The Modern Workspace

Wired and Wireless AV Collaboration

-Karl Rosenberg-
“Build me a Unified Collaborations Space”
Huddle Room
Huddle Room with Soft VTC
Classrooms and Boardrooms are changing
Classrooms are Changing
Classrooms are Changing
AV Technology Deployment

4 types
Hard Wired AV Infrastructure using CATx

- Wired AV connections offer benefits related to reliability
- To INCLUDE a CATx for USB
Wireless AV

- Wireless AV offers flexibility, mobility, and benefits for installations that have architectural challenges
- Network reliability, access, coverage, and congestion can effect performance
AV Streaming

Lectern
- Camera
- Confidence Monitor
- Audio
- Wireless Microphone
- HDMI
- USB
- Power
- Ethernet

Live Stream
- Internet
- Firewall
- Ethernet
- Content Delivery Networks

Overflow Room
- HDMI
- Display
- Stream to a remote location

Remote Viewer
- Watch on any device
- Laptop
- Tablet
- Phone

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AV over IP

- Control?
- Audio distribution?
- Bandwidth/Data rate?
- Compression...yes
- Client Network?
- Your Network?
  - 1G
  - 10G
AV over IP Considerations
AV over IP – AES 67 Audio Distribution

- AES 67 Standard allows audio transportation over IP based systems
- Interoperability between network audio over IP protocols
- Adds audio networking technology into a variety of applications
- Supports both multicasting and unicasting
AV over IP – Compression

○ Compression – Three factors
  • Bit Rate
  • Image Quality
  • Latency

<table>
<thead>
<tr>
<th>Video Rate</th>
<th>Uncompressed Bit Rate @ 24 bpp</th>
<th>1G Compression @ 880 Mbps</th>
<th>10G Compression @ 4 Gbps</th>
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<tbody>
<tr>
<td>480p60 (SD)</td>
<td>422</td>
<td>1:1</td>
<td>1:1</td>
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<tr>
<td>720p60 (HD)</td>
<td>1,330</td>
<td>2:1</td>
<td>1:1</td>
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<tr>
<td>1080p60 (HD)</td>
<td>2,990</td>
<td>3:1</td>
<td>1:1</td>
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<tr>
<td>2160p60 (UHD)</td>
<td>11,940</td>
<td>14:1</td>
<td>3:1</td>
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<tr>
<td>4096x2160 @ 30 (4K/30)</td>
<td>6,370</td>
<td>7:1</td>
<td>2:1</td>
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<tr>
<td>4096x2160 @ 60 (4K/60)</td>
<td>12,740</td>
<td>14:1</td>
<td>3:1</td>
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</tbody>
</table>
AV over IP – Network

○ Layer 3 Protocols
  • Multicasting
  • IGMP Snooping

○ Client Network?

○ Private Network?
Collaboration Space Considerations
Your Goals for the Room?

- What is the budget for this space?
- Who will be using the space?
- VTC?
- How will the space be managed?
- How will the space be operated?
Keys to success in this Collaboration arena (three C’s)

○ **Connectivity**
  • CATx, Wireless and USB

○ **Conferencing Interface**
  • Zoom..Skype…your laptops or phones
  • Phone interface
  • VOIP

○ **Control**
  • Simple
  • Push button
  • Motion sensor
  • Touchpanel with Interface
Connectivity

Video Signals
Resolutions

- Old Resolutions
- New standard 1080p
- Headed to 4K/UHD and 8K

- SD 720x480
- HD 1280x720
- Full HD 1920x1080
- 2K 2048x1080
- UHD 3840x2160
- 4K 4096x2160
Digital Signals – HDMI

- HDMI is an uncompressed digital video signal
  - Designed for the consumer market
USB
Universal Serial Bus
CONNECT TO THE HDMI AND THE USB
Digital Signals – USB

○ A standard for communication protocols that includes cables and connectors

○ Historically used for attaching peripheral devices to computers

○ Maximum length of USB 2.0 cable: The 2.0 specification limits the length of a cable between USB 2.0 devices (Full Speed or Hi-Speed) to **5 meters** (or **about 16 feet** and 5 inches).
Digital Signals – USB

- Over the years speeds have increased and USB supports video and audio transfer
  - USB 2.0 - 480 Mbps
  - USB 3.0 - 5 Gbps
- Providing additional options for transporting video and audio
USB-C Solutions
USB-C Connectivity for ProAV
USB Type-C

- Send Data, Video, Audio, and Power
- Latest, high speed, reversible USB
- 10Gbps data rate (V3.1), V3.0 = 5Gbps
- Deliver up to 100 watts! Devices negotiate...

“...beyond 20 Gbps in the future.” — Pres. USB-IF
Example 5 (Video Only)

USB-C
HDMI
VGA
MDP
Uncompressed Video Over Twisted Pair
HDBaseT

- HDBaseT Alliance, is a consumer electronic (CE) and commercial connectivity standard for transmission of uncompressed high-definition video (HD), audio, power, home networking.
Twisted Pair Transmission

- Distance
  - 328 feet (100 meters) between endpoints

Twisted Pair Transmitter for HDMI

328 feet/100 meters

Twisted Pair Receiver for HDMI
Why Use Twisted Pair?

○ One twisted pair cable can carry multiple signals

- Digital Video
- Digital Audio
- IR Control
- RS-232 Control
- Ethernet
- Power
Twisted Pair Shielding

- Different types of twisted pair shielding

<table>
<thead>
<tr>
<th>Cable Name</th>
<th>Outer Shielding</th>
<th>Individual Pair Shielding</th>
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<tbody>
<tr>
<td>U/UTP</td>
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<td>None</td>
</tr>
<tr>
<td>F/UTP</td>
<td>Foil</td>
<td>None</td>
</tr>
<tr>
<td>U/FTP</td>
<td>None</td>
<td>Foil</td>
</tr>
<tr>
<td>S/FTP</td>
<td>Braided</td>
<td>Foil</td>
</tr>
<tr>
<td>SF/UTP</td>
<td>Braided &amp; Foil</td>
<td>None</td>
</tr>
</tbody>
</table>
Twisted Pair Signal Transmission

- Shielded cable protects against outside interference from:
  - Air conditioning units
  - Power from adjacent cabling
  - Crosstalk from other cables or within the same cable
  - Radio interference from walkie-talkies
Twisted Pair Installation

- Cable infrastructure and patch points
  - Up to 2 patch points recommended

Typical scenario for AV connectivity
Wireless Technologies

Compression
Wireless Video Application

Collaboration

Receiver
Using Your Own WAP
Using Their WAP
Collaboration with their WAP

TCP/IP Network

Rx with HDMI
Key Features to have in a Wireless Video Platform

- Easy Wireless and Wired Collaboration
  - Wireless connections via OS mirroring or app
  - Wired connections via HDMI Input

- Multi-Platform Support
  - Mac / Windows runtime or installed app
  - Android / iOS app
  - Apple & Android mirroring
Conference Interface
Multiple Types of Devices
Table connectivity including Power and USB charging
Seamless Conferencing Experience
Control
Motion Sensor or Timed System
Meeting Space Collaboration System
Simple Motion Sensor

- Motion Sensor wiring
  ![Motion Sensor wiring diagram]

- Control system module for Motion Sensor configuration
  ![Control system module]

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How a timer works
System with Show Me Cables

1. Enters the meeting room
2. Connects laptop
3. Presses Connect Button
4. Connects laptop
5. Presses Connect Button
6. Content is displayed
7. Enters the meeting room
8. Connects laptop
9. Presses Connect Button
10. Connects laptop
11. Presses Connect Button
12. Input switches
13. After a configured period of inactivity the system automatically shuts down

- Occupancy sensor sends signal to the Receiver
- Power On command to display via CEC
- Content is displayed
- Both disconnect and leave

CATx Cable up to 230’ (70m)
Upgrade Options – Wireless Connectivity

- HDMI/CEC
- Occupancy Sensor
- CATx Cable up to 230' (70m)
- Wireless Devices
- HDMI
Upgrade Options – Touchpanel Control

- HDMI/CEC
- Occupancy Sensor
- CATx Cable up to 230’ (70m)
- Ethernet
- LAN
- Touchpanel
- Ethernet
- LAN
Push Button Controllers
These do NOT count!
Single Display Application

- **PC**
  - Ethernet
  - HDMI with embedded audio

- **Blu-ray Player**
  - IR to Blu-ray
  - Ethernet
  - Ethernet/PoE

- **TCP/IP Network**
  - HDMI with embedded audio

- **Projector with internal speakers**
  - Ethernet

- **Screen Control**
  - Ethernet

- **Relay to Screen Control**

- **BICSI FALL Conference & Exhibition**
Final Design Thought
Equipment
The Modern Workspace

-Thank You-
Karl Rosenberg