IT/AV and HDBaseT™ Control Systems

This Changes Everything

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IT/AV and HDBaseT™ Control Systems

- Why we need Control Signals
- Control Signal Options & Examples
- HDBaseT Control Features
- Simple Room Control Example Using HDBaseT

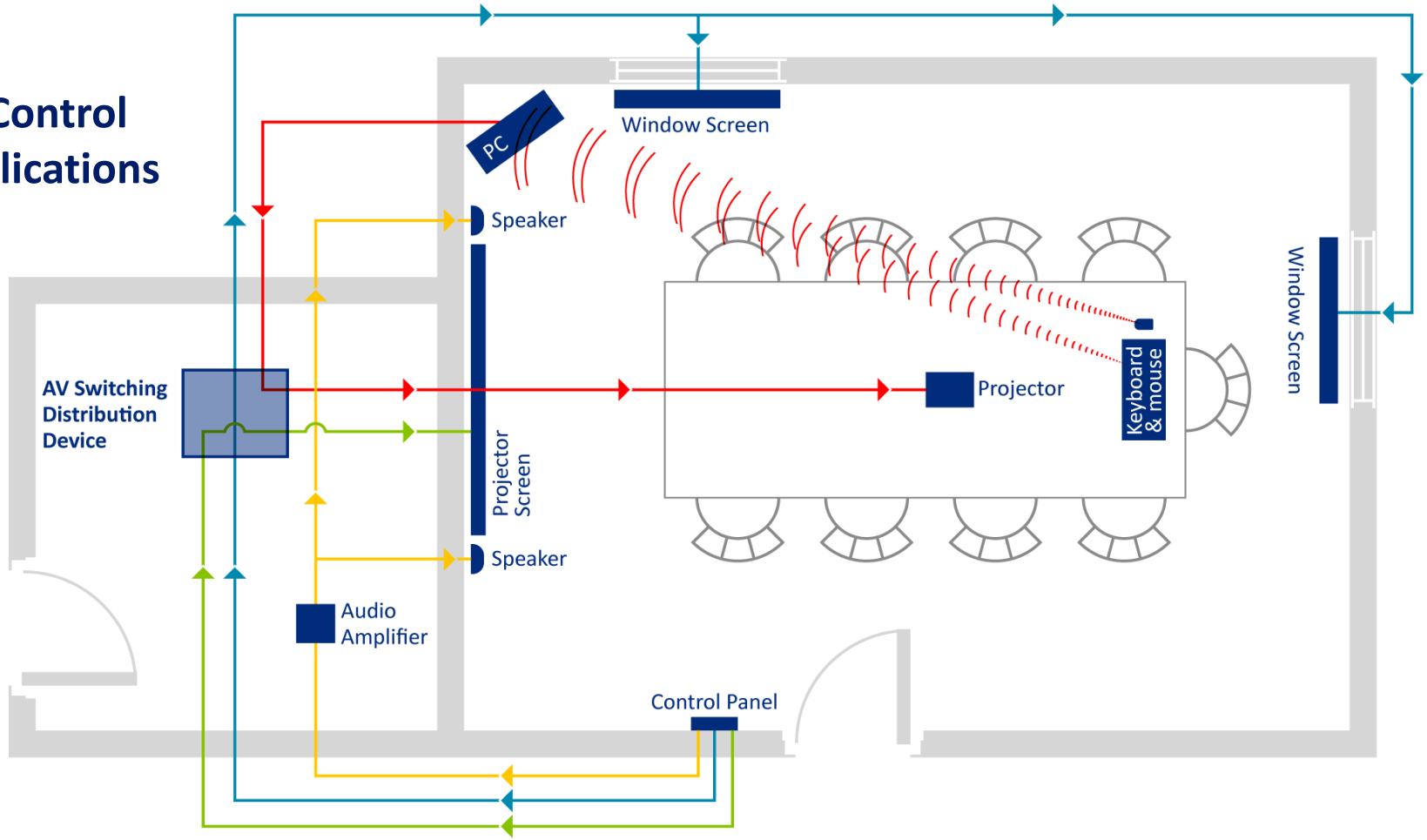
Control Signals

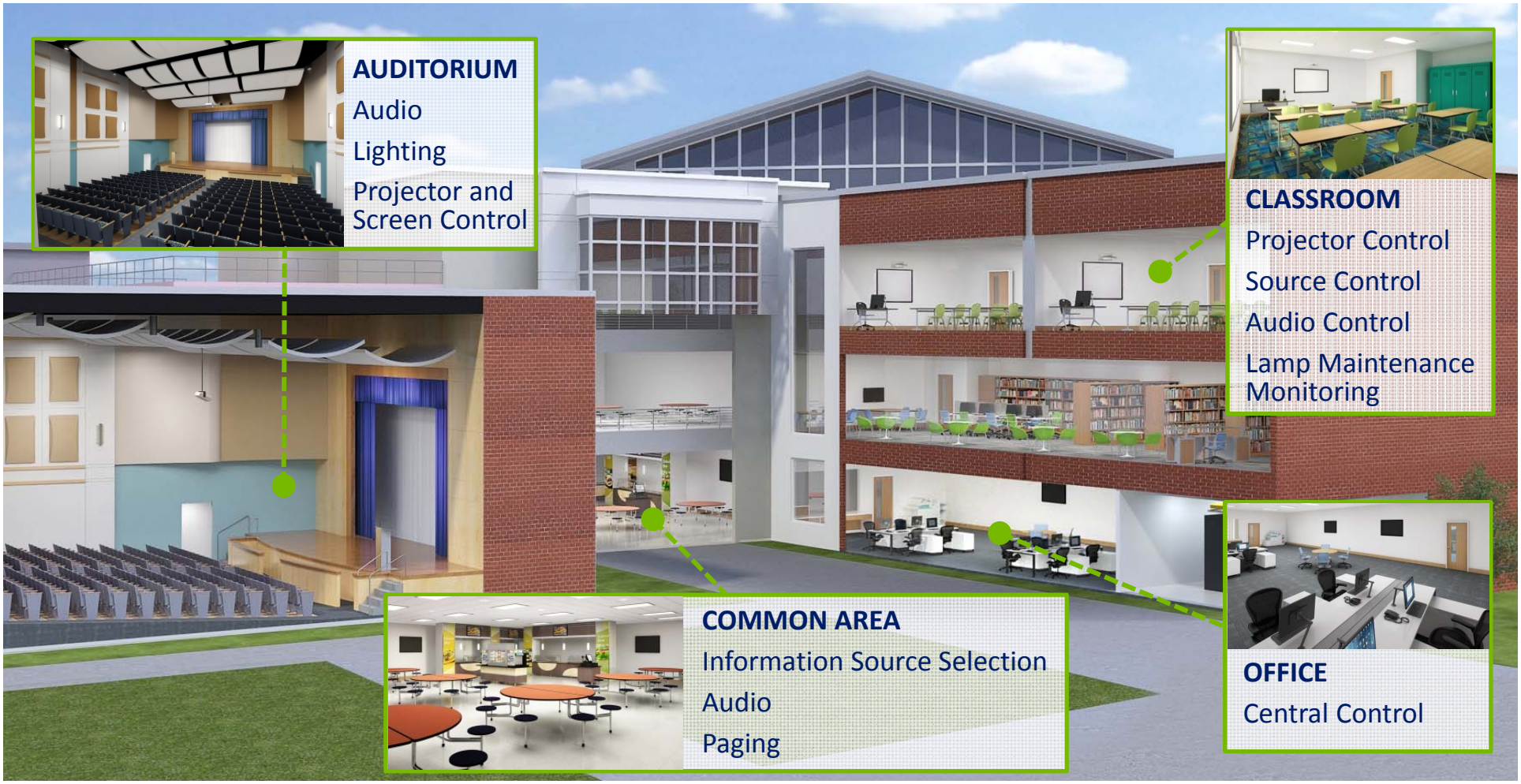
Why do we need them?

AV Control Applications

- Convenient and centralized control
  - Device power
  - Input or output signal switching
  - Audio volume
  - Room attributes
    - Projection screens, Lights, Shades
  - Device monitoring
    - Projector lamp life, Scheduled system-wide power-down, Theft detection

AV Control Applications




AUDITORIUM
Audio
Lighting
Projector and Screen Control
CLASSROOM
Projector Control
Source Control
Audio Control
Lamp Maintenance Monitoring
COMMON AREA
Information Source Selection
Audio
Paging
OFFICE
Central Control

Control Signals

Options and Examples

Control Signal Options

Wired

Relays and contact closures (low voltage on/off)

RS-232 Serial

USB

Ethernet (Internet Protocol over the LAN)

Wireless

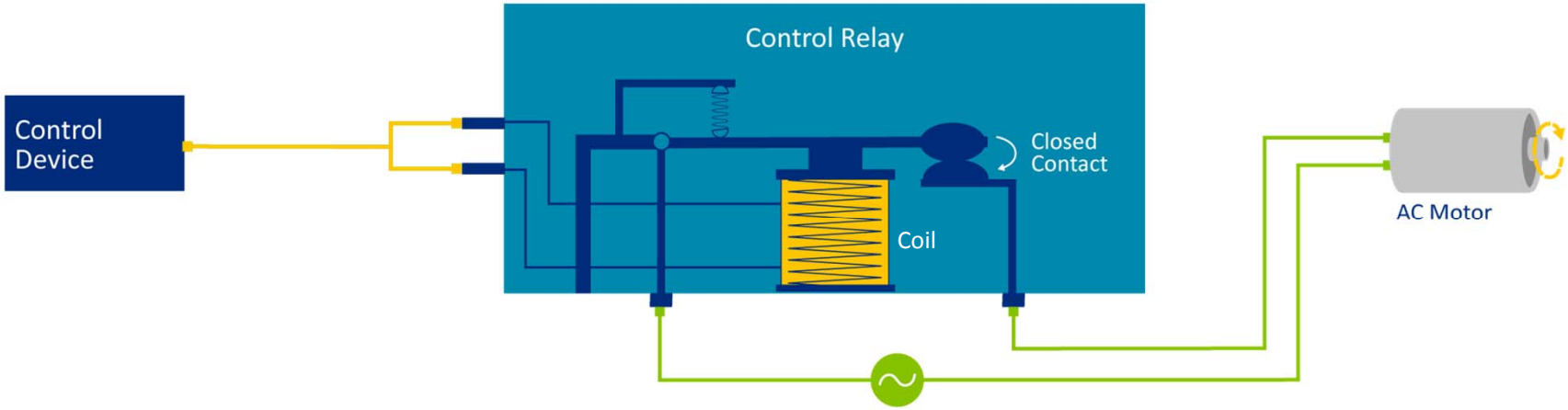
IR (Infrared)

RF (Radio)

- Wi-Fi (2.4 & 5GHz, 802.11, Ethernet/IP)
- Bluetooth (UHF 2.4-2.485 GHz)
- Z-Wave (908.42MHz)
- ZigBee (802.15.4 standard – low cost, low speed, and low power)
- Thread (802.15.4 standard, Nest)

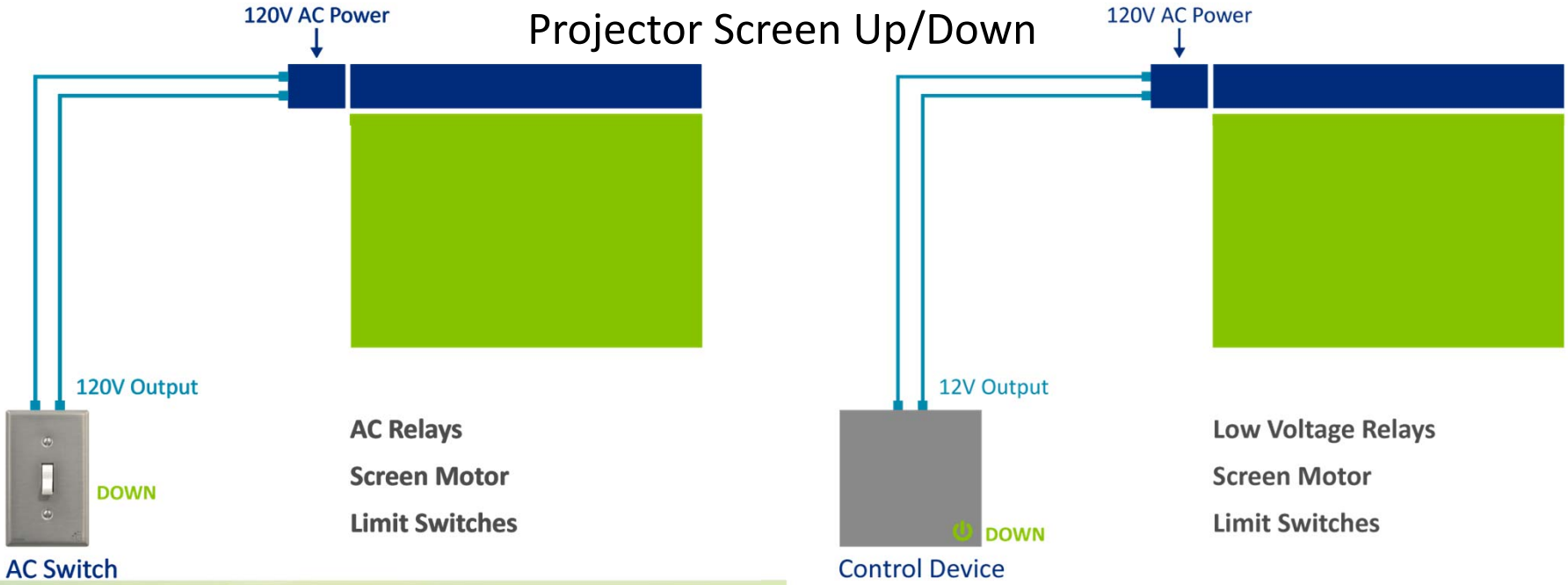
Relays and Contact Closures (switches)

- Low-voltage signal from control device energizes the relay coil



- Coil becomes a magnet to close a contact to complete circuit, energize motor

Relay and Contact Closure Example



RS-232

- Serial bidirectional communication
  - Typically 3 wires
  - Max distance per standard of ~15m or 50’ – depends on data rate
  - Logic 1 (mark) asserted at -3 to -15V
  - Logic 0 (space) asserted at +3 to +15V

- Each manufacturer’s device has its own protocol and command set
- Implementation
  - AV controller with RS232 output
  - Direct communication using a PC terminal emulation to send discrete ASCII or hexadecimal commands

Transmit Data (TXD)
Receive Data (RXD)
Ground (GND)

Serial Command Example

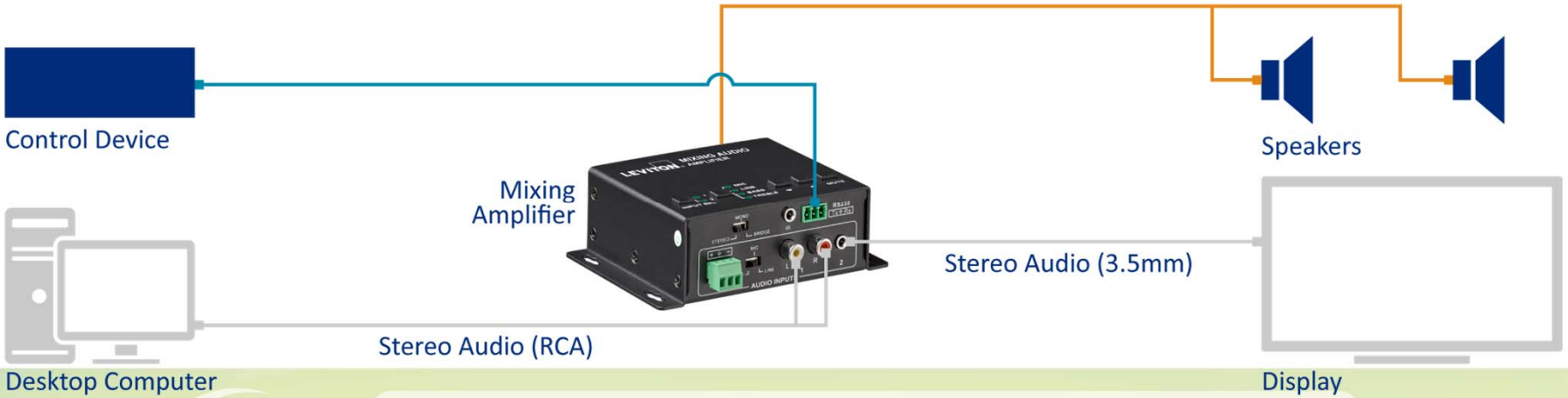
Switching inputs of an audio amplifier

- Typical protocol
  - 9600 Baud rate, 8 data bits, 1 stop bit, No parity
- ASCII Command: 2A1.
  - Switches from Input #1 stereo RCA to Input #2 3.5mm stereo

Serial Command Example

Switching inputs of an audio amplifier

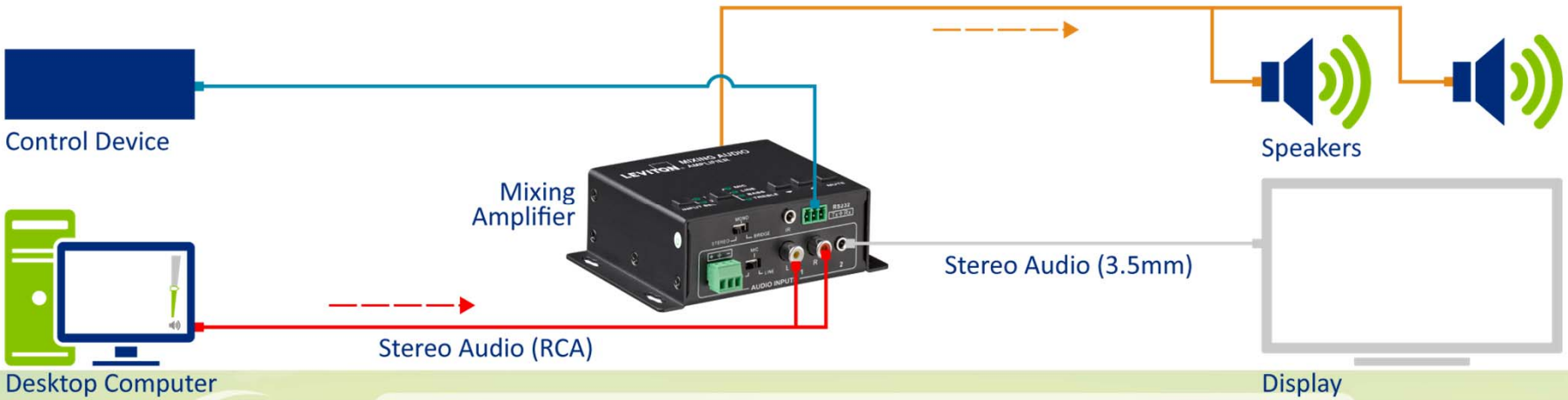
- PC to stereo RCA input #1, Display to stereo 3.5mm input #2
- Control device connected to RS232 input of amplifier



Serial Command Example

Switching inputs of an audio amplifier

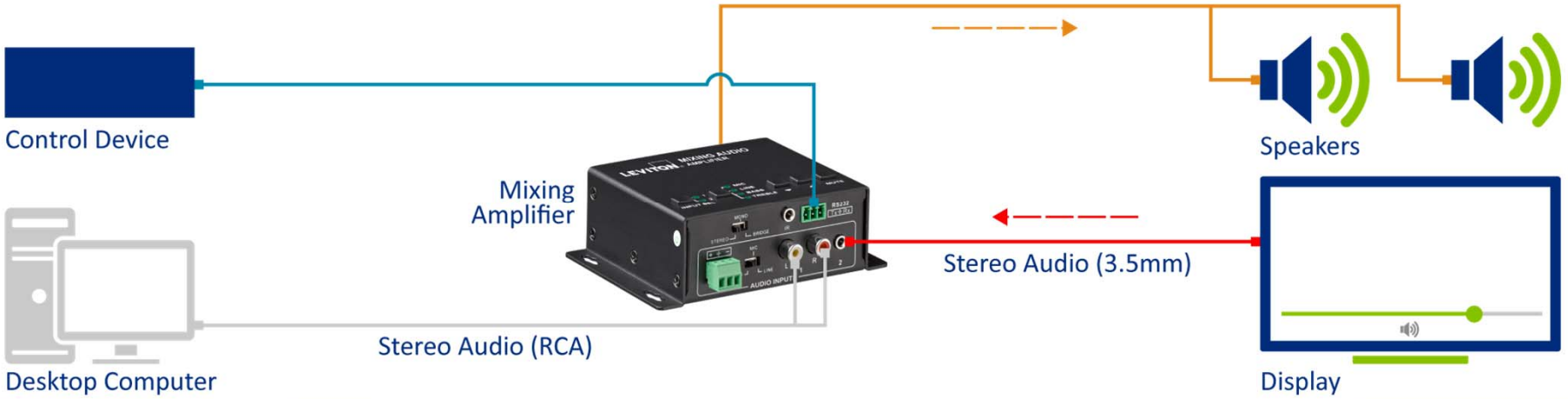
- Input # 1 PC stereo RCA to start



Serial Command Example

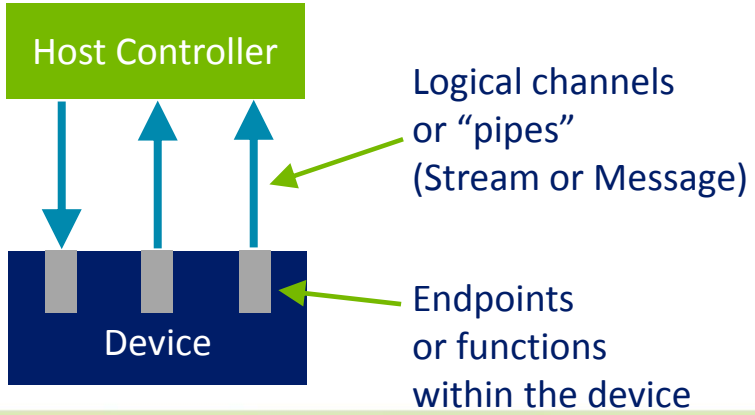
Switching inputs of an audio amplifier

- Send ASCII command: 2A1.
  - Switches to 3.5mm input connected to display



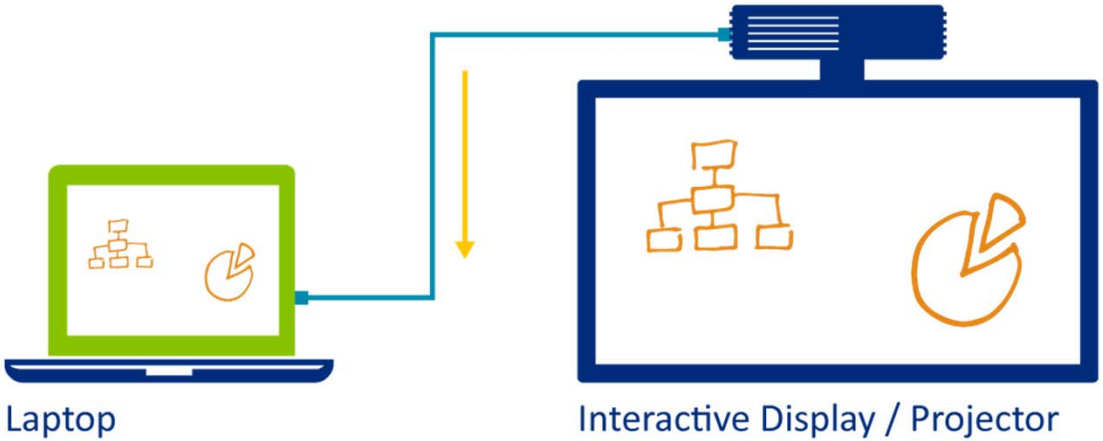
USB

- Universal Serial Bus
  - Bus for connection, communication, and power between computers and electronic devices
  - Intelligent host-to-device differential signaling over twisted-pair cables



USB

- Most common AV usage
  - Interactive projectors and whiteboards

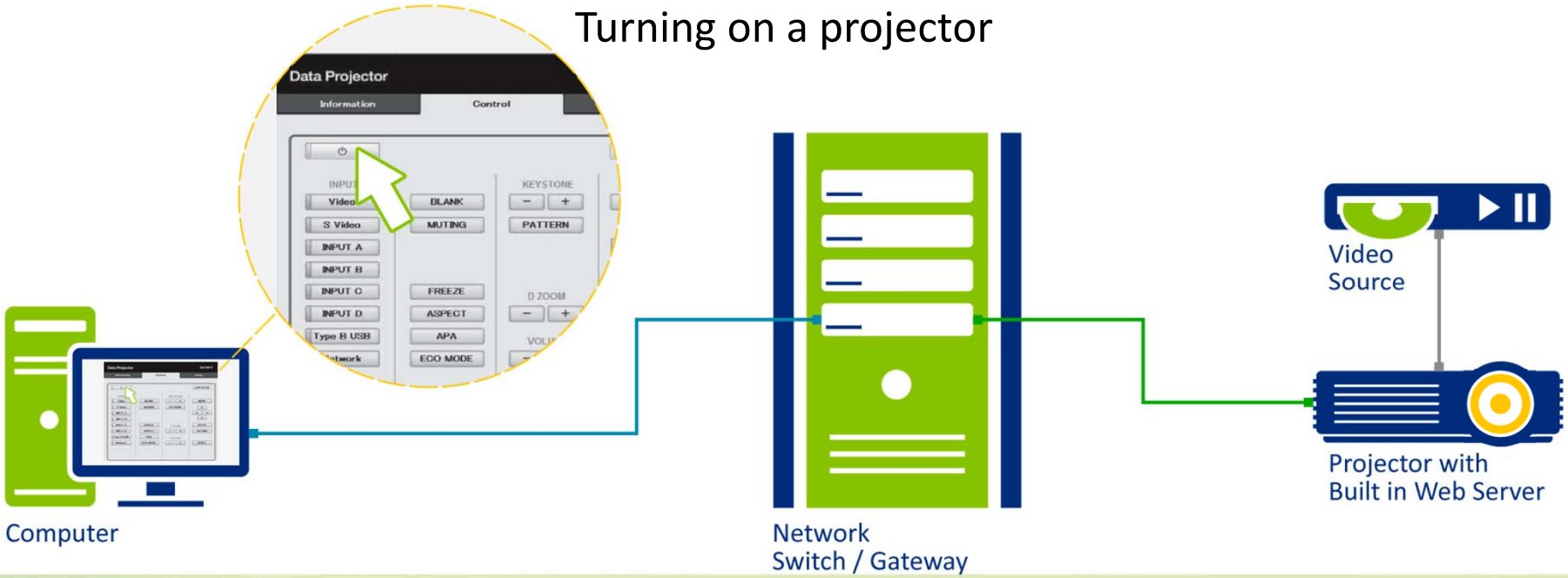


Ethernet – TCP/IP Protocol Suite

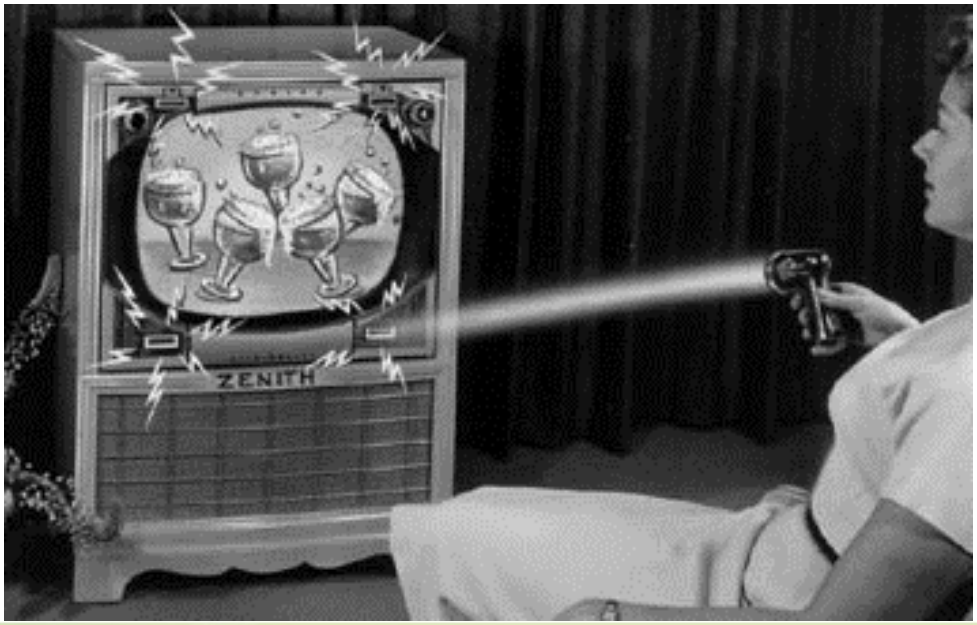
- Computer network communication
  - Bidirectional serial packet-based transmission of data
  - Implemented over category cable or fiber (or via Wi-Fi)
  - **T**ransmission **C**ontrol **P**rotocol provides host-to-host connectivity
  - **I**nternet **P**rotocol is responsible for addressing hosts and routing packets across the network
- IP command
  - Created within control software application or web server interface
  - Unique to AV device
- Implementation
  - Typically sent between a computer or AV controller and a device on the network

IP Command Example

Turning on a projector

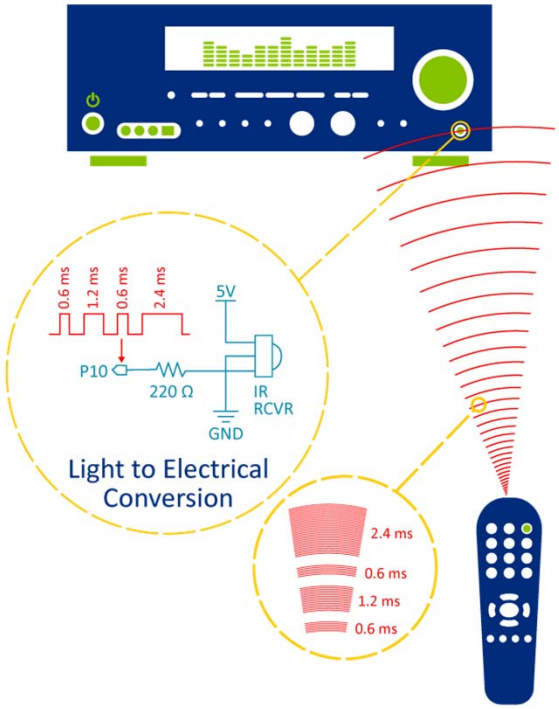


Infrared – IR



Infrared – IR

- Modulated one-way infrared light transmission from transmitter to receiver
  - Light pulse code for each function
  - Light pulses converted to electrical signal pulses at the receiver
- Short range line-of-sight (~10m or 30’)
- Can be affected by bright ambient light
- Inexpensive and simple
- Included in virtually all consumer electronics products and in many professional AV devices

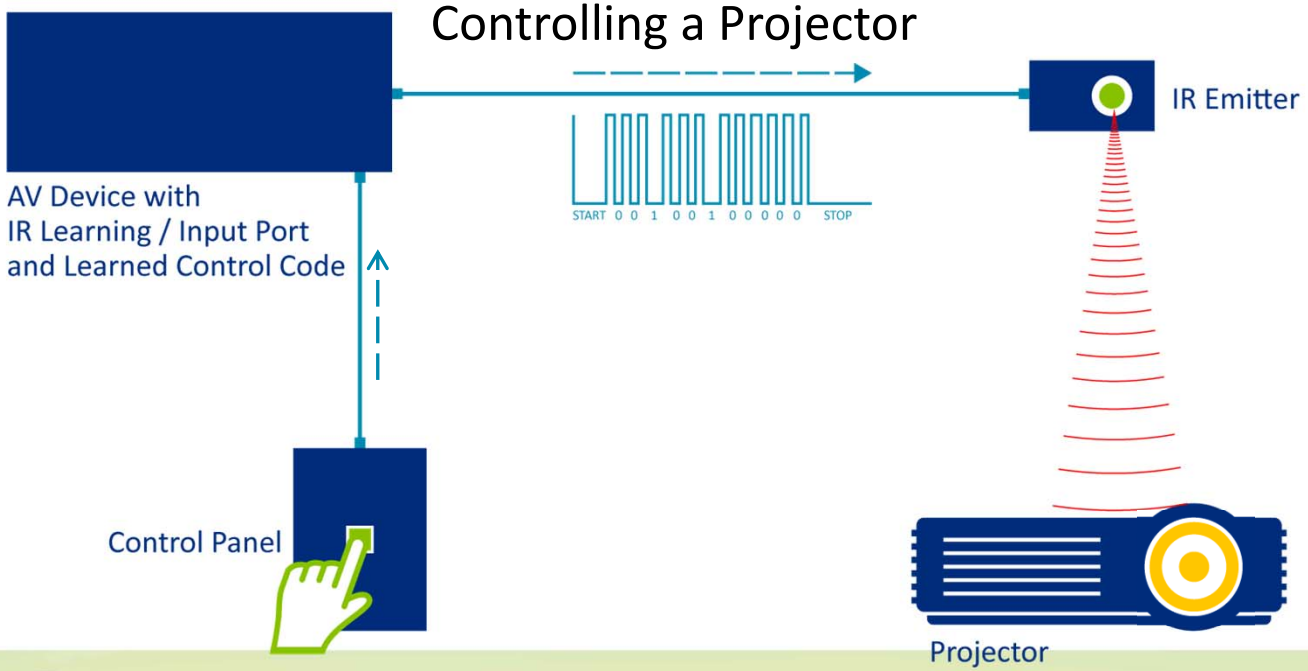


IR Learning


AV Device with
IR Learning / Input Port
IR Remote Control
START 0 0 1 0 0 1 0 0 0 0 0 STOP
Light-to-Electrical Binary Code
Conversion and Storage
START 0 0 1 0 0 1 0 0 0 0 0 STOP
Binary Code for Each Command / Button
of the Control Panel

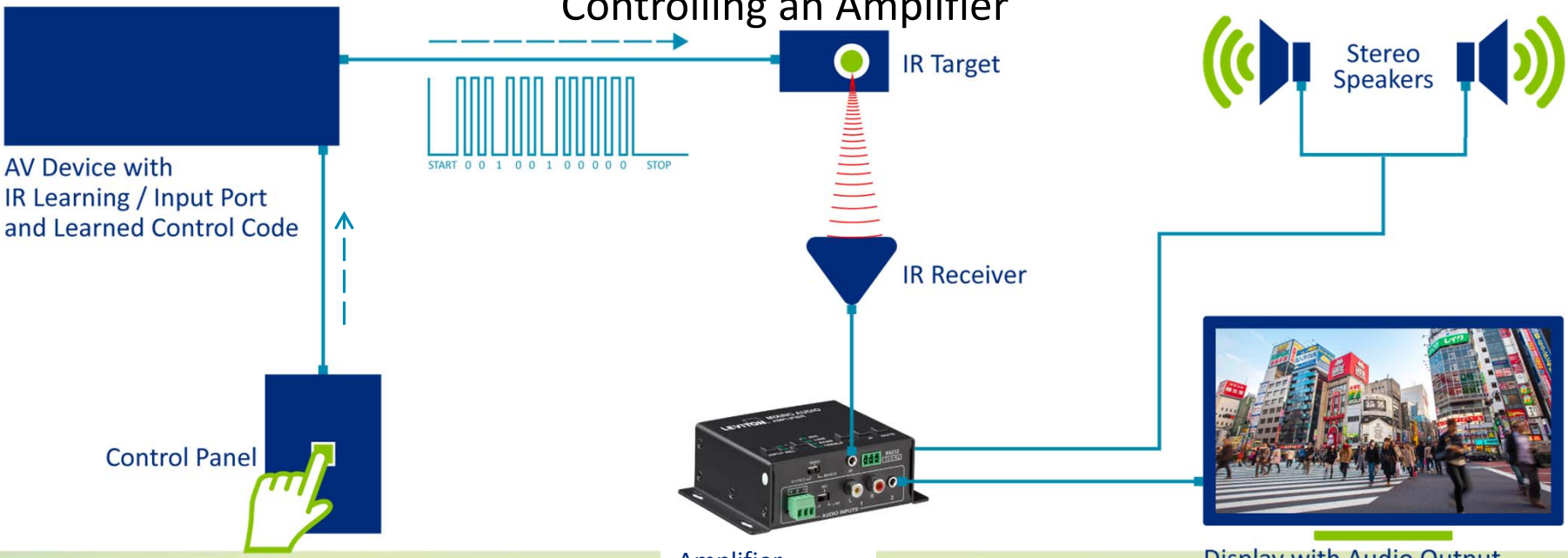
IR Control Example

Controlling a Projector



IR Control Example

Controlling an Amplifier

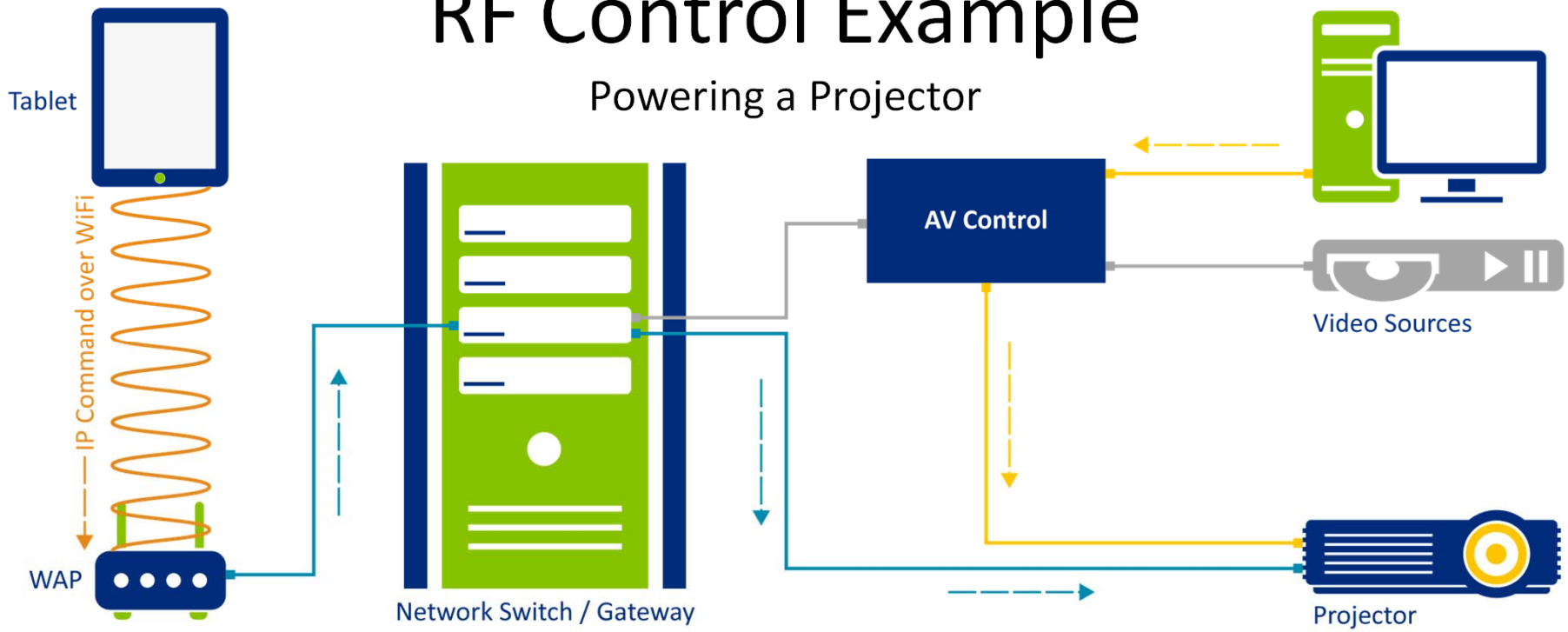


Radio Frequency – RF

- Typically omni-directional radio transmission from transmitter to receiver
- Short-range radios most used for AV control indoors
  - Wi-Fi - 2.4 & 5GHz, 802.11, 100m or 330’
  - Bluetooth - UHF 2.4-2.485 GHz, typically less than 10m or 33’
- Relatively inexpensive and Wi-Fi is available in most facilities today
- Considerations
  - Affected by (walls and ceilings)
  - Security
  - Bandwidth usage
  - Implementation requires coordination with IT managers

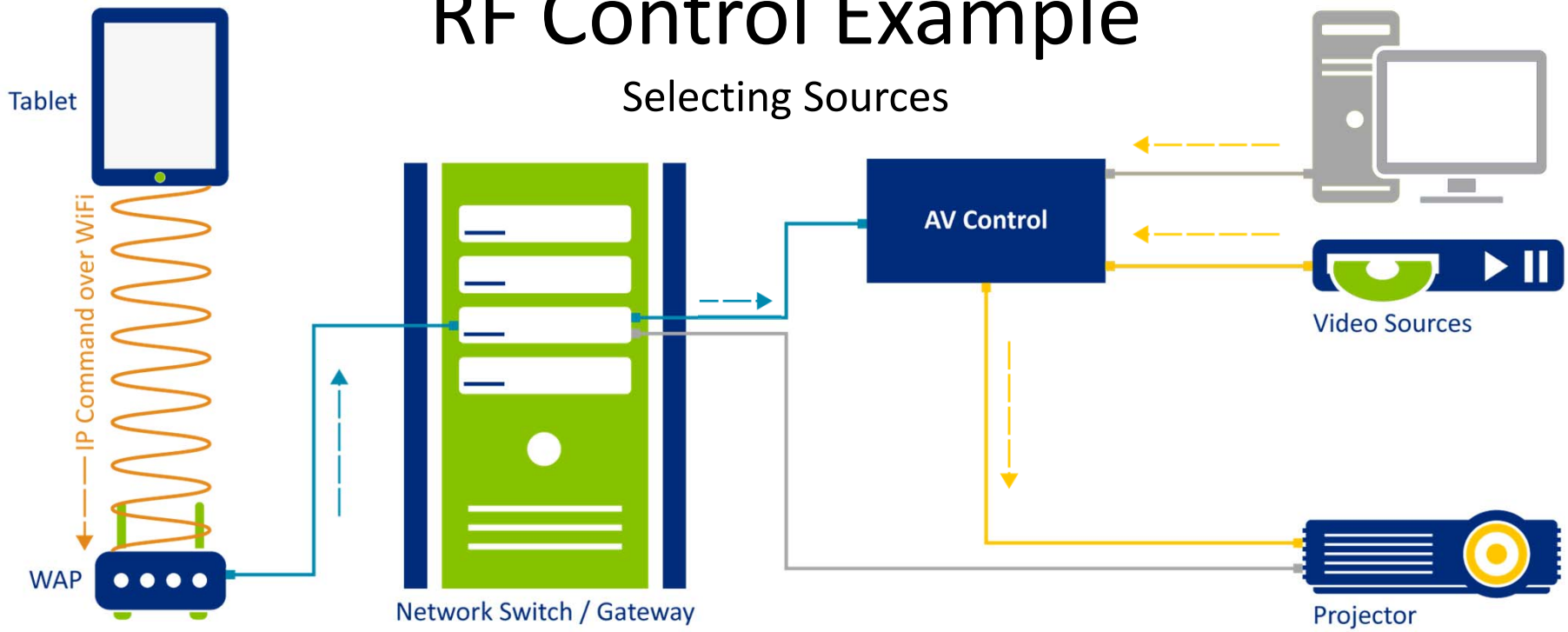
RF Control Example

Powering a Projector



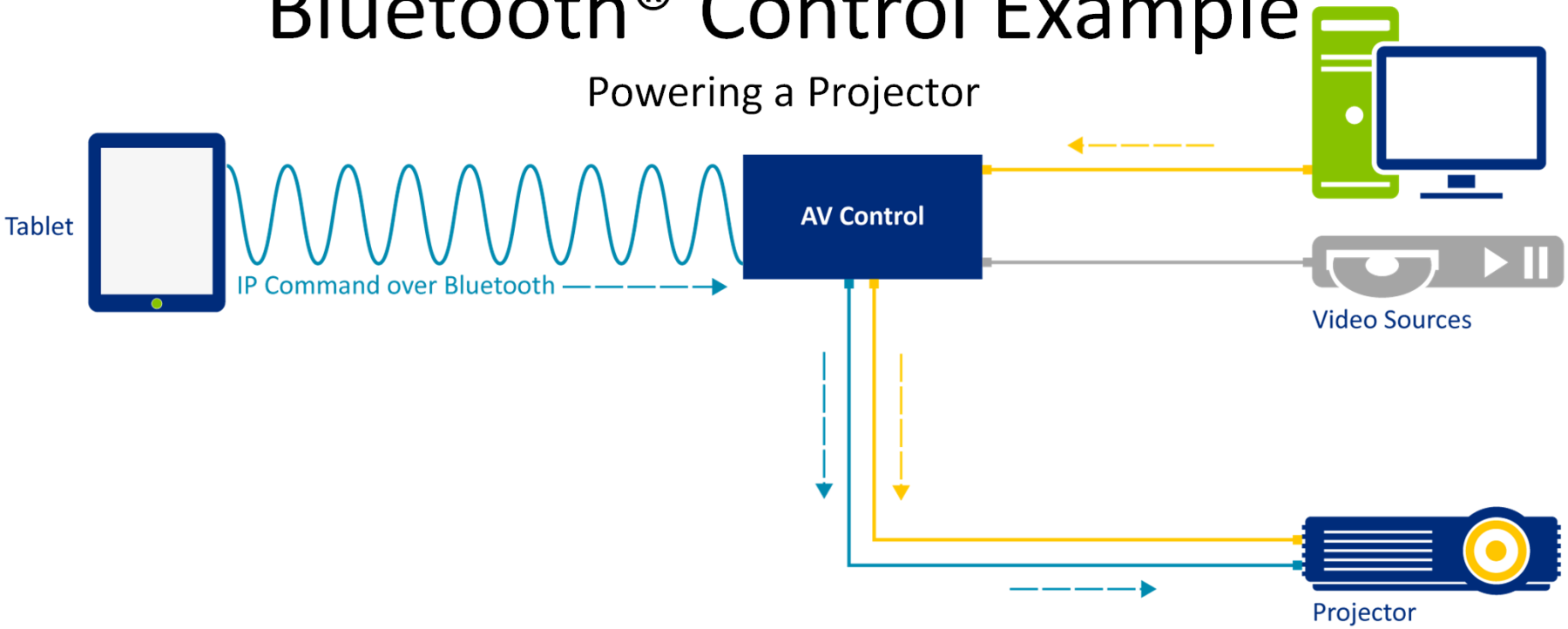
RF Control Example

Selecting Sources



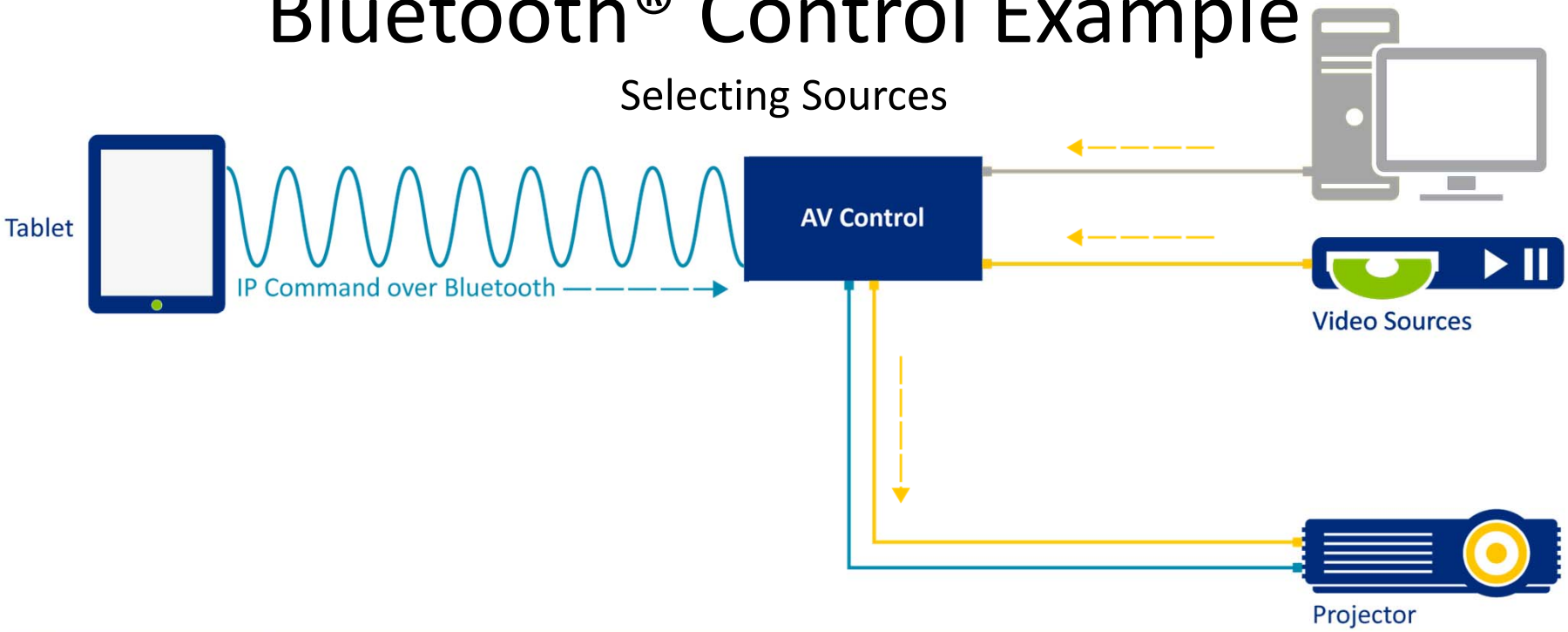
Bluetooth® Control Example

Powering a Projector



Bluetooth® Control Example

Selecting Sources



HDBaseT™ Control Features

HDBaseT™ – Breakthrough Technology

- HDMI® extension on a single category cable
  - Packet-based technology for extending HDMI on category cable up to 100m
  - Marketed and certified by the HDBaseT Alliance
  - Reliable, plug-and-play HDMI extension method
  - IEEE is adopting the HDBaseT spec as IEEE 1911.1

HDBT™

www.hdbaset.org

HDBaseT™ 1.0 – More than AV

HDBT™

5Play™

Full digital audio

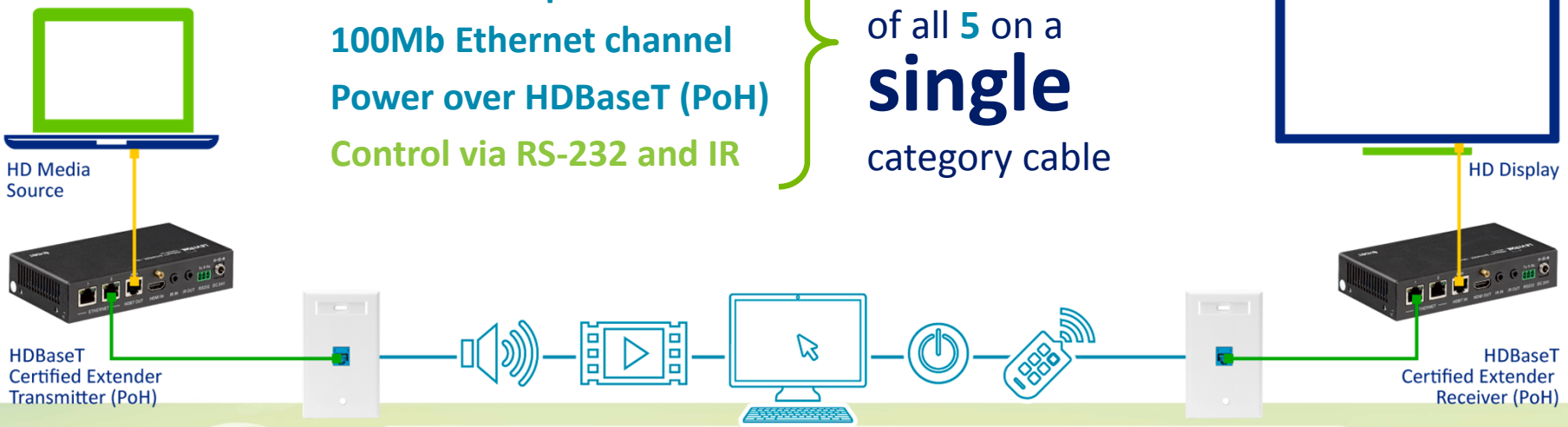
HDMI uncompressed video

100Mb Ethernet channel

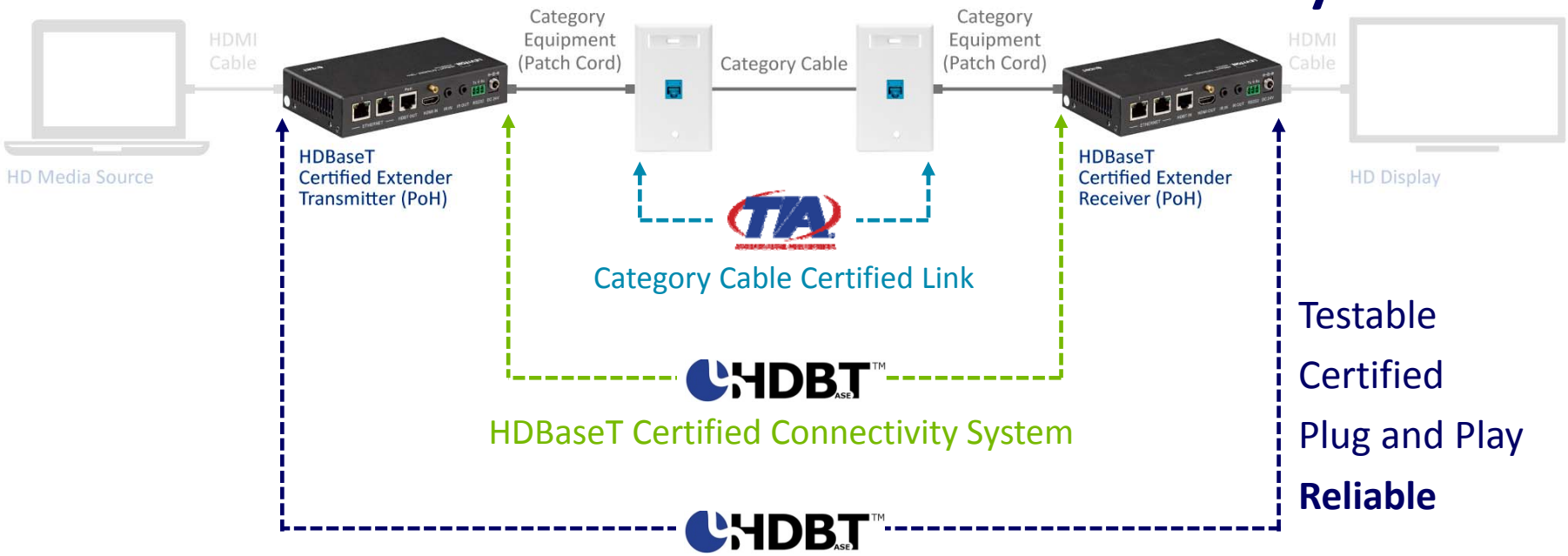
Power over HDBaseT (PoH)

Control via RS-232 and IR

Simultaneous transmission of all **5** on a **single** category cable



End-To-End HDBaseT™ Certified System



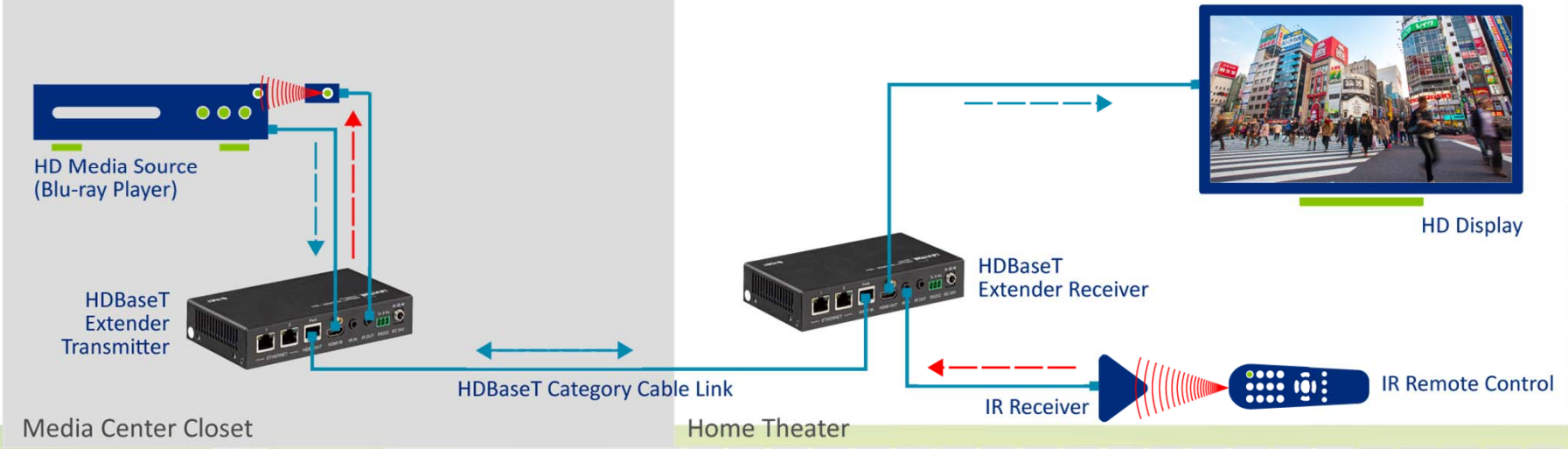
HDBaseT™ 2.0 – Adds USB

Options For Control Over HDBaseT™

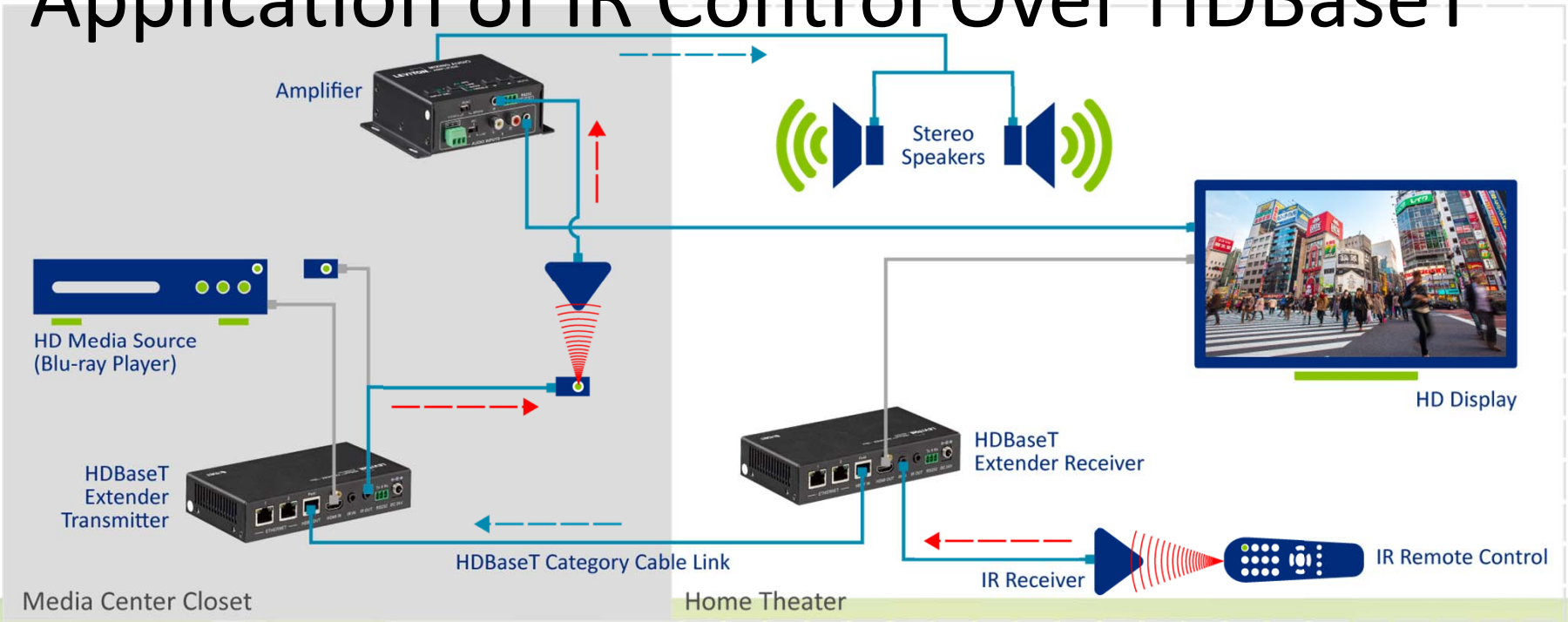
- HDBaseT is a wired connection
  - RS-232
  - IR
  - Ethernet (IP)
  - USB

Options for Control Over HDBaseT™

Application of IR Control Over HDBaseT™

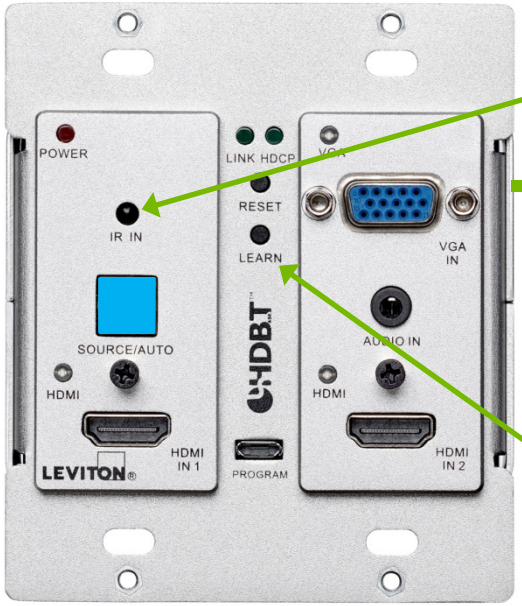


Application of IR Control Over HDBaseT™



Simple Room Control Example Using HDBaseT™

Leviton IT/AV Control Devices



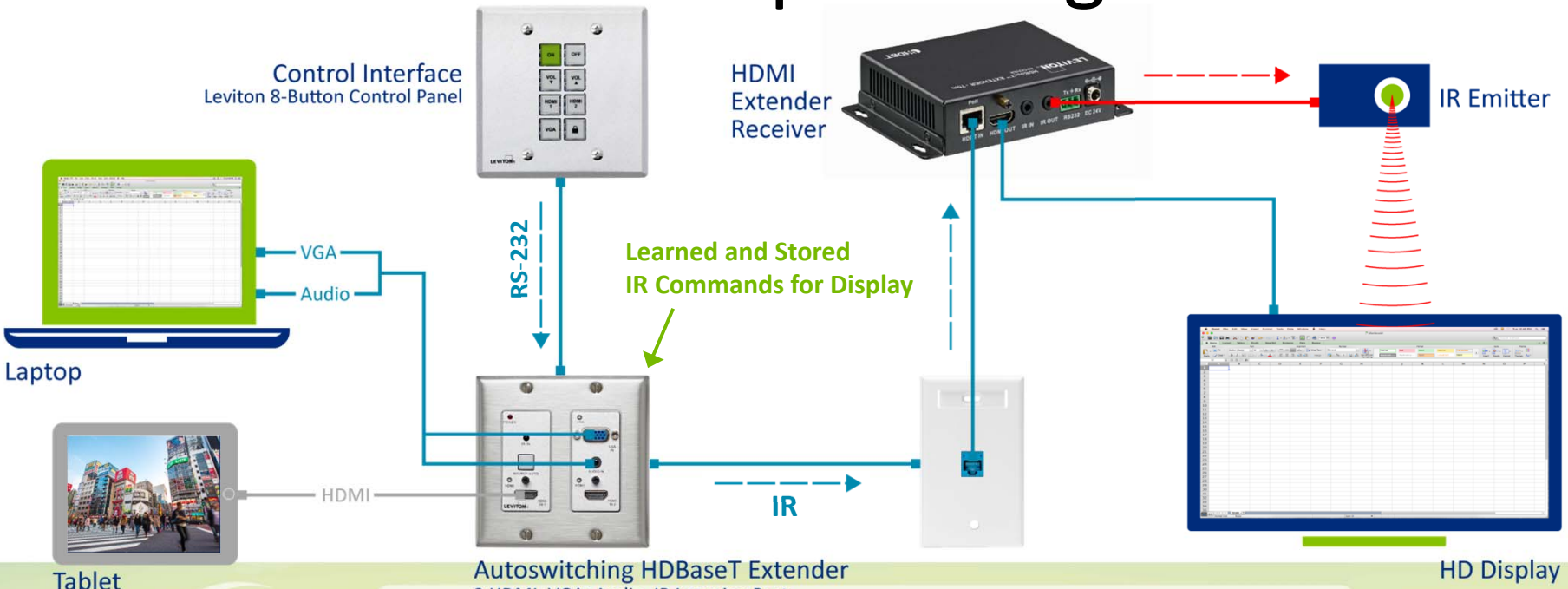
IR Receiver

Autoswitching Wallplate

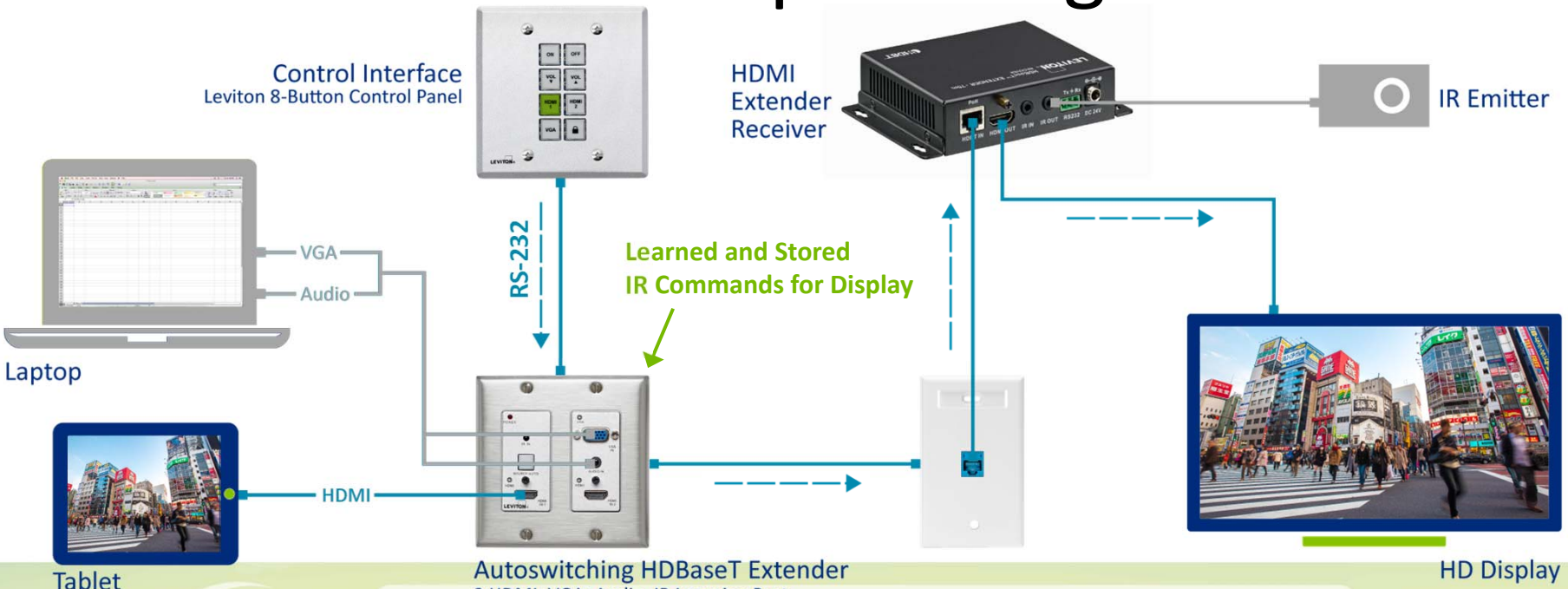
IR Learn Activation Button

8-Button Panel

Room Control Example Using HDBaseT™



Room Control Example Using HDBaseT™



Questions?

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