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Livewire+ AES67 Audio over IP: Becoming the Foundation of Broadcast Radio

Ken Skok, Director of Sales, Asia Pacific, Telos Alliance

- How technology is changing the design concept AoIP broadcasting equipment and systems (기술이 어떻게 AoIP 기반의 방송 장비 및 시스템 디자인 개념을 변화 시킬 수 있나요?)
- AES67-2013 AoIP standards and promotion process (AES67-2013 AoIP 표준과 홍보 과정)
- "High-performance audio technology network interconnection standards" (고기능 오디오 네트워크 기술의 연결 표준)
- AES67 applications in Radio and Television and the audio field (라디오 및 텔레비전, 오디오 분야의 AES67 적용)

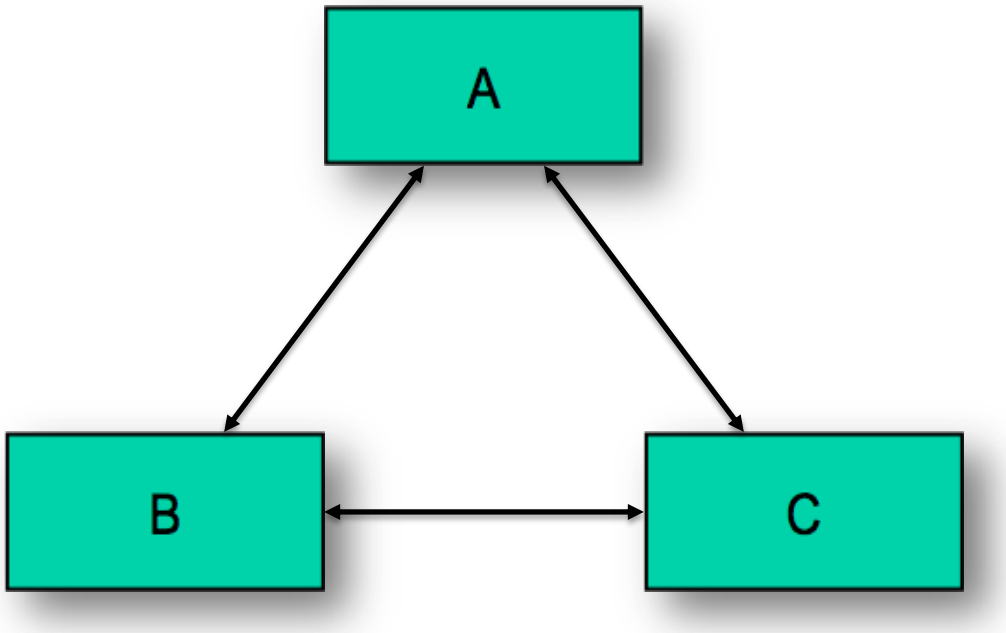
Explore the profound impact AoIP broadcast design systems technology bring: (AoIP 방송 시스템 디자인이 가져다 주는 심오한 효과에 대한 탐색)

- It applies to radio and television studio, studio and broadcast trucks (라디오 및 텔레비전 스튜디오, 스튜디오 및 중계차에 제공됩니다.)
- Modern broadcast history of Review and Prospects (현재의 방송 역사에 관한 평가 및 전망)

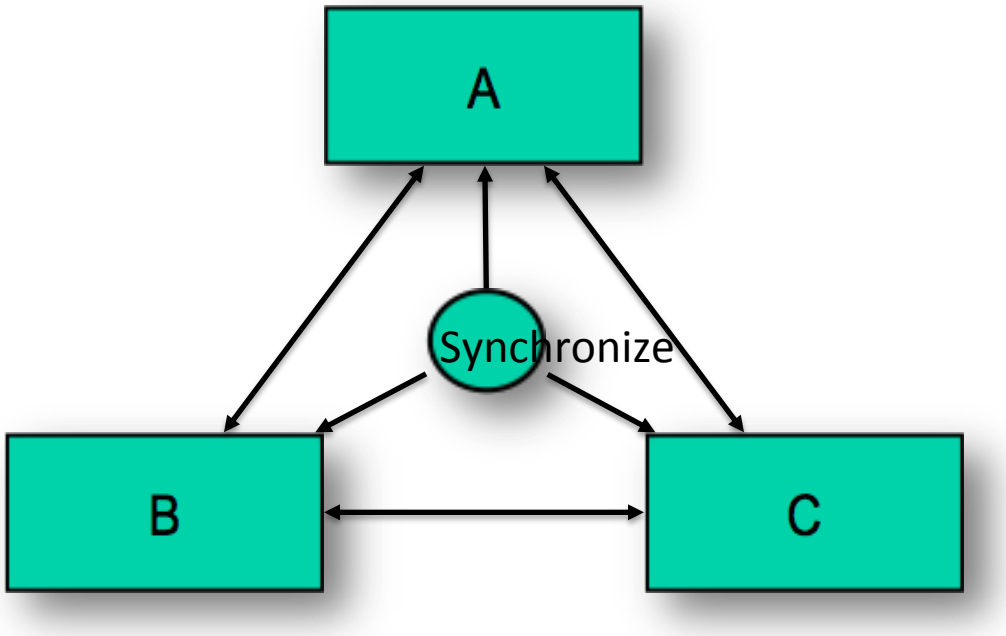
(The new technical standard AES67 AoIP open up infinite possibilities) (새로운 기술인 AES67 AoIP가 열어놓은 무한한 가능성)

Broadcasting Systems Evolution

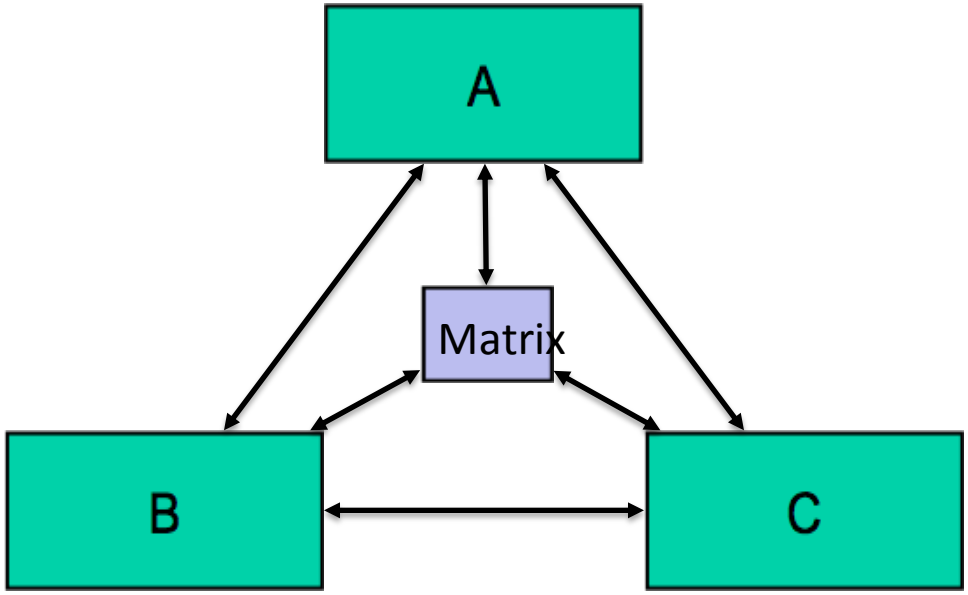
Stage 1 | Classic Analog Studio



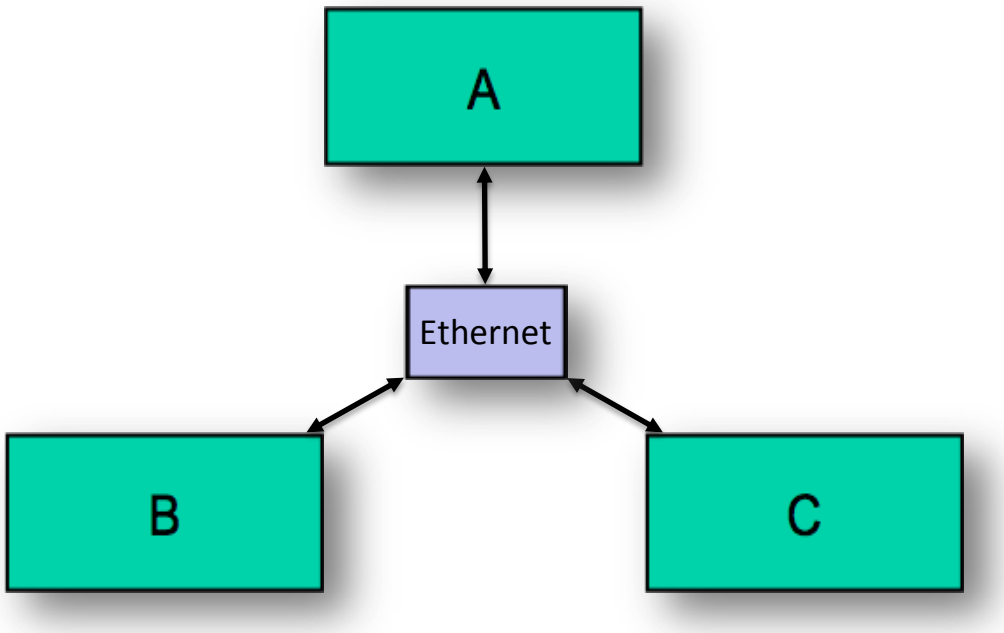
Stage 2 | Digital Studio （AES3 / SDI / MADI）



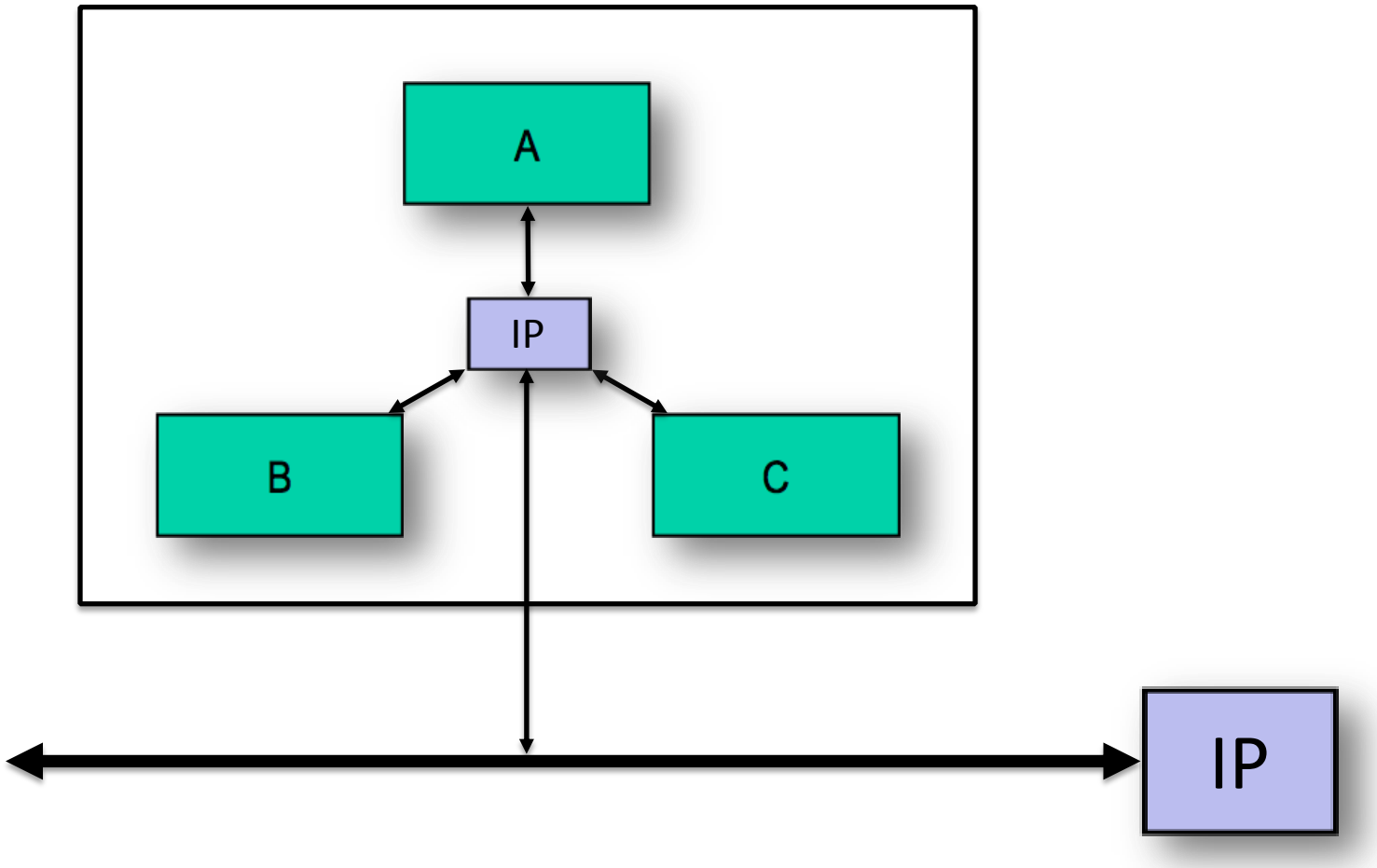
Stage 3 | TDM Matrix （AES3 / SDI / MADI）



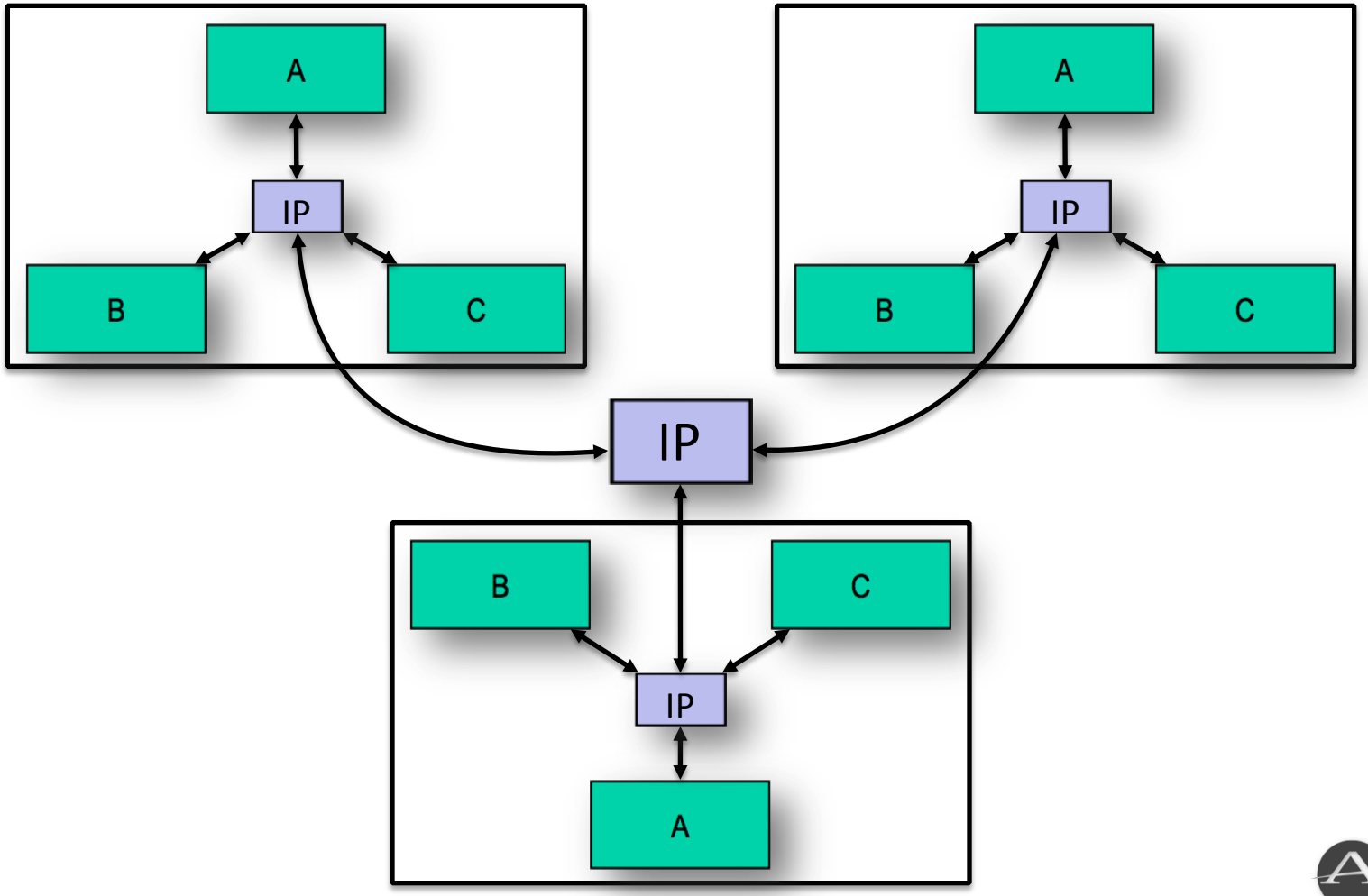
Stage 4 | Network audio inside the studio (Livewire+ AES67 / AVB)



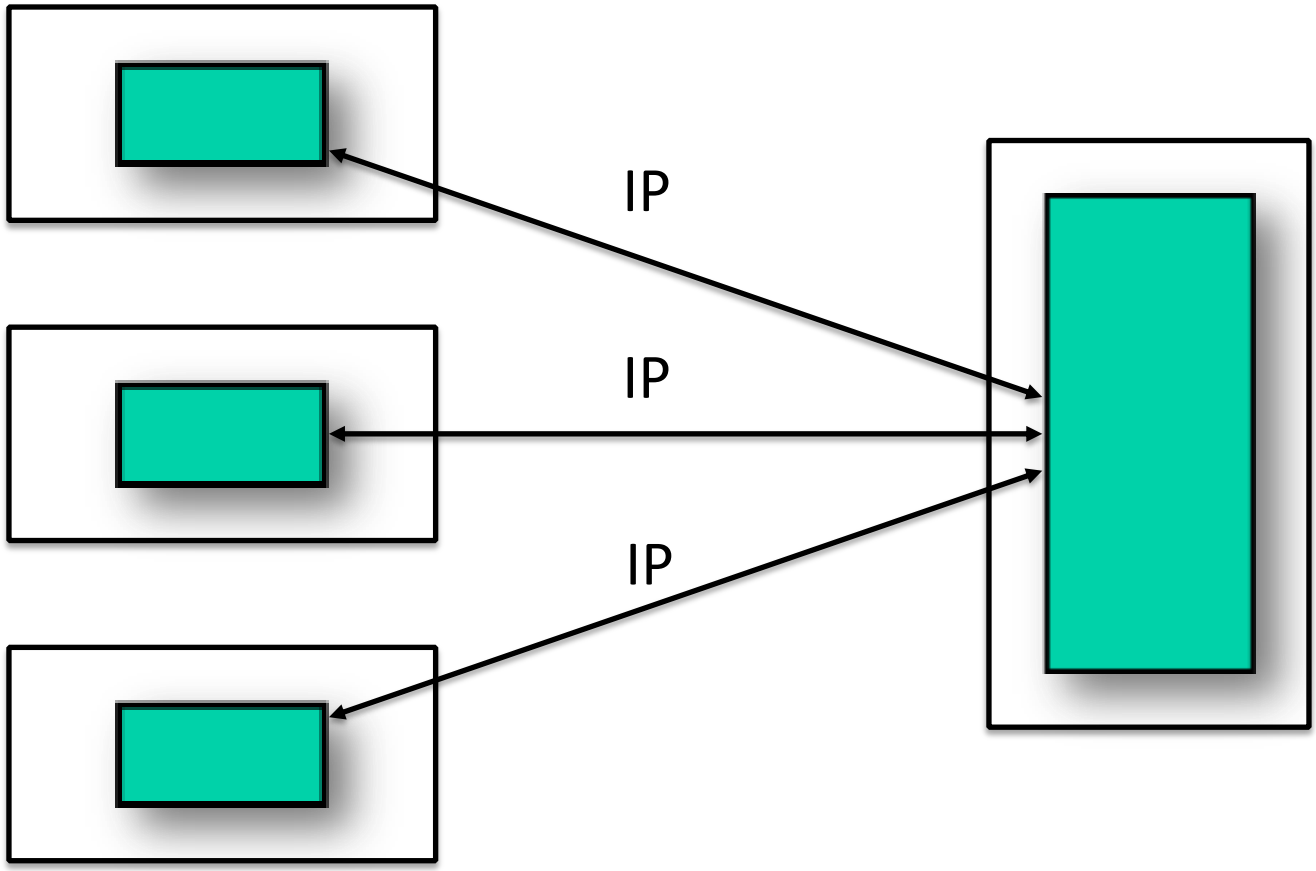
Stage 5 | IP audio in & out of the studio (Livewire+ AES67)

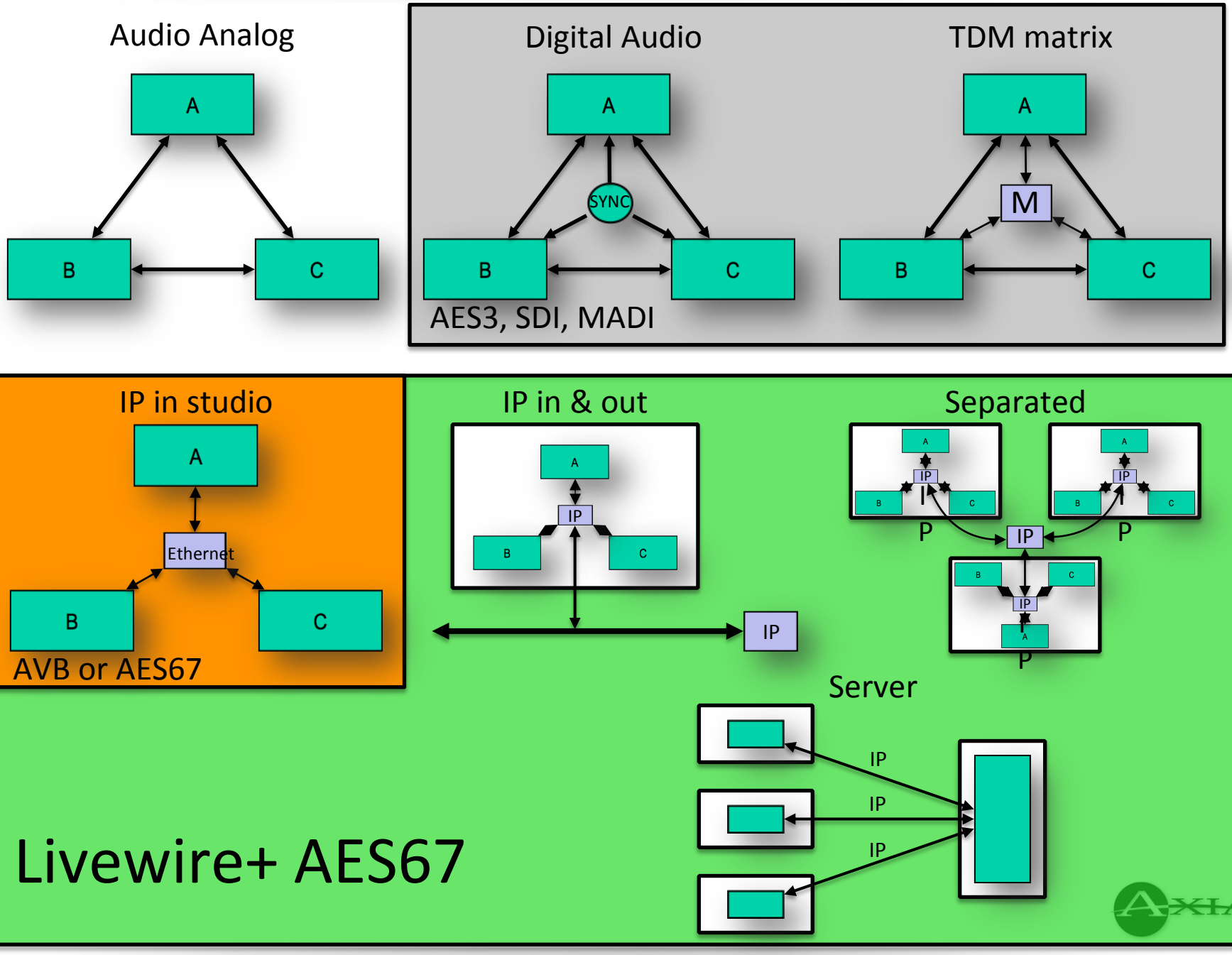


Stage 6 | Separated geography, acting as one studio (distributed structure) (Livewire+ AES67)



Stage 7 | Geographically centralized server room (Livewire+ AES67)




Audio Analog
A
B
C
Digital Audio
A
SYNC
B
C
AES3, SDI, MADI
TDM matrix
A
M
B
C
IP in studio
A
Ethernet
B
C
AVB or AES67
IP in & out
A
IP
B
C
IP
Separated
A
IP
B
C
P
IP
P
P
Server
IP
IP
IP
Livewire+ AES67

AoIP broadcast audio system design based on the new network can adapt to needs

Based on Layer 3, AES67 Livewire + network audio technology not only feasible, but also has formed a complete ecosystem

Status of AES67 : (AES67 발전현황)

- Review: AES67 standard issued Sept 2013
- 24 bit linear 48Khz (opt 44.1/96) uncompressed digital audio
  (Carried on IP network layer 3 (UDP/RTP)
- Hundreds or thousands of channels on LAN and managed WAN
  Standard IT network switches
- IEEE-1588 for synchronization (SMPTE adopting too)
- Multiple vendor demo last NAB April 2014.
- First open vendor-to-vendor 'plug fest' in Munich, hosted by IRT, October 2014. 15 vendors present. 'Acid test' of real interoperability, vendor neutral host.

Progress of AES67 adoption:

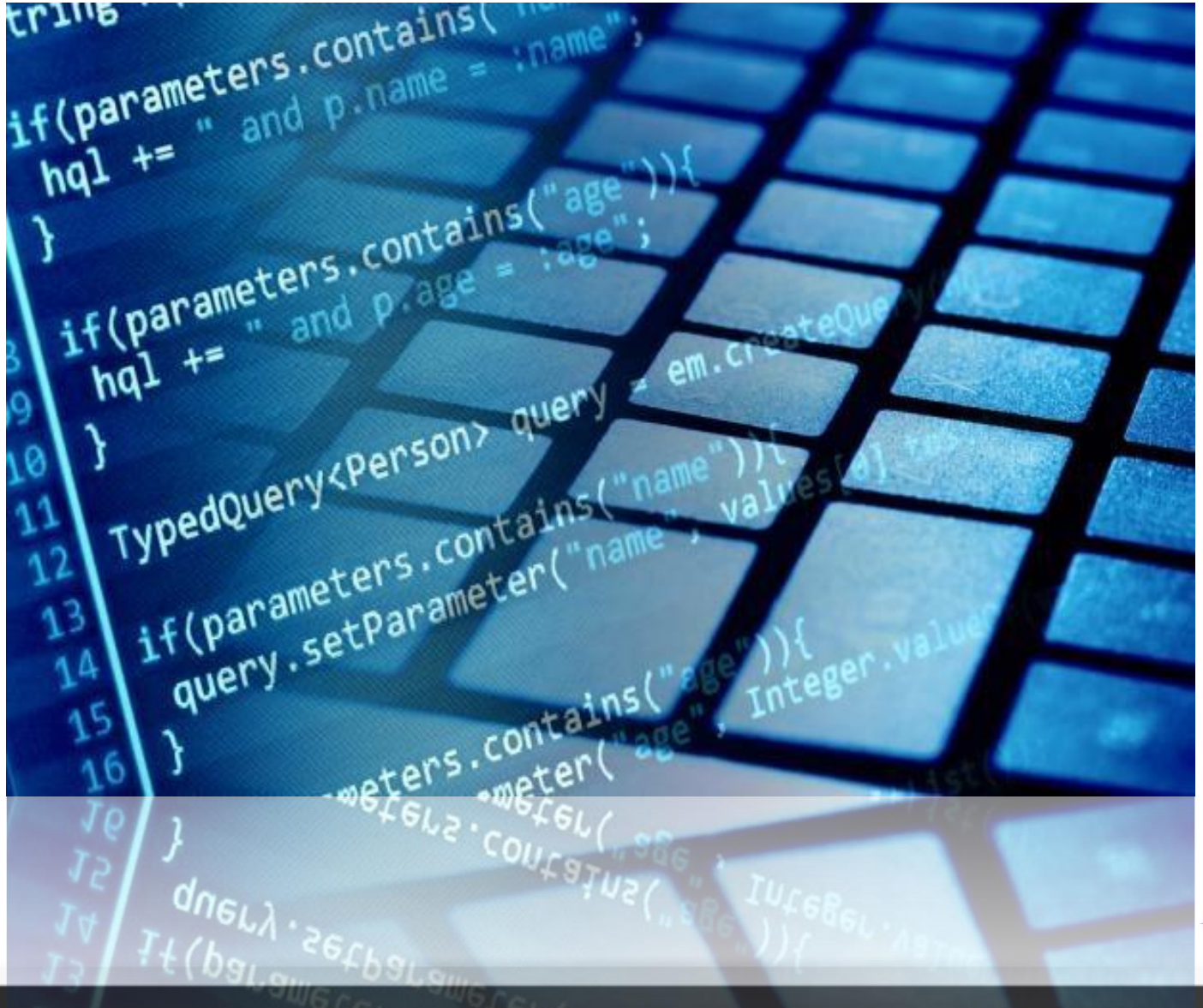
Very rapid adoption rate: Embraced by all major broadcast audio equipment vendors: Calrec, Digigram, Dolby, Harman, Jutel, Lawo, Merging Tech, QSC, Ravenna, Riedel, Studer, Telos Alliance, Wheatstone…*Audinate (Dante), and through Dante: (140 total) Allen & Heath, Behringer, Bosch, Bose, BSS, Crestron, ESI Audiotechnik, Extron, Focusrite, Nexo, Peavey, Shure, Soundcraft, SSL, Stewart, Symetrix, TC Group, Yamaha……*

These come from a wide cross section of industries:

Radio, TV, arena sound, live sound, intercom, motion picture theater, production, microphones, speakers, and processing.

What is the most valuable thing that Audio over IP connects directly to?

Software !


if(parameters.contains(
hql += " and p.name = :name";
}
if(parameters.contains("age")){
hql += " and p.age = :age";
}
TypedQuery<Person> query = em.
if(parameters.contains("name")){
query.setParameter("name",
}

In conclusion(결론):

Equipment manufacturers quickly accepted the new AES67 network audio technology one step ahead of the industry standard Livewire+AES67 has redefined broadcasting system capacity and cost

(장비 제조사들은 한 단계 앞서 신속하게 산업 표준으로 AES67 네트워크 오디오 기술을 받아들이며, Livewire+AES67이 방송 시스템 용량과 비용을 재평가 합니다.)

AoIP Protocol Comparisons:

	AES67 Compatibility	IP Layer 3 Routable	GPIO control included	Standard IP switches
AES67	Yes	Yes	No	Yes
Livewire+	Yes	Yes	Yes	Yes
AVB	No	No	No	No
Dante	(Announced)	Yes	No	Yes
Ravenna	Yes	Yes	No	Yes

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Ken Skok, Director of Sales, Asia Pacific & Russia, Telos | Omnia | Axia | 25 Seven

1984

2015

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Telos® Omnia® 25 seven™ AXIA® LINEAR ACOUSTIC®

Hybrids:

VX Talkshow System

Codecs:

Zip One

IP Intercom

AES67 Livewire+

AoIP Consoles:

Fusion

Watermark:
Voltair

Audio Time content Management:
PDM

Streaming Audio:
9X/2

Audio Processing:
Omnia 9

Omnia®

Audio Analysis:

MT 2000

Intelligent Dynamics:

LINEAR ACOUSTIC®

- Network Audio Transmission Technology Overview
- How to build a network audio system

Networks are Everywhere!

Ethernet already one of the most-common ways of transporting audio within the broadcast environment?

- Automated or live-assist delivery systems
- Store-and-forward systems
- Delivery of streaming content

Use of existing infrastructure:

- AoIP making traditional audio distribution infrastructures obsolete as the tape machine.
- AoIP use same IP technology that powers business data networks.
- AoIP eliminates the discrete-wiring model used since the dawn of radio.

AoIP Benefits:

- IP Audio networks enable broadcasters to cut costs by using a common transport mechanism for audio, control, messaging, and other data traffic such as files and e-mail and VoIP phones.
- IP-Audio networks provide broadcasters the flexibility to grow and change at will.
- Because IP-Audio networks are standards-based, even smaller stations can afford to deploy them.

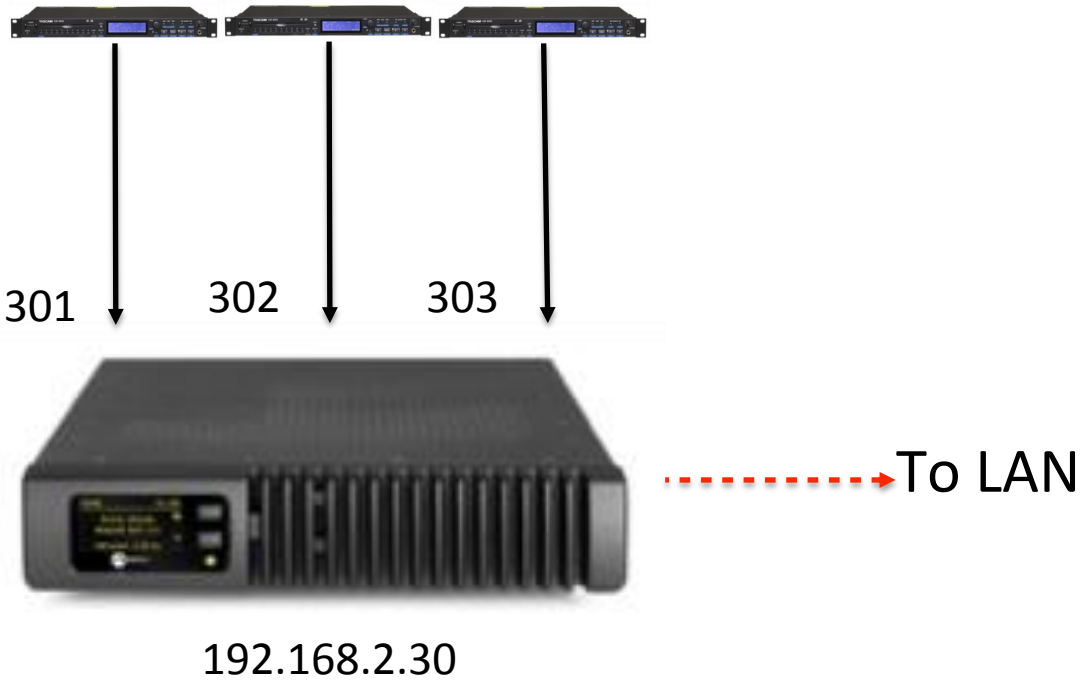
How IP-Audio works:

Audio sources connect to Audio I/O Device

How IP-Audio works:

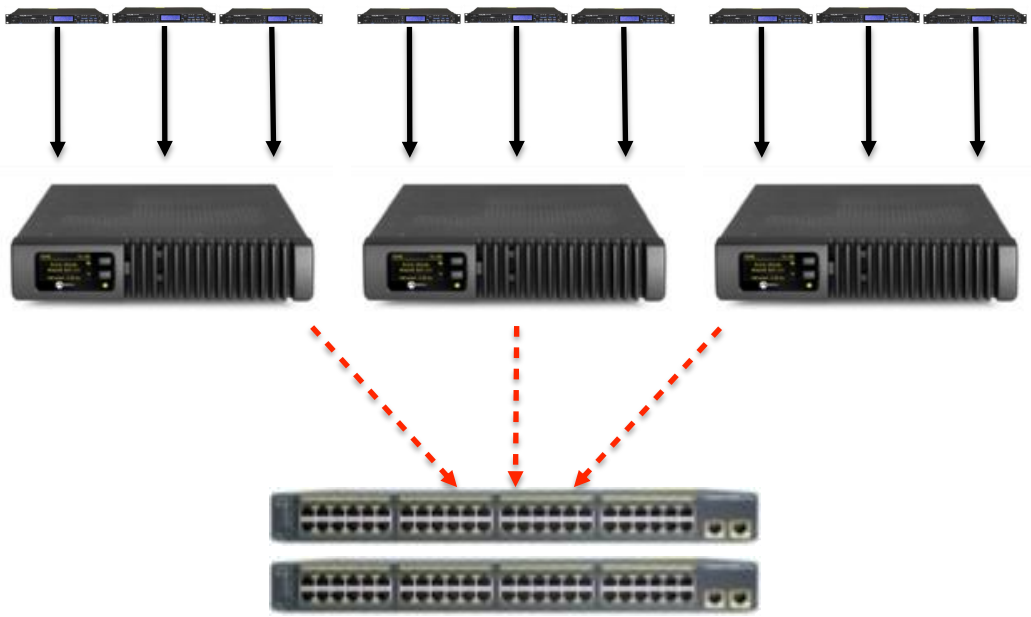
xNodes convert audio to uncompressed, 24-bit/48 kHz digital audio, then packetize into RTP streams.

How IP-Audio works:



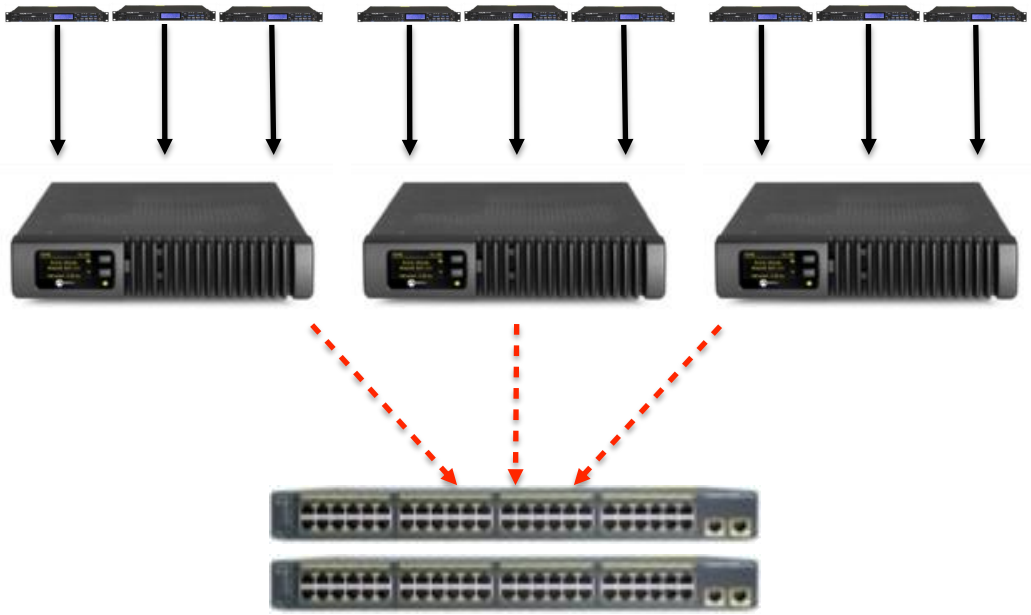
Each audio source is given a channel number. Each xNode is assigned an IP address for identification and routing purposes

How IP-Audio works:



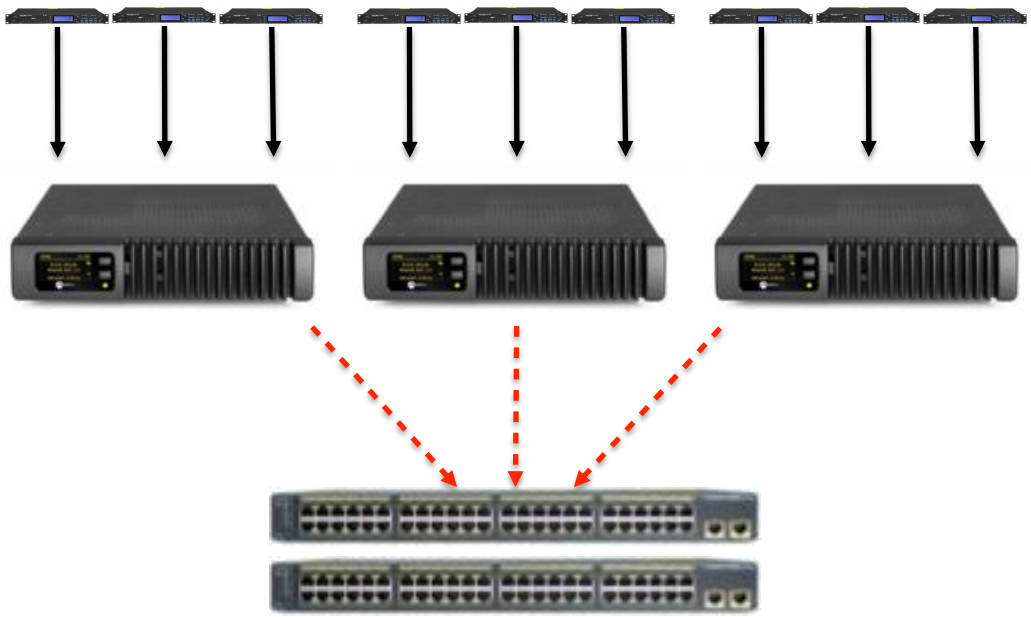
xNodes are networked to each other over a standard Ethernet IP network.

How IP-Audio works:



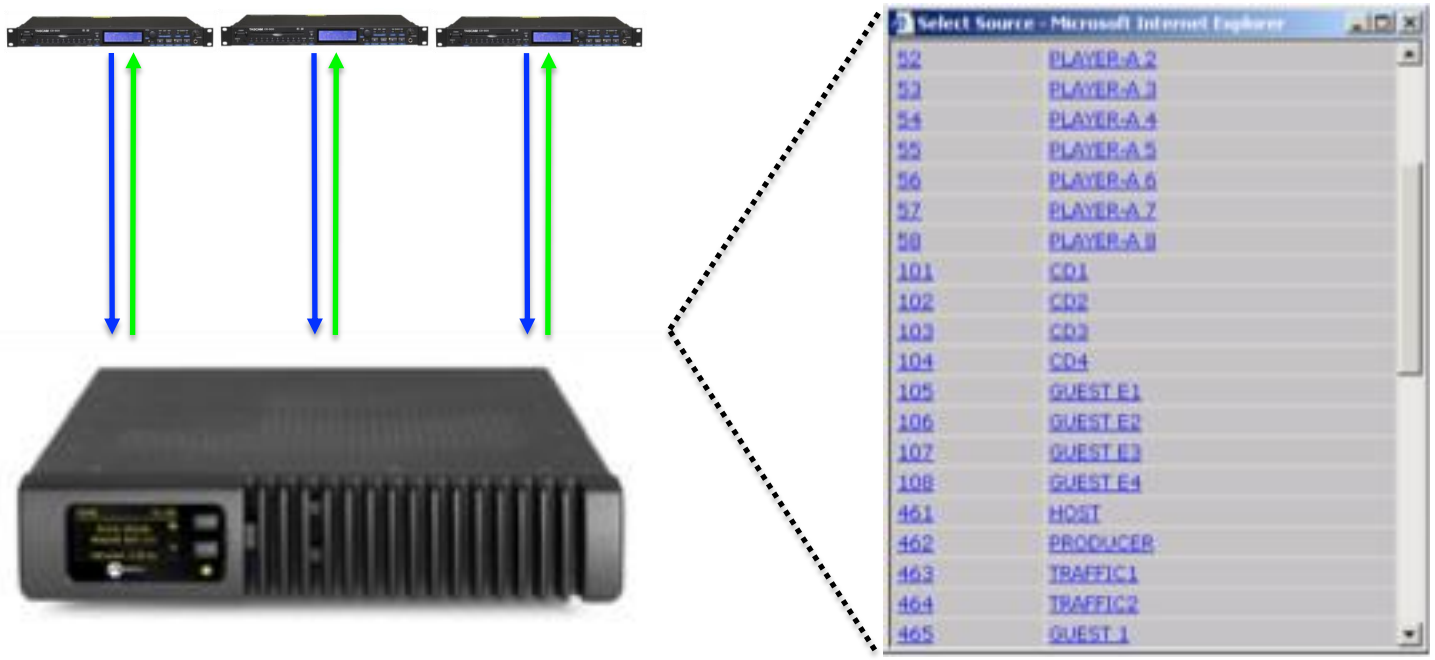
The combination of standard protocols used STP, UDP, QoS, IGMP, etc. We collectively called “Livewire+”.

How IP-Audio works:



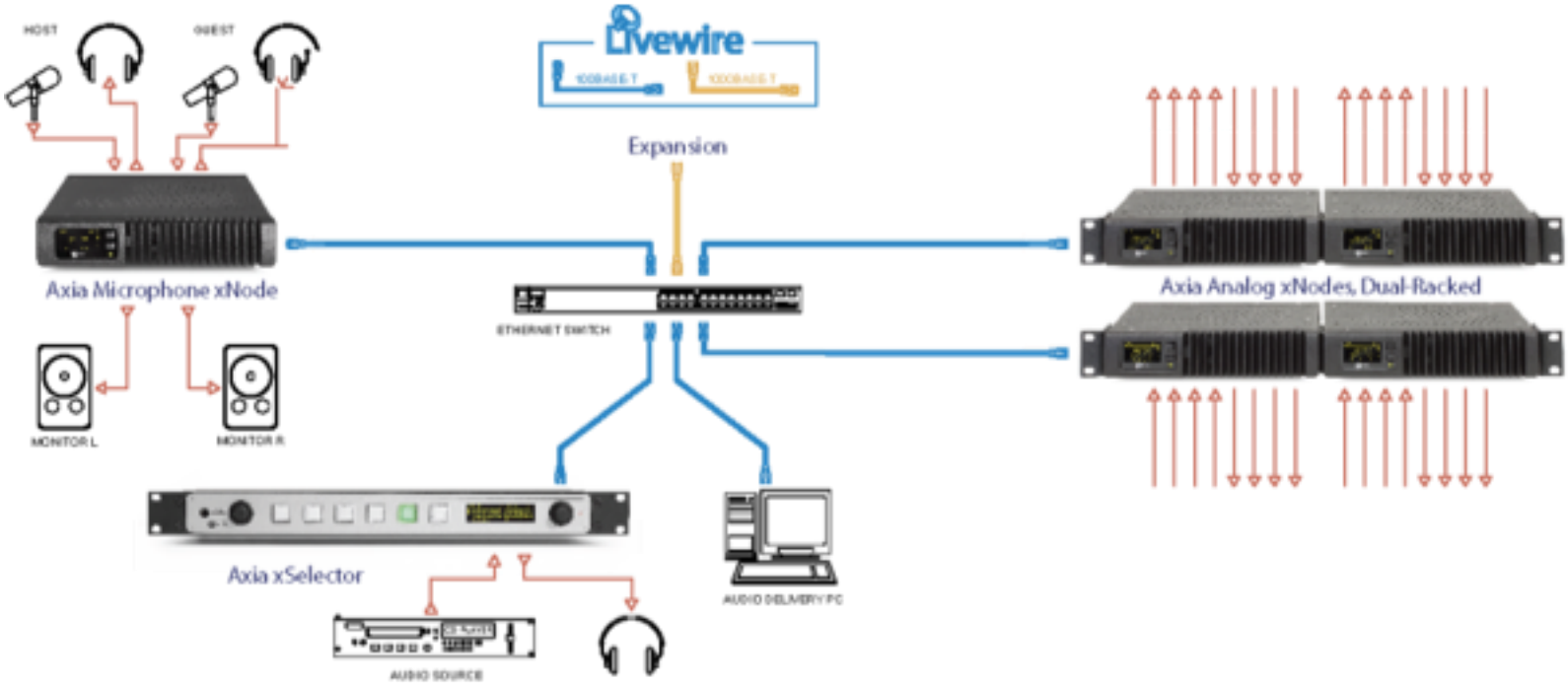
Audio streams are “Multicast”.
They arrive at the Ethernet switch and wait there.

How IP-Audio works:



Source names and addresses are “displayed” across the network.
Each node Automatically Discovers other xNodes’ sources.

How IP-Audio works:



A networked routing switcher is built by networking nodes and PCs.

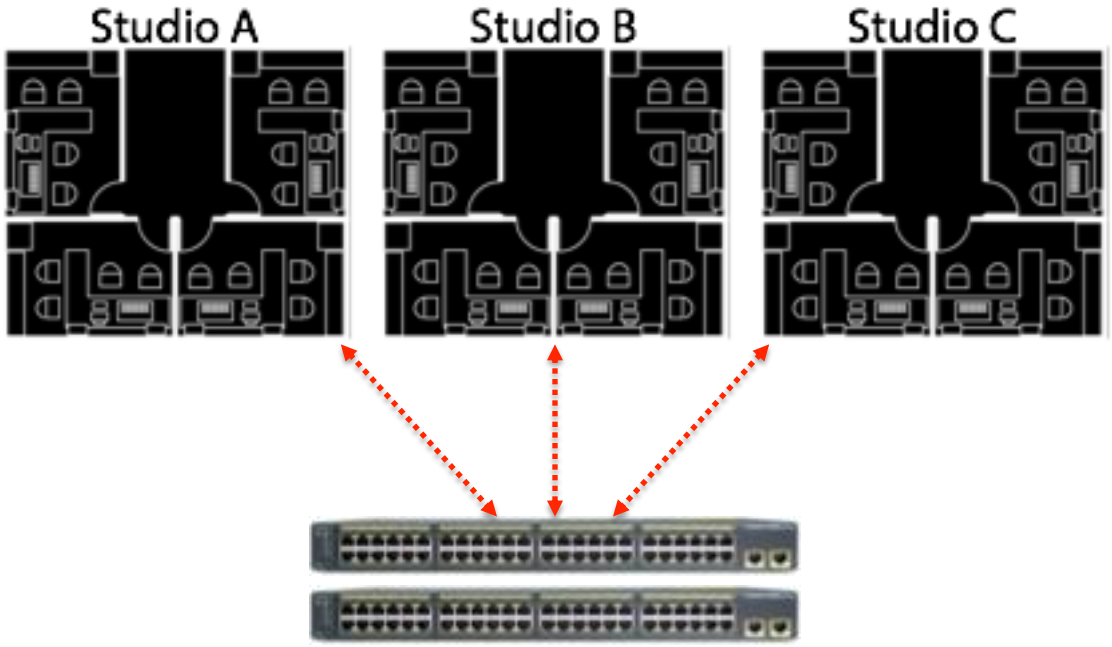
How IP-Audio works:

Add a control surface (console) and Mix Engine for a complete Studio.

How IP-Audio works:

Node installation at Minnesota Public Radio.
Typically two nodes per studio.

How IP-Audio works:



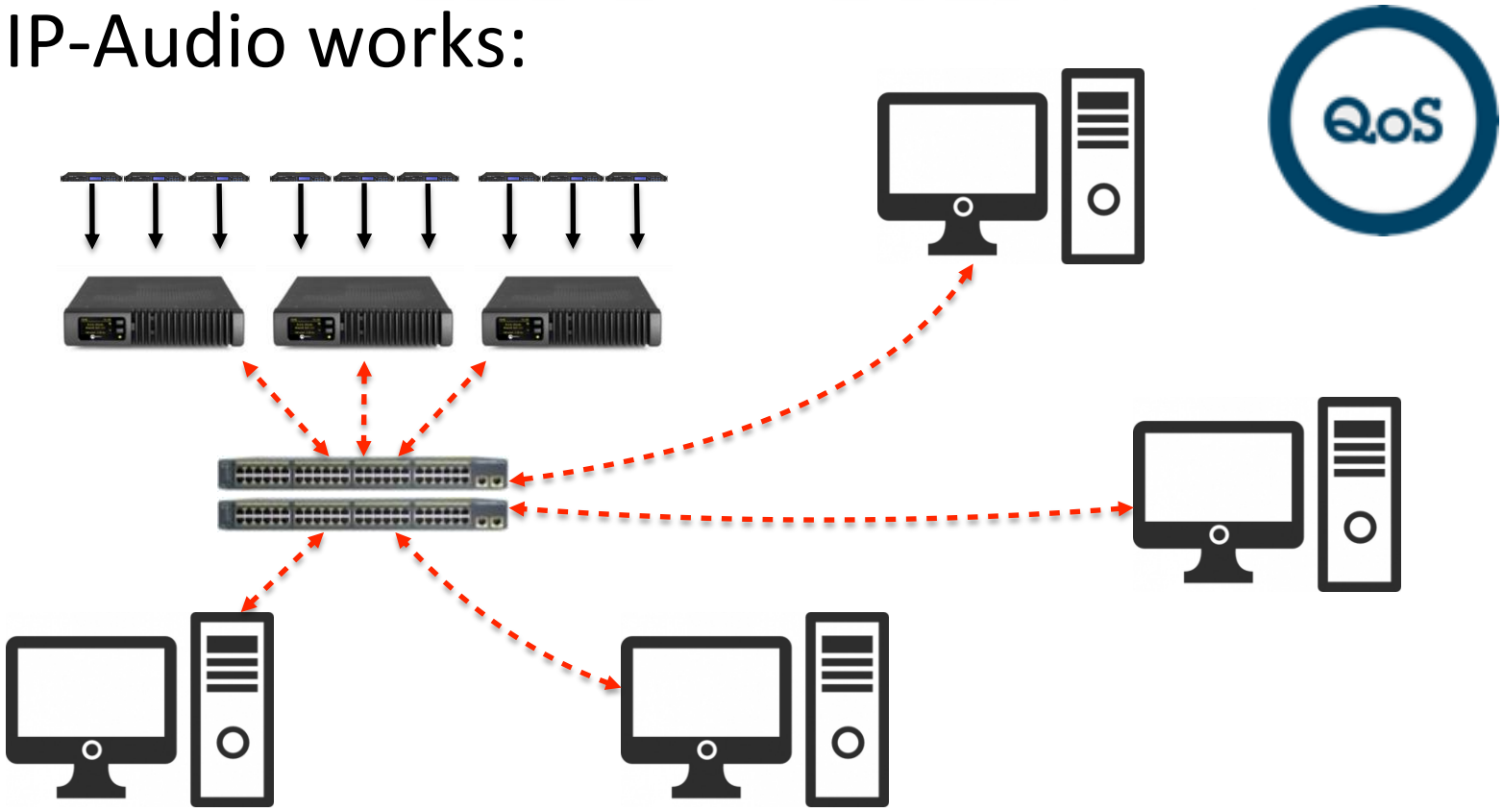
Each studio's local Ethernet switch is connected to the other rooms via core switches or daisy-chain.

How IP-Audio works:

MPR – Central Rack per floor for Ethernet Switches and Mix Engines

WICR-FM, Indianapolis Rack with Ethernet switches and Tech Center nodes.

How IP-Audio works:



Livewire+ packets and streams are fully compatible with other IP traffic. E-mail, TCP, HTTP, SMTP, IPX/SPX, etc. may all traverse the same network as Livewire.

Audio over IP: What's Different?

- xNodes conveniently placed near the equipment they serve.
- Short audio cable runs. Quick installation.
- CAT5e or 6 cable from xNodes to the Ethernet switch.

- Wiring materials and labor are reduced dramatically!
- Installation time is HOURS, not DAYS.
- Configuration is done using a PC and browser.

AES/EBU	*Ethernet*
15 years old stagnant technology	Sustained and rapid development
Only 1 stereo pair	512 channels via 1Gb/s connection
One way	Full time duplex
Soldered connector, hard to make	RJ-45 connector
Audio only, no data	Audio, GPIO and advertising info
Low volume, high cost	High volume, low cost
Need Expensive TDM Matrix	Universal IT Tech, cost saving

Why Ethernet is better?

- 100 Mbps to 1 Gbps to 10 Gbps.
- CAT 5e/6 Copper or Optical Fiber.
- Switched star, not shared – No collisions.
- Full-duplex
- Priority for audio Quality-of-Service.
- Multicast allows one-to-many.

Audio over Ethernet/IP: Why Is It So Good?

- IT industry agreed upon technological innovation going forward
- Uses a common and universal wiring
- Volume brings performance, variety, and low cost
- AoIP control of the audio, telephone and information systems

Revolutionary change with AoIP: (AoIP 혁신적인 기술 변화)

- Not a traditional “router”, it’s an audio “network”
- Livewire+ leverages standard, off-the-shelf Ethernet switches to route audio
- These Ethernet switches come from the huge IT industry.

AoIP 혁신적인 기술 :

- Ethernet switch can completely replace TDM Router
- One switch can handle thousands of channels
- Extend network capacity just by adding more switches

AES67/Livewire+ AoIP System:

- Use switch to build, but work like TDM system
- Fast installation, high reliability, high flexibility, low latency, low cost

Livewire Where we are Today...

AXIA

Enter AES67:

- AoIP standard newly adopted in 2013 known as AES67
- Only standardizes audio interoperability
- xNodes support AES67 today

	AES67	Livewire
Audio Interoperability	☑	☑
GPIO		☑
Discovery of Audio Streams		☑

AES67 and Telos Alliance:

- We are a founding member of the committee
- We funded the committee
- Our principal engineers are very active members of the committee

AES X192 Founding Member:

Greg Shay
Telos Alliance

AES New York 2013
Network Audio Session N5

Sunday, October 20, 11:00 am — 12:30 pm (Room 1E08)

N5 - X192 / AES67: How the New Networked Audio Interoperability Standard Was Designed

Chair:
Greg Shay, The Telos Alliance - Cleveland, OH, USA
Panelists:
Kevin Gross, AVA Networks - Boulder, CO, USA
Stefan Heinzmann, Heinzmann - Konstanz, Germany
Andreas Hildebrand, ALC NetworX - Munich, Germany
Gints Linis, University of Latvia - IMCS - Riga, Latvia
Abstract:
It is said, to really understand a solution, you must clearly understand the problems it is solving. The nature of a technical specification like AES67 is that it is the end result of much discussion and deliberation. However, many of the intentions, the tradeoffs that were made, and an understanding of what problems were being solved, are not fully contained in the resulting document.

AES67,
언제 실용 단계로 진입하게 될까요?

Learn about AES67

AES67=AoIP Confidence Now !

- What does the AoIP future look like?
- Overwhelmingly the dominant technology
- As Livewire garnered dozens of partners, so will AES67.

Livewire+ growing with AES67

- AoIP connectivity to over 70 broadcast equipment items now.

- Includes Source Advertising and GPIO now.
- Livewire+ includes routing, control, real-time monitoring over the same Ethernet/IP.
- Livewire+ licensing for any manufacturer or party.
- First US-manufacturer of AES67 compliant equipment

Milestones of Livewire AoIP

2002 - 2015

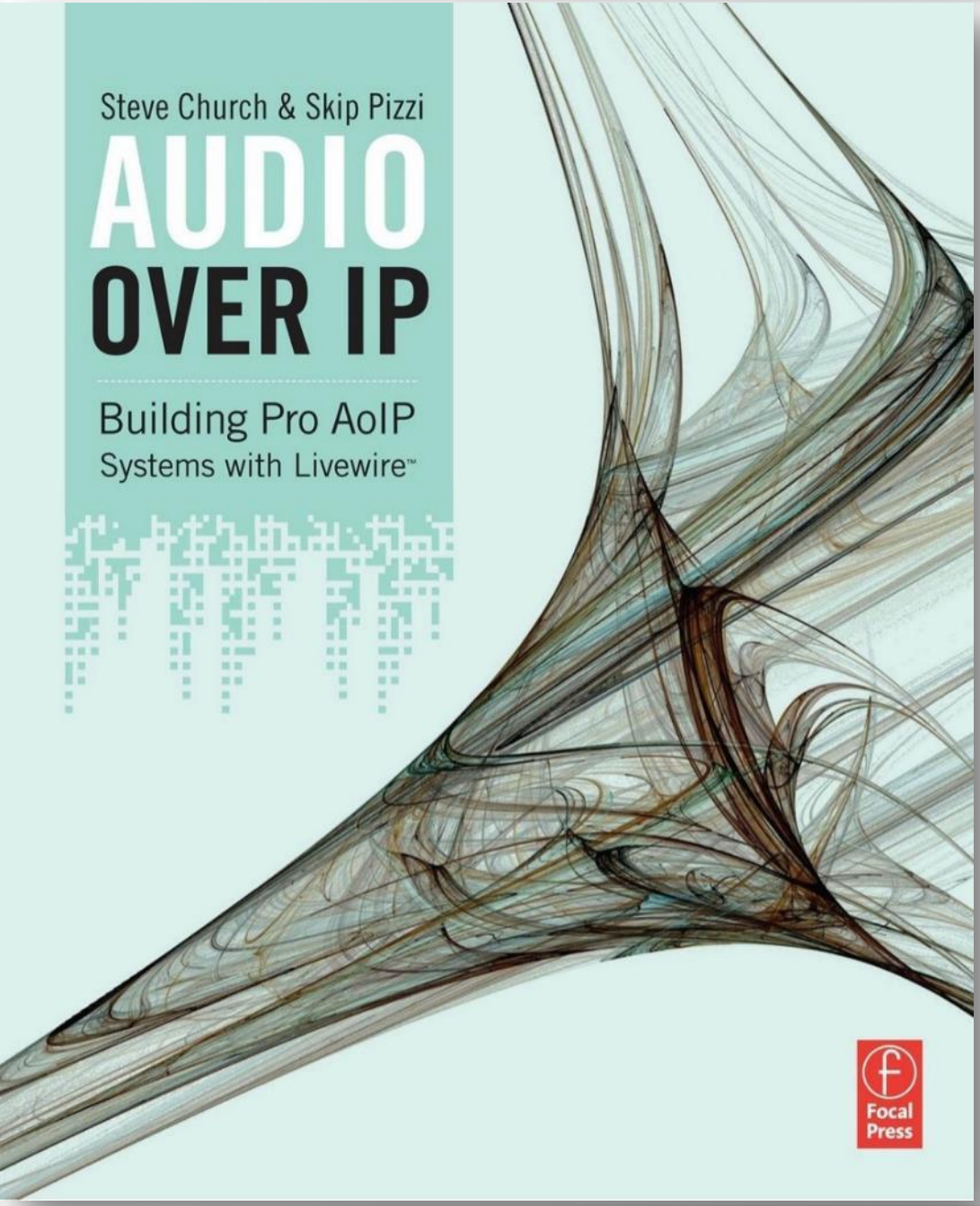
6000+ Consoles

"On the Air"

Worldwide

Milestones of Livewire AoIP

70000+ Livewire Devices



AUDIO OVER IP:
Building PRO AoIP
System with Livewire

Author: Steve Church

After all,

We did write the Book on it **!**

- Reviewed basic AoIP technology
- Illustrated AoIP Network infrastructure

AES67
Livewire+

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