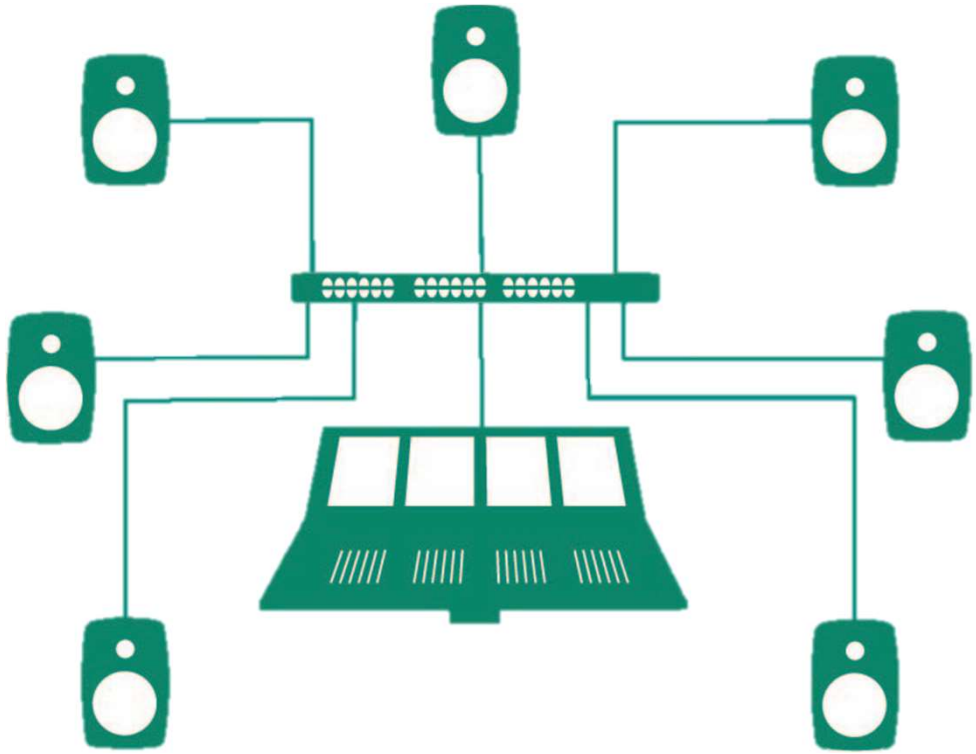
Assignable console or workstation monitoring



Flexible continuity monitoring

- Audio-over-IP enables the monitor to tap to any audio stream and channel in the stream

High Channel Count

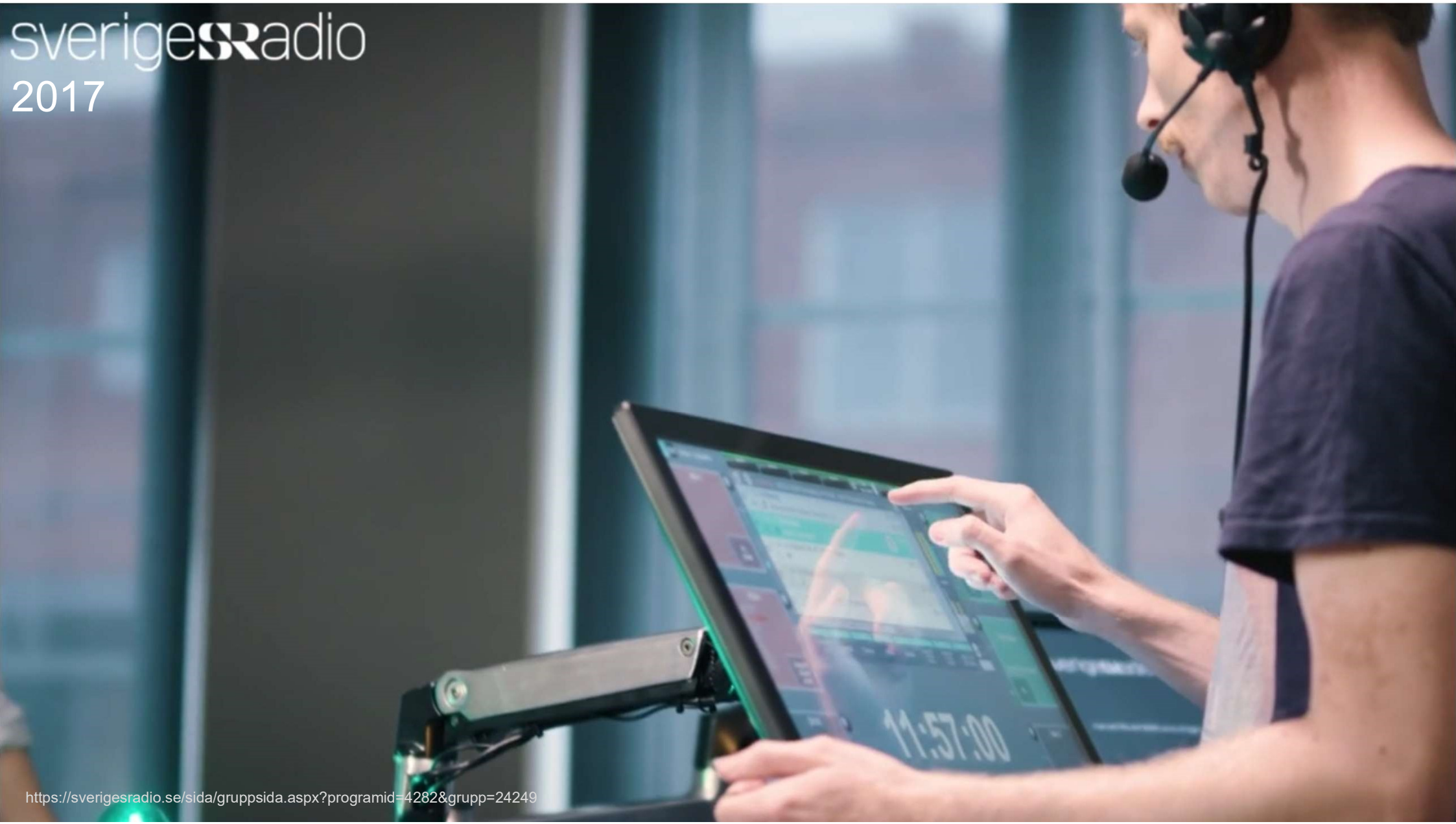


- Audio-over-IP does not limit the channel count, format mix, presentation resolution, or sample rate (bandwidth).
- No limit to the channel count. Audio-over-IP can support all current and future immersive formats, for example.

Broadcast Case Examples

BBC IP Studio Project (2017)


sverigesradio
2017
https://sverigesradio.se/sida/gruppsida.aspx?programid=4282&grupp=24249


sverigesradio
2017
11:57:00
https://sverigesradio.se/sida/gruppsida.aspx?programid=4282&grupp=24249


sverigesradio
2017
12:59:50
https://sverigesradio.se/sida/gruppsida.aspx?programid=4282&grupp=24249

Virtual Radio Studio (2017)

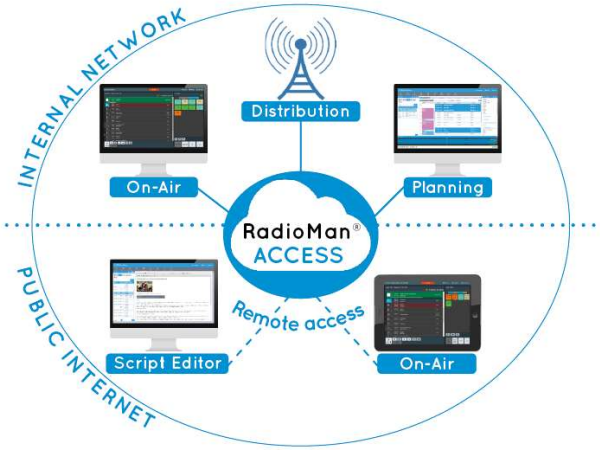
Genelec 8430A

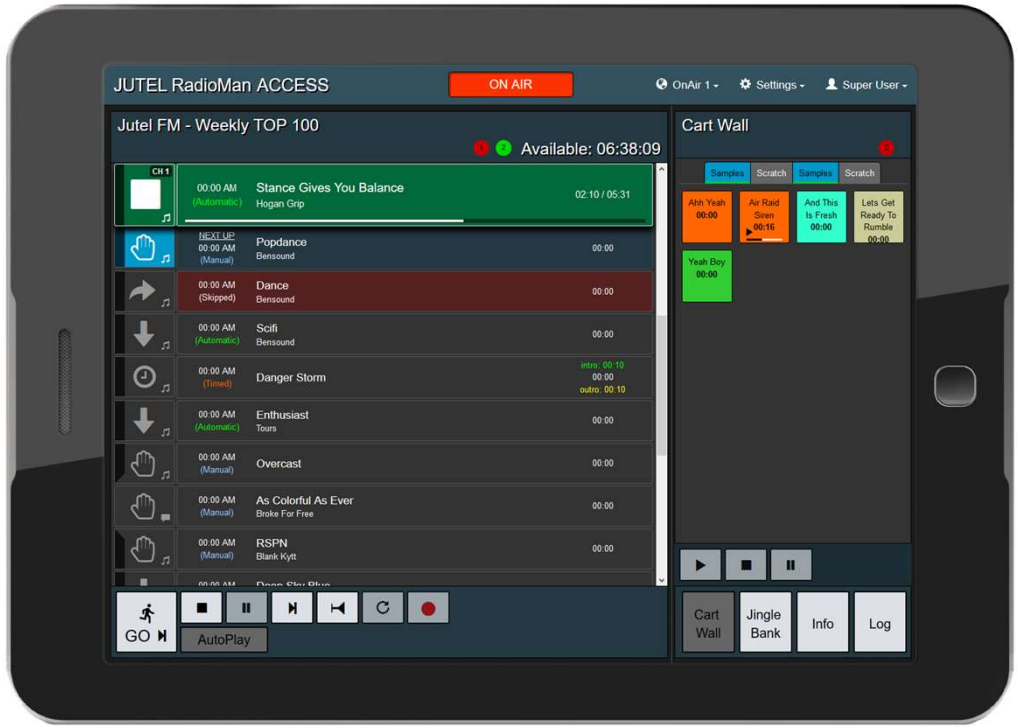
Genelec 8430A

Axia Audio IP-Tablet Virtual Radio software, designed by IP-Studio

https://www.telosalliance.com/Axia/ip-tablet-virtual-radio-software

Jutel RadioMan Access (2018)





RadioMan® ACCESS On-Air tablet interface

https://jutel.fi/products/jutel-radioman-access/

Hogeschool, Utrecht

Hogeschool, Utrecht

CCTV EFP system in Djakarta, control room 1

CCTV EFP system in Djakarta, control room 2

CCTV EFP system in Djakarta, control room 3

AV Install Case Examples

Maaninka Church, Finland

Restaurant Nallikari, Finland

http://www.n4s.fi/2015magazine/article13/

Summary

- standard Ethernet hardware
  - running on standard IP networks keeps operation simple and cost down
- AES67 and RAVENNA for audio-over-IP
  - open system designs and standard protocols, part of ST2110
  - uncompromised quality
- direct monitoring of AES67 compliant streams
  - simplifies system design, build, and operation
  - keeps the system cost and complexity down
  - has great flexibility: direct access to any channel, in any stream, by only logical configuration

the sonic reference