AVoIP - Streaming Media Comes to Professional Systems

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Agenda

• Why AVoIP?
• Bandwidth Considerations
• Compression & Latency
• Streaming Formats
• Hardware
• Control, Monitoring & Management
Why AVoIP?

• Simplified Cabling

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Why AVoIP?

• Simplified Cabling
• Reduced Infrastructure
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• Simplified Cabling
• Reduced Infrastructure
• Flexibility
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• Simplified Cabling
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• Features
Why AVoIP?

• Simplified Cabling
• Reduced Infrastructure
• Flexibility
• Features
• Scalability
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• Simplified Cabling
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• Scalability
• Control, Management & Monitoring
Bandwidth - Audio

• 44.1 kHz, 16-bit
  44,100 x 16 = 705.6 kbps -> 1,417 ch/1 Gb link

• 48 kHz, 24-bit
  48,000 x 24 = 1.152 Mbps -> 868 ch/1 Gb link

• 96 kHz, 24-bit
  96,000 x 24 = 2.304 Mbps -> 434 ch/1 Gb link
Bandwidth - Video

- 1080p/60
  \[1920 \times 1080 \times 3 \times 10 \times 60 = 3.73248 \text{ Gbps}\]
- UHD (3840 x 2160)
  \[3840 \times 2160 \times 3 \times 10 \times 60 = 14.92992 \text{ Gbps}\]
- True 4K (4096 x 2160)
  \[4096 \times 2160 \times 3 \times 12 \times 60 = 19.1102976 \text{ Gbps}\]
Bandwidth - Video

• 4K60 4:4:4
  4096 x 2160 x 3 x 12 x 60 = 19.1102976 Gbps

• 4K30 4:4:4
  4096 x 2160 x 3 x 12 x 30 = 9.5551488 Gbps

• 4K60 4:2:0
  4096 x 2160 x 1.5 x 12 x 60 = 9.5551488 Gbps
Compression

• Audio – no compression needed
Compression

- Audio – no compression needed
- Video – may require compression
  - 4K60 4:4:4 -> ~20:1 (1Gb), <2:1 (10Gb)
  - 4K30 4:4:4/4K60 4:2:0 -> ~10:1 (1Gb), 1:1 (10Gb)
Compression

• Audio – no compression needed
• Video – FHD and above require compression
• CBR vs. Adaptive/Dynamic BR
Compression
Latency

• Encoding + Network + Decoding
Streaming Formats

• Trade-offs:

  - Compression
  - Latency
  - Quality/Cost
Streaming Formats

- H.264/H.265
- JPEG2000
- Dante (https://audinate.com/products/dante-enabled/partners)
- AES67
- Q-LAN
- ST 2110
- 802.1BA (AVB) (https://avnu.org/our-members/)
- NDI
- SDVoE (https://sdvoe.org/alliance/members/)
Hardware

• Encoder
  – 1G or 10G
  – Wall plate
  – Standalone
  – Card
Hardware

• Encoder
• Decoder
  – 1G or 10G
  – Wall plate
  – Standalone
  – Card
Hardware

- Encoder
- Decoder
- Transceiver
  - 1G or 10G
  - Wall plate
  - Standalone
  - Card
Hardware

• Encoder
• Decoder
• Transceiver
• Network Switch
Hardware

- Network Switch Considerations
  - Managed
  - Non-blocking
  - 1Gb or 10Gb ports
  - Uplink(s)
  - PoE
Hardware

- Encoder
- Decoder
- Transceiver
- Network Switch
- Management Appliance
Control

• Software-defined
• APIs
Control & Management
Control & Management

• Configure channels as public or private on your network
• Group systems, devices, and applications to preference
• Connect to and access channels on other networks via IP address
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• Advanced tab allows preference for TCP or UDP connections, multicast operation, and optional discovery server support
Control & Management
Control & Management
Testing
Monitoring
Summary

- Commercial AV systems moving to AVoIP solutions for network transport and virtual switching
- Audio can be transported without compression
- High resolution video often needs to be compressed
- Choose codec/streaming solution based on application (tolerance for compression & latency)
- HW & SW codecs, and software control, management & tools allow for an end-to-end digital solution
Thank You!

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