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Studio Production and Directing

Camera and Video Directing

Vladimir Maksimovic

University of Mitrovica (UPKM)

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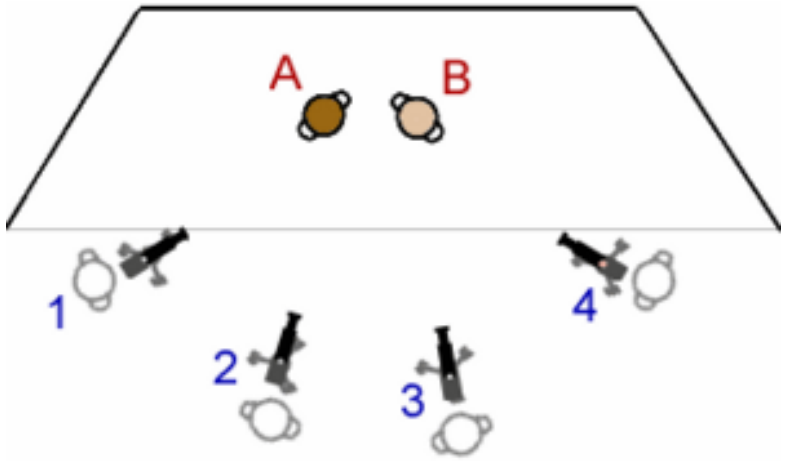
Multi-camera operation

•Directing a live program is the process of coordinating and controlling all technical and creative aspects of a television program while it is broadcast in real time.



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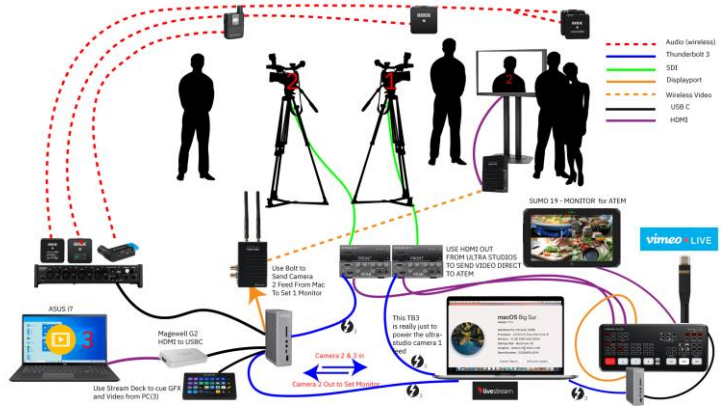
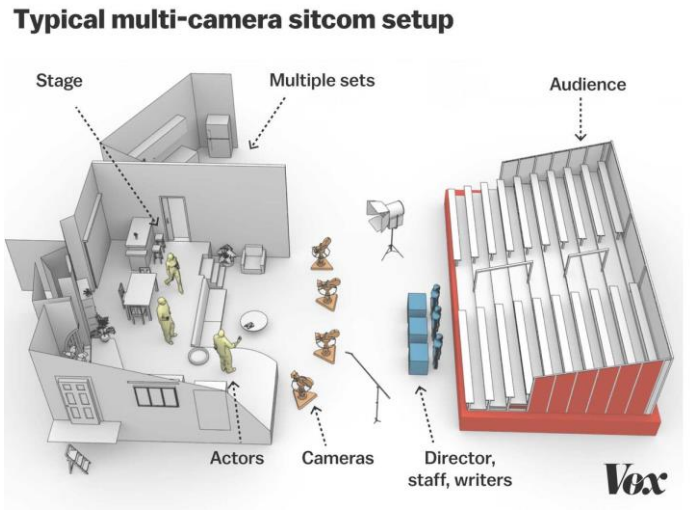
Advantages of multi-camera imaging

- Enables **scene continuity without repeated takes**.
- Increases **production efficiency**, especially for interviews, shows and live events.
- It provides multiple visual perspectives simultaneously (close-up, medium and wide shots).
- Facilitates **dynamic editing and switching between shots**.

How to organize multiple cameras on set?

- Camera and parameter synchronization
- **Setting cameras according to visual needs:**
  - **Main camera (A camera)** – Fixed wide shot for the primary frame.
  - **Secondary camera (B camera)** – Medium shot or zoom on the subject.
  - **Third camera (C camera)** – Alternate angle or scene details.
- **Coordination between operators** - All camera operators must know **when and how to change the frame.**
- **Using the control room monitors**- To ensure that all shots are visually aligned.





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Example

- Audio and Video Directing
- Engine room.
  - 4 computers (2xplayout, graphics, ultascop)
  - Matrix 20x20
  - SDI converters
  - Network
  - Power supply
- Studio with multiple scenery
- Lighting

Example

•**Backmagic ATEM 2 M/E Production Studio 4K** is a live production switcher with 20 SDI/HD/UltraHD inputs.

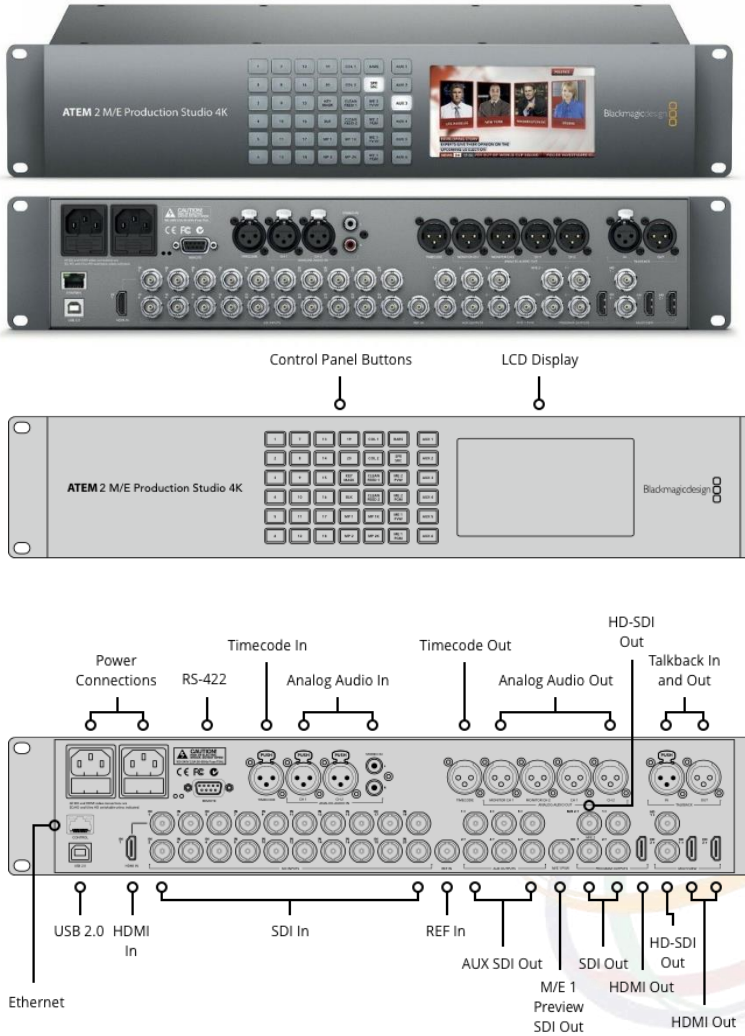
•Supports NTSC/PAL and 4K formats, with frame synchronizers at each input.

•It has a reference input (tri-sync/ blackburst) for synchronization with other devices.

•The device features up to 4 upstream keyers and 2 downstream keyers, and support for the chroma key effect.

•It has multiview outputs, media pool and built-in audio mixer with embedded audio support.

•It can be controlled via software or hardware control panels (e.g. ATEM panel)



Example

•The ATEM 1 M/E Broadcast Panel is a hardware control unit for **ATEM switchers**.

•It allows the operator direct access to program (PGM) and preview (PREV) inputs through physical buttons.

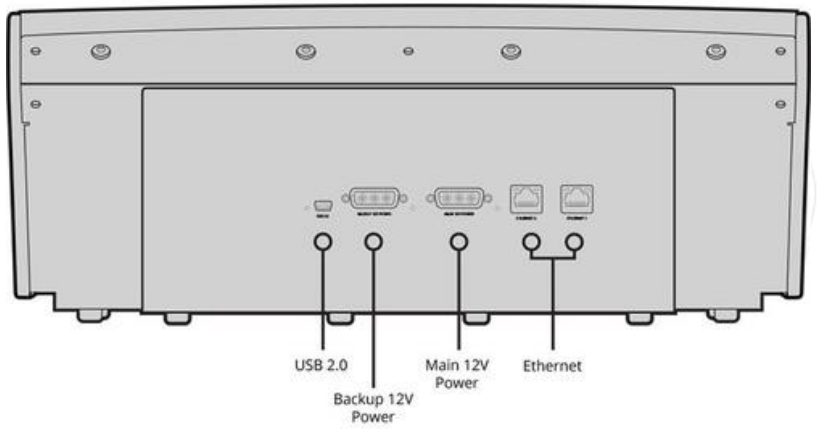
•The built-in **T-bar fader** enables manual control of transitions between sources.

•The panel has **an Ethernet connection** and operates via the ATEM network control protocol.

•It is integrated with effects, keying and real-time graphics control.

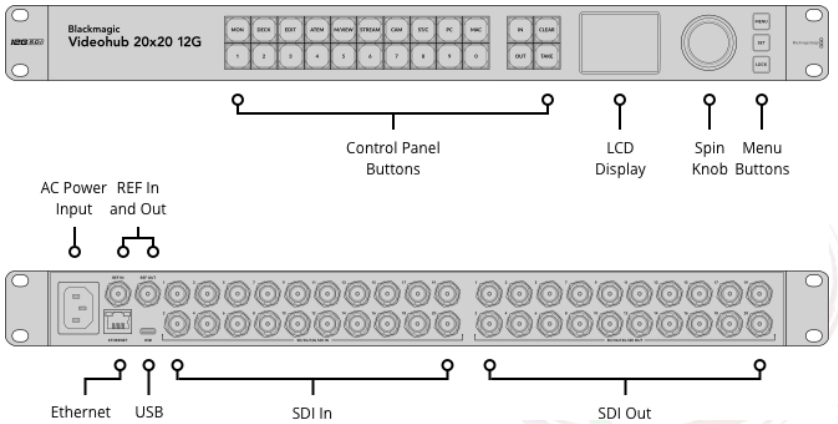
•Connects to the switcher as a primary or auxiliary control interface.

•The ideal solution for live production where precise and highly responsive control is required.



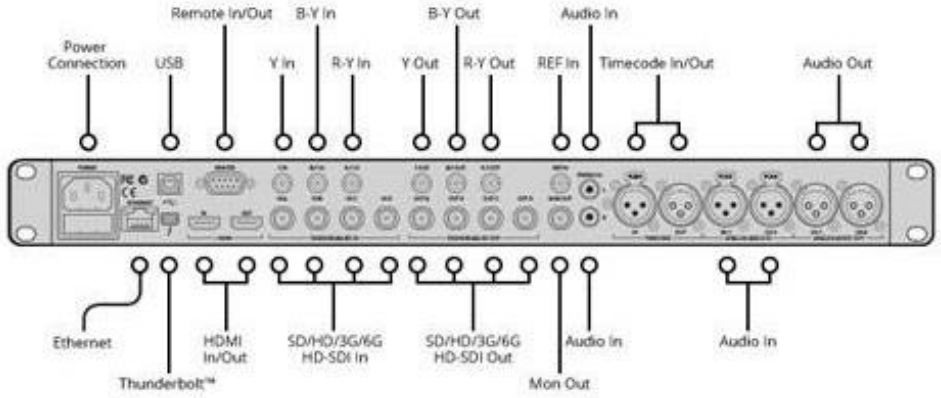
Example

- **Blackmagic VideoHub** is a video router that routes SDI signals between multiple inputs and outputs.
- It allows versatile signal switching with minimal latency (routing switch).
- Supports control via front panel, software and remote control.
- Used in broadcast environments to route signals between cameras, switchers, recorders, monitors.
- It is crucial in systems where signals are multiplexed and distributed.
- Model types: VideoHub 12x12, 20x20, 72x72 and larger.



Example

- **Blackmagic HyperDeck Studio** is a file-based video recorder/player designed for broadcast workflow.
- Supports ProRes, DNx and compressed formats, HDR standards and various SDI/HD/4K formats.
- Features a 12G-SDI input and two 12G-SDI outputs, with fill/key output support in Pro models.
- ItIncludes two SSD slots and two SD slots for uninterrupted hot-swap recording.
- Controlled via Blackmagic OS, with LCD monitor and adjustment screen.
- Supports 10G Ethernet for network recording and control.



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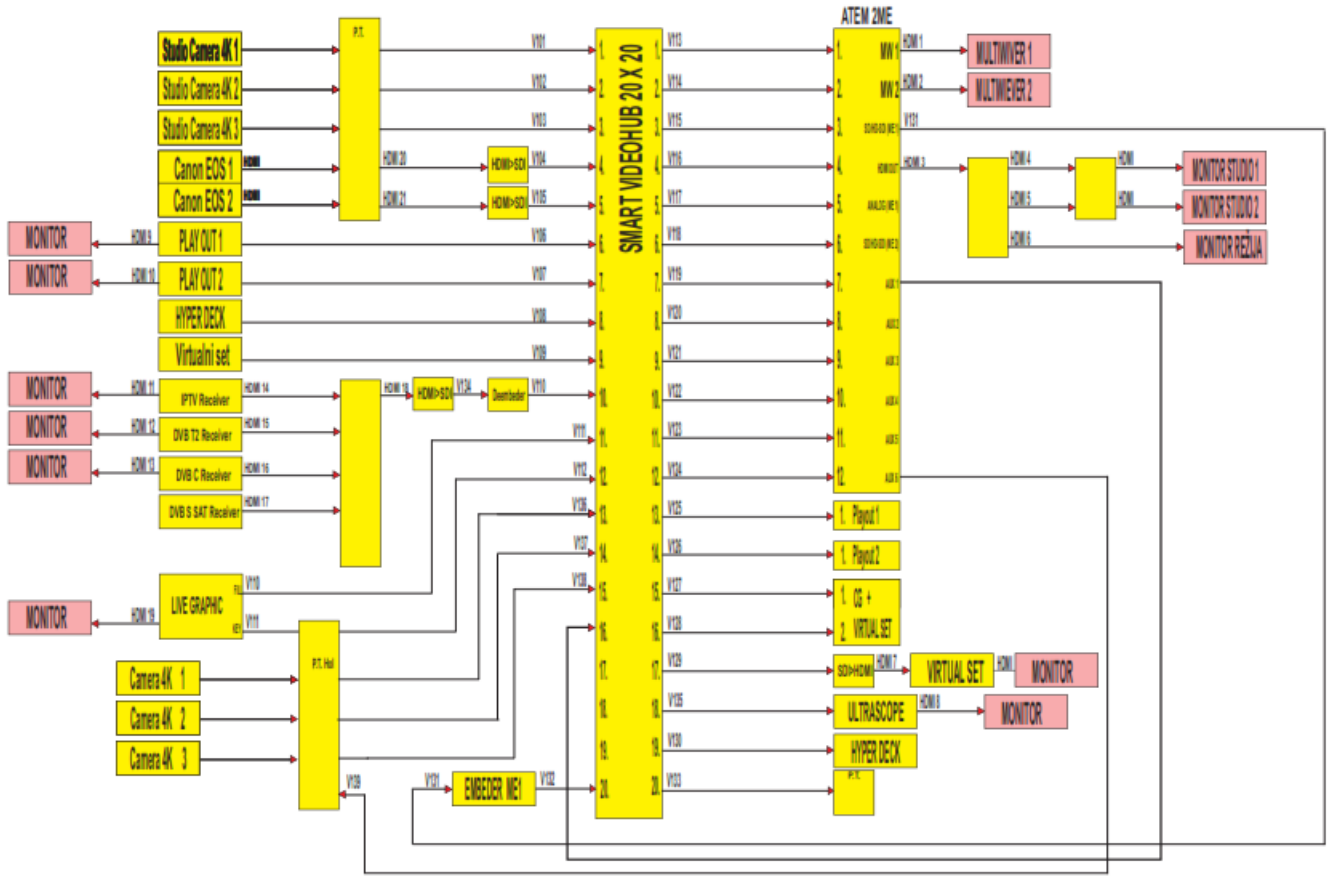
Example

- In live production, we combine the **ATEM switcher** as the core of switching cameras and graphics.
- **The HyperDeck** is used to record master copies or replays (ISO recording).
- **VideoHub** distributes signals between cameras, control room, monitors, and recorders.
- Control and synchronization are achieved using a reference signal (blackburst / tri-sync).
- The result: a flexible and modular broadcast system with adaptive signal paths.
- This combination is the standard in modern production studios.

Example


ATEM 2ME
SMART VIDEOHUB 20 X 20
Studio Camera 4K 1
Studio Camera 4K 2
Studio Camera 4K 3
Canon EOS 1
Canon EOS 2
PLAY OUT 1
PLAY OUT 2
HYPER DECK
Virtualni set
IPTV Receiver
DVB T2 Receiver
DVB C Receiver
DVB S SAT Receiver
LIVE GRAPHIC
Camera 4K 1
Camera 4K 2
Camera 4K 3
EMBEDER ME1
MONITOR
MULTIVIEVER 1
MULTIVIEVER 2
MONITOR STUDIO 1
MONITOR STUDIO 2
MONITOR REŽIJA
VIRTUAL SET
ULTRASCOPE
HYPER DECK

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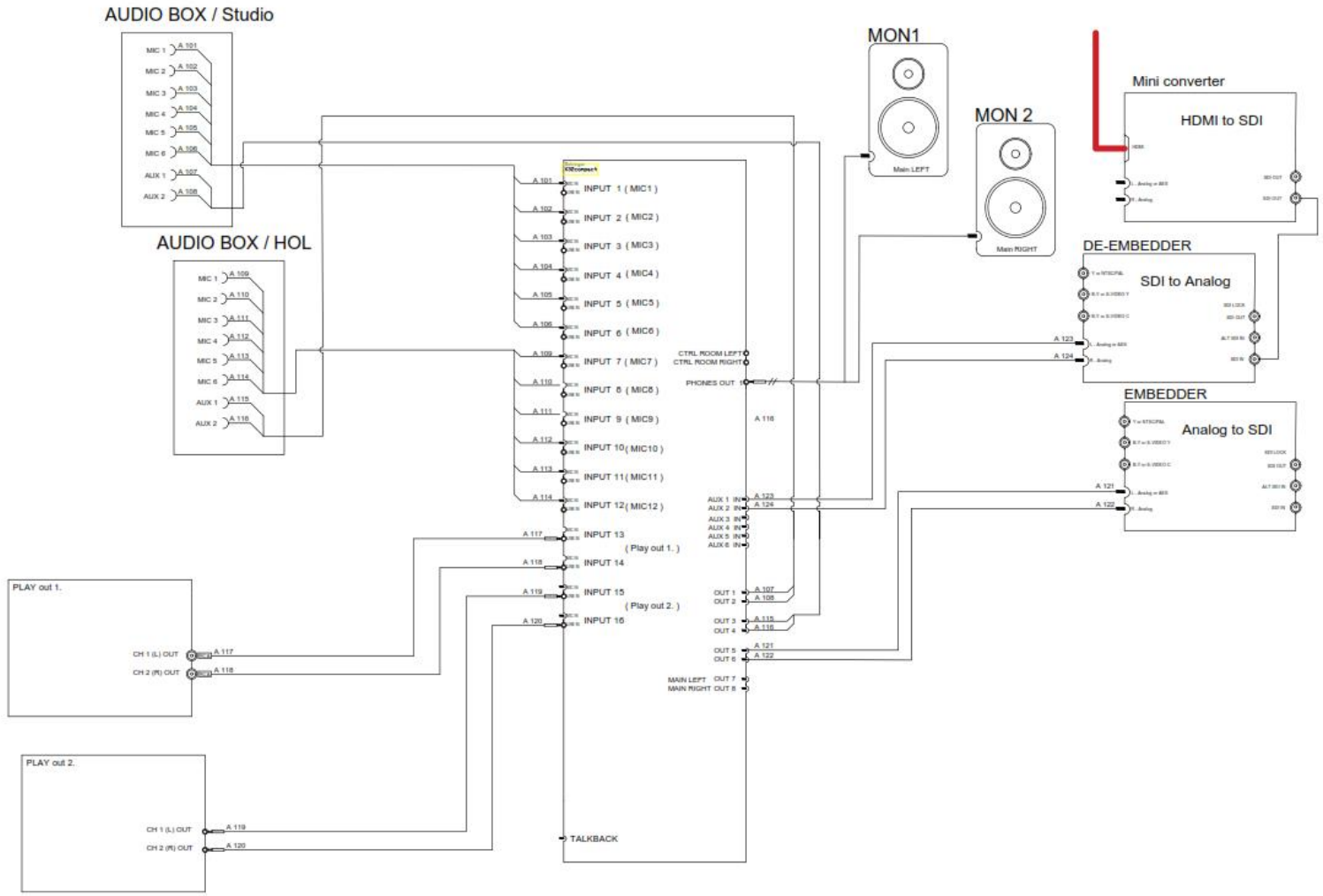
Example



Example

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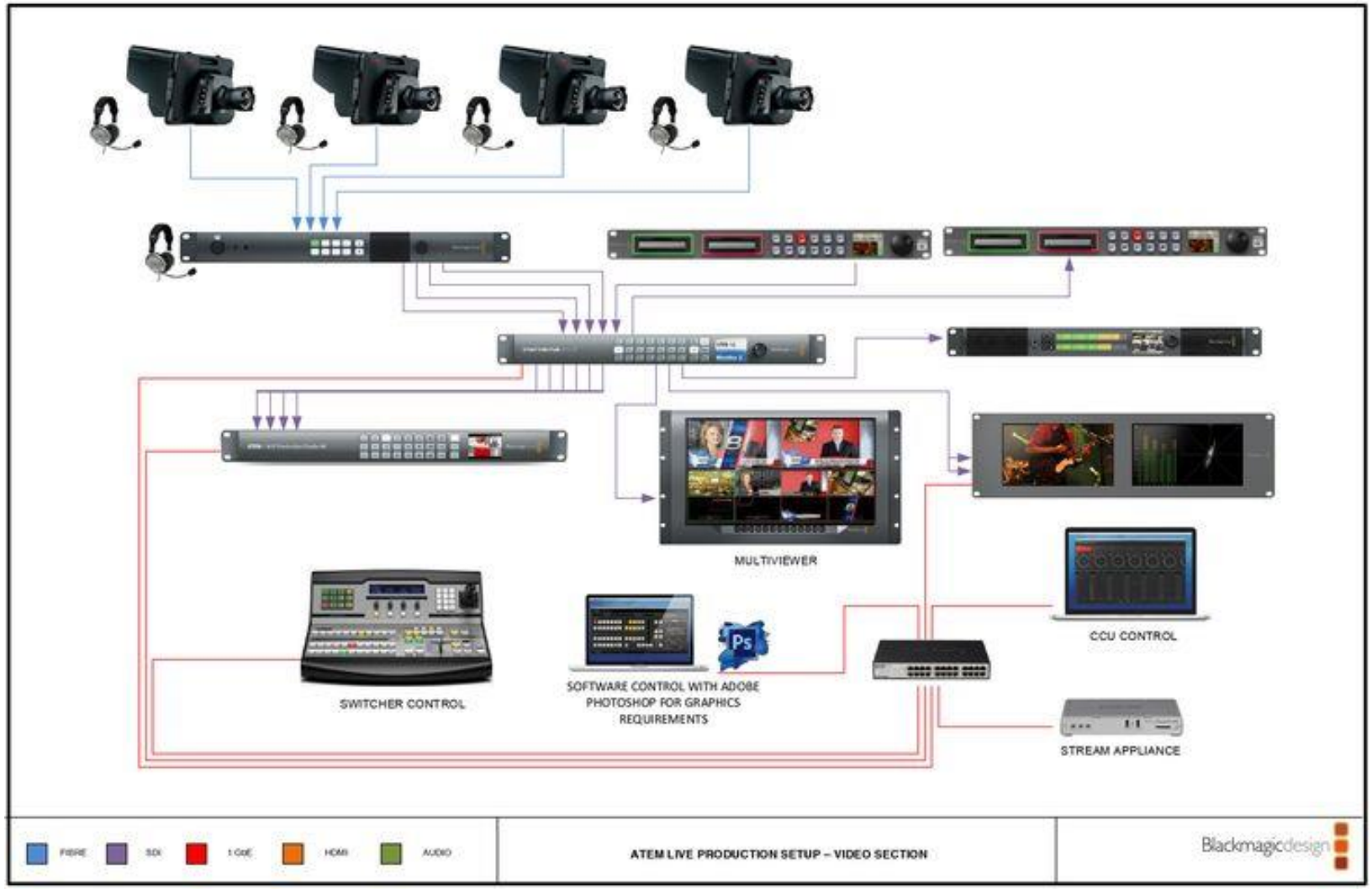
Example



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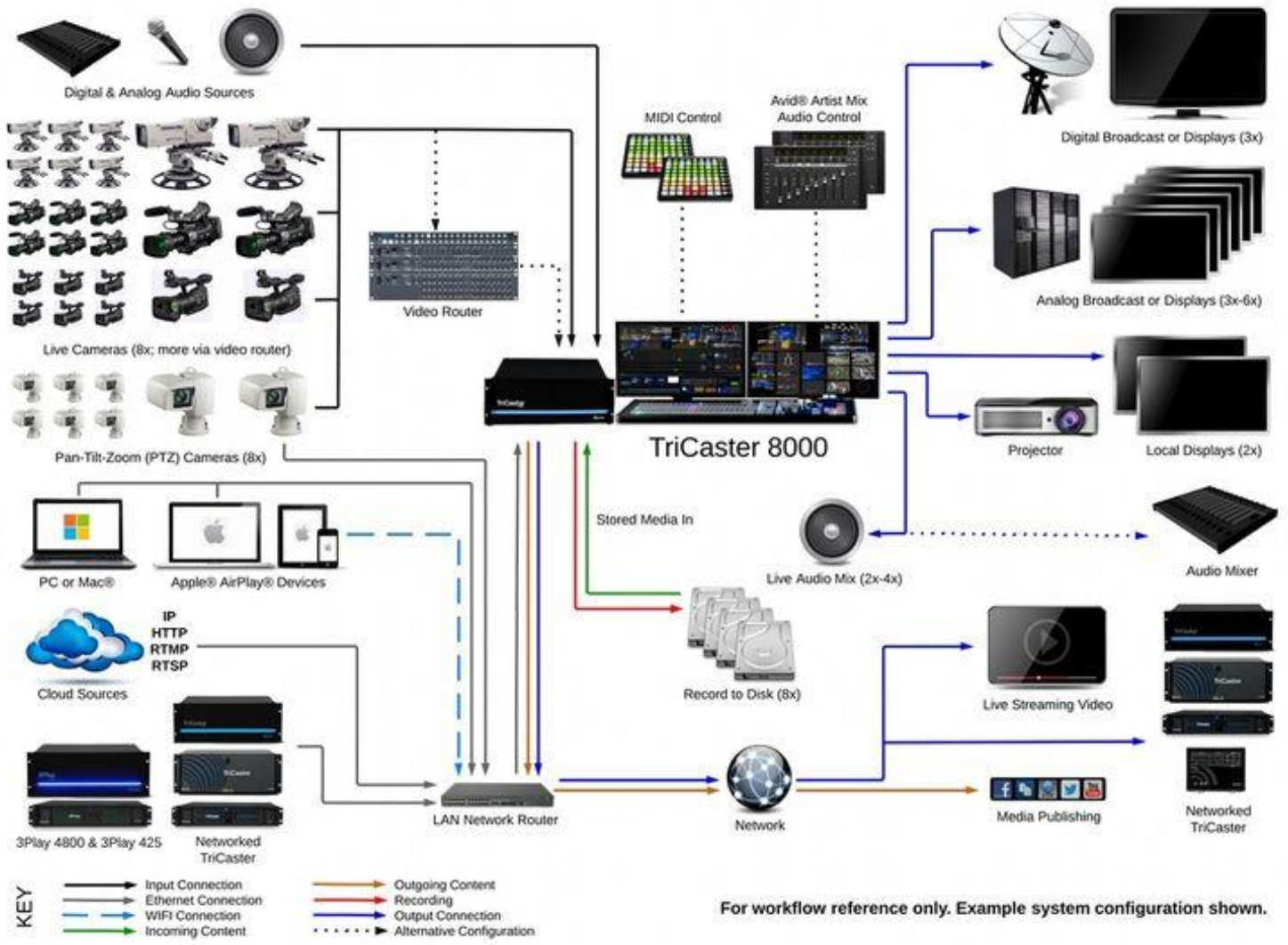
Example



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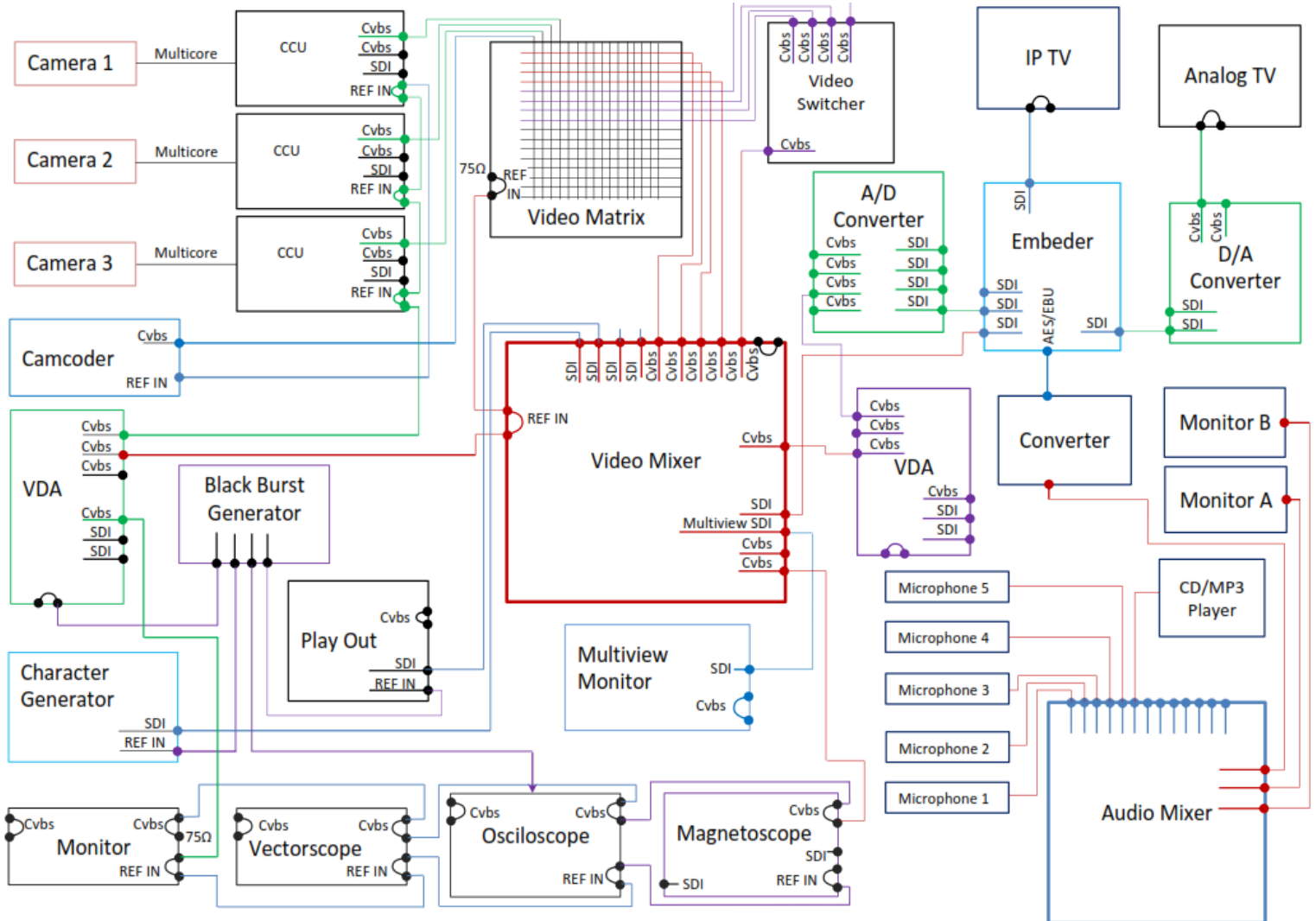
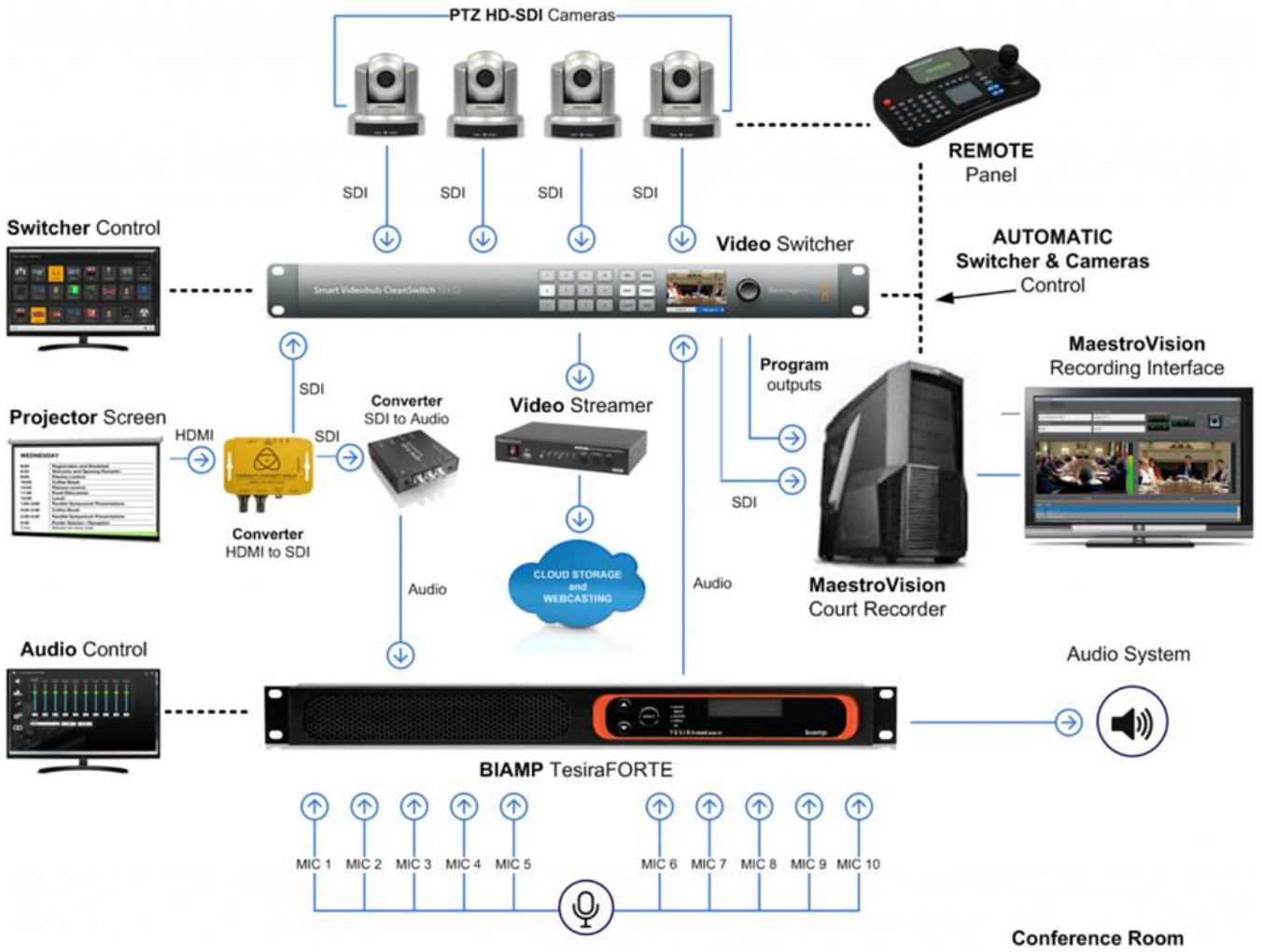
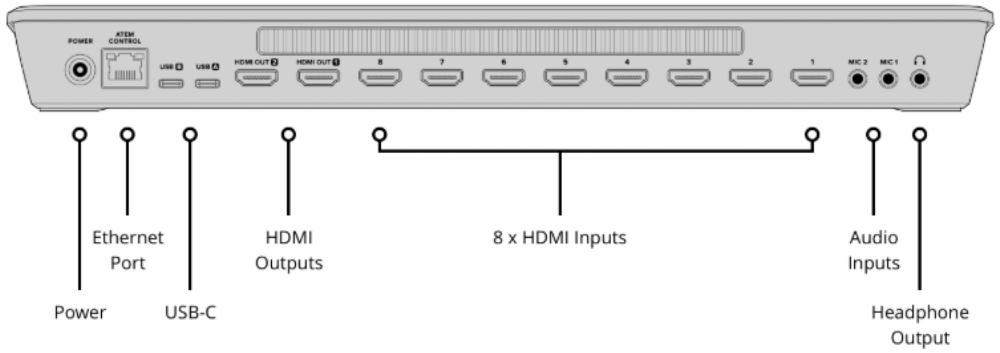
Example

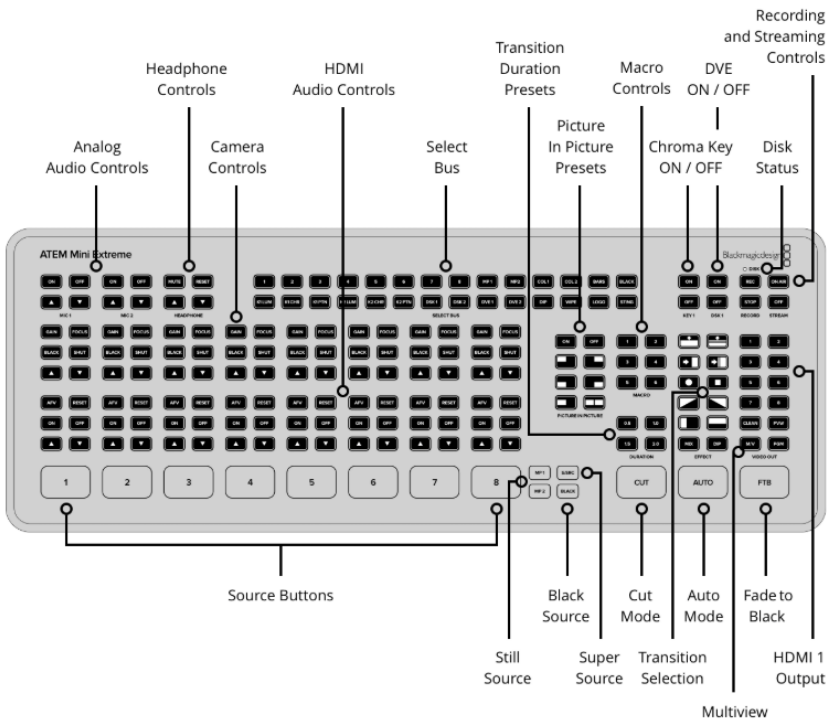


Example


PTZ HD-SDI Cameras
REMOTE
Panel
SDI
SDI
SDI
SDI
Switcher Control
Video Switcher
AUTOMATIC
Switcher & Cameras
Control
MaestroVision
Recording Interface
Program
outputs
Projector Screen
HDMI
SDI
Converter
SDI to Audio
Video Streamer
SDI
Converter
HDMI to SDI
CLOUD STORAGE
and
WEBCASTING
Audio
Audio
MaestroVision
Court Recorder
Audio Control
Audio System
BIAMP TesiraFORTE
MIC 1
MIC 2
MIC 3
MIC 4
MIC 5
MIC 6
MIC 7
MIC 8
MIC 9
MIC 10
Conference Room

Example





Standards

HD Video Input Standards
720p50, 720p59.94, 720p60
1080p23.98, 1080p24, 1080p25, 1080p29.97, 1080p30, 1080p50, 1080p59.94, 1080p60
1080i50, 1080i59.94, 1080i60

HD Video Output Standards
1080p23.98, 1080p24, 1080p25, 1080p29.97, 1080p30, 1080p50, 1080p59.94, 1080p60

Video Streaming Standards
1080p23.98, 1080p24, 1080p25, 1080p29.97, 1080p30, 1080p50, 1080p59.94, 1080p60

Ultra HD Video Standards
None

Video Sampling
4:2:2 YUV

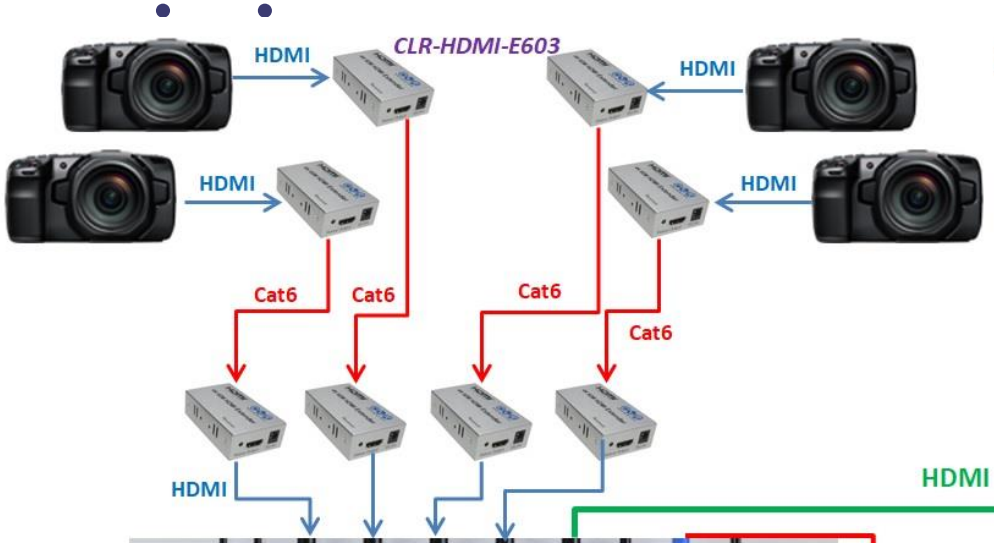
Color Precision
10-bit

Color Space
Rec 709

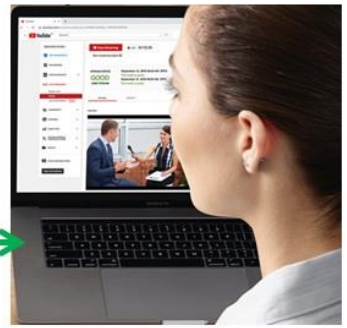
HDMI Input Resolutions from Computers
1280 x 720p 50Hz, 59.94Hz and 60Hz
1920 x 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94 and 60Hz
1920 x 1080i 50, 59.94Hz and 60Hz

Colorspace Conversion
Hardware based real time.

Example ATEM



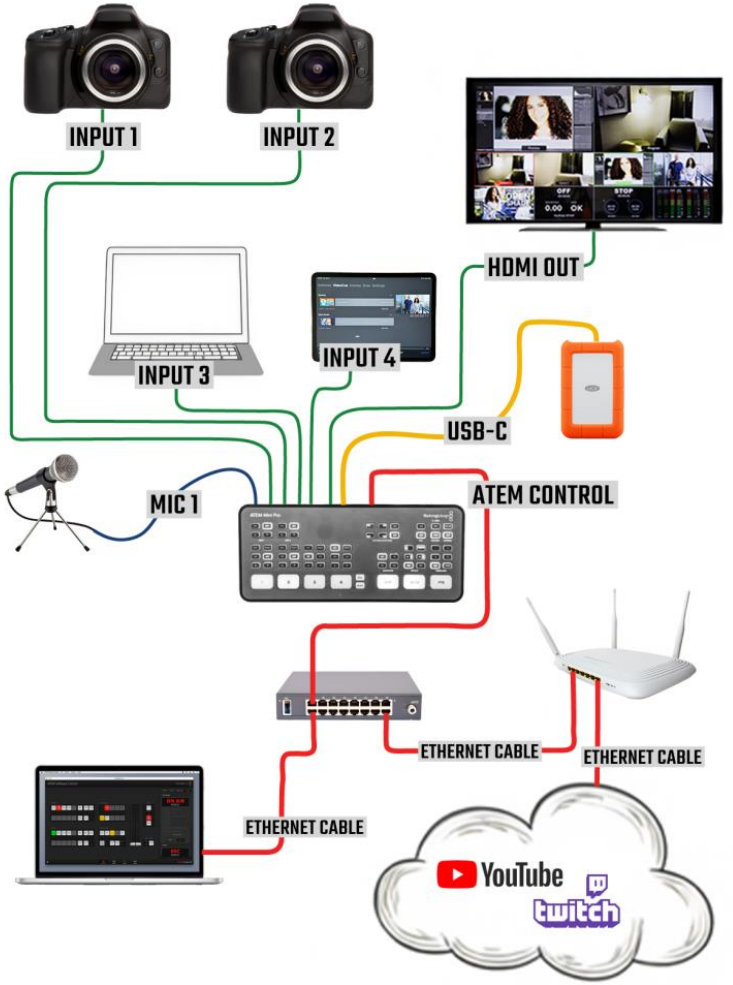
CLR-HDMI-E603 HDMI Extender ve Atem MiniPro ile Canlı yayın uygulaması



HDMI

Cat6

Internet or Local Network



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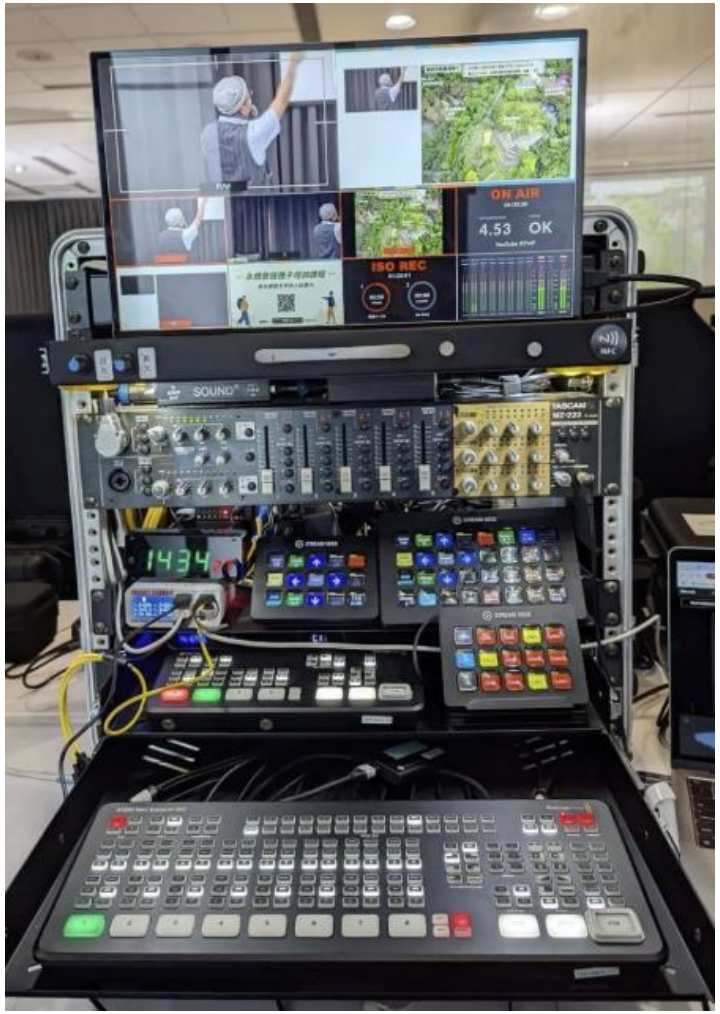
Example



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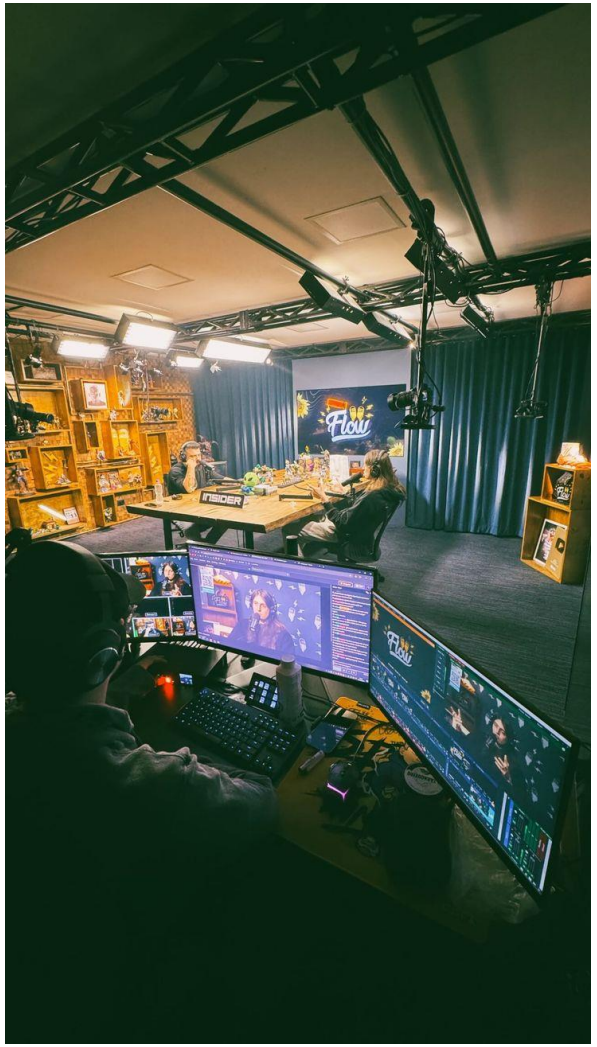
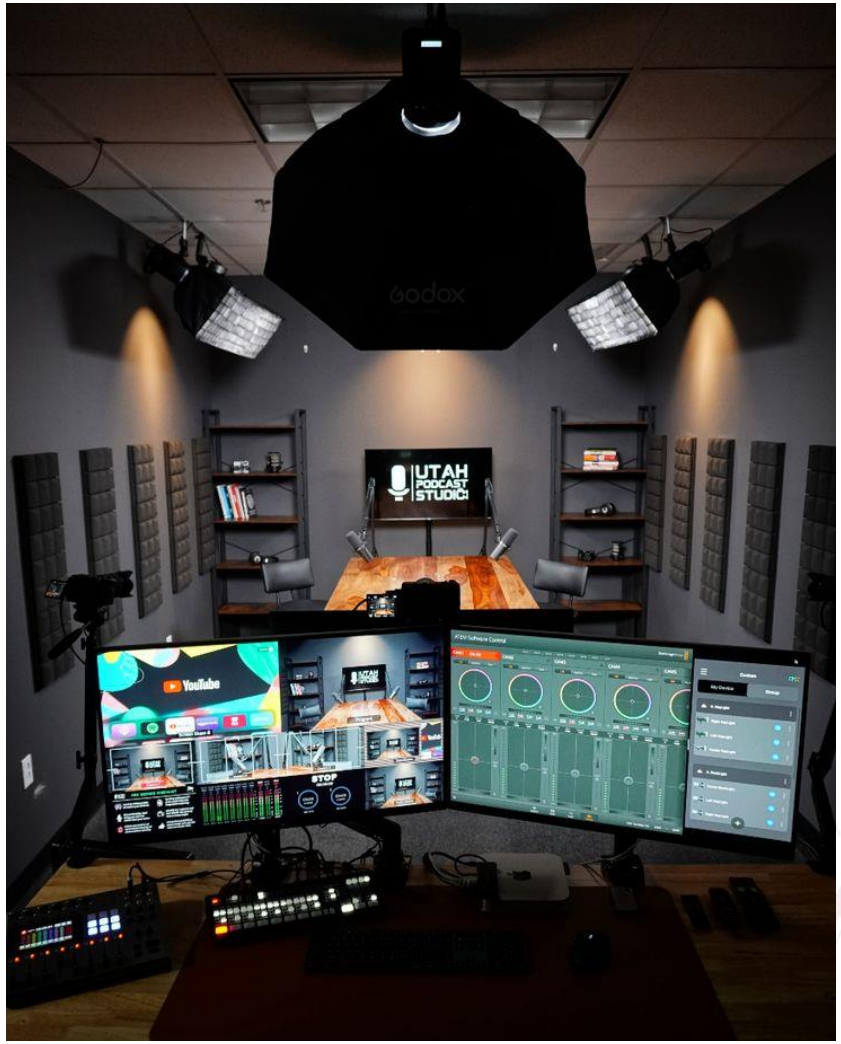
Example





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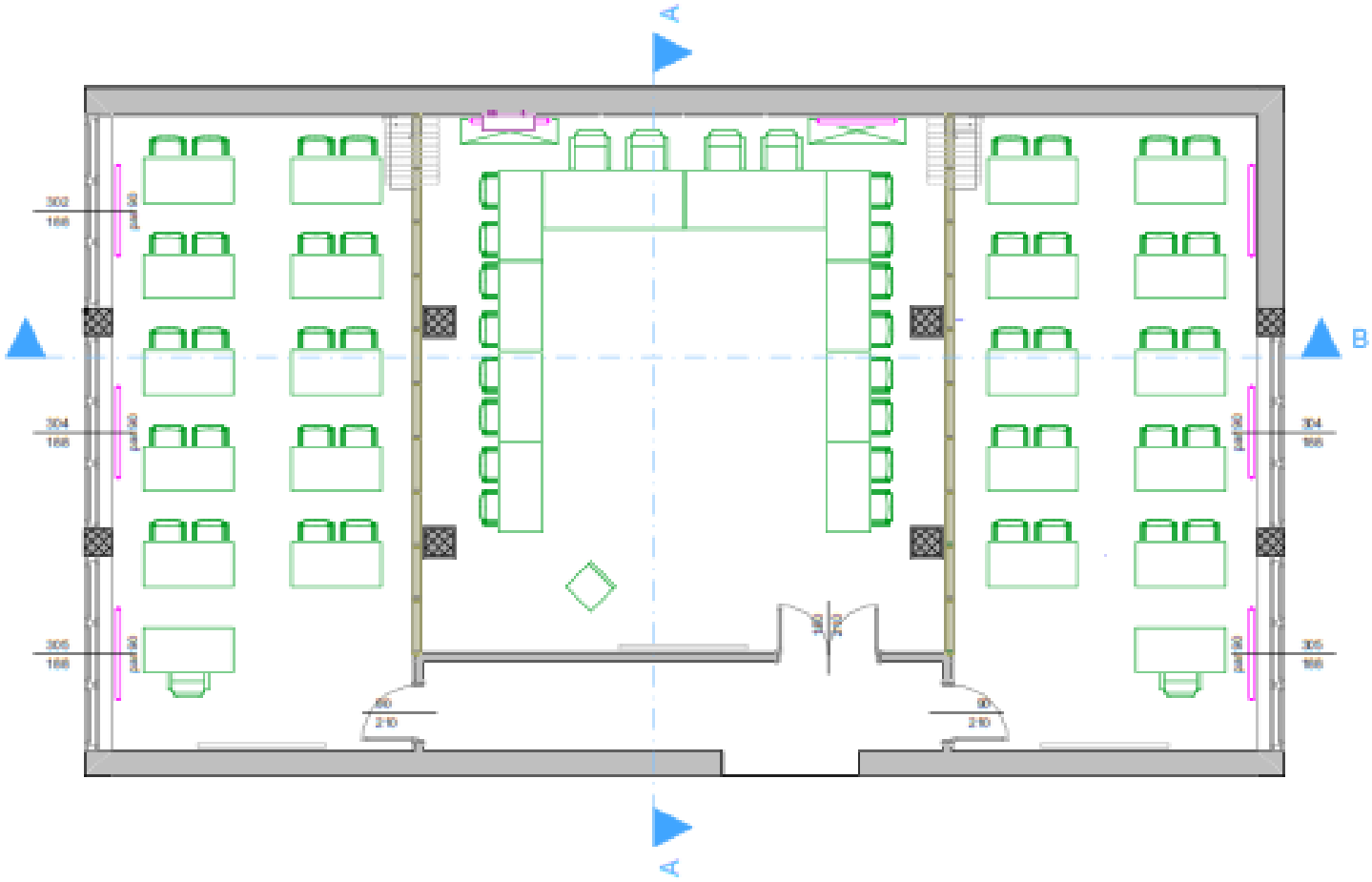
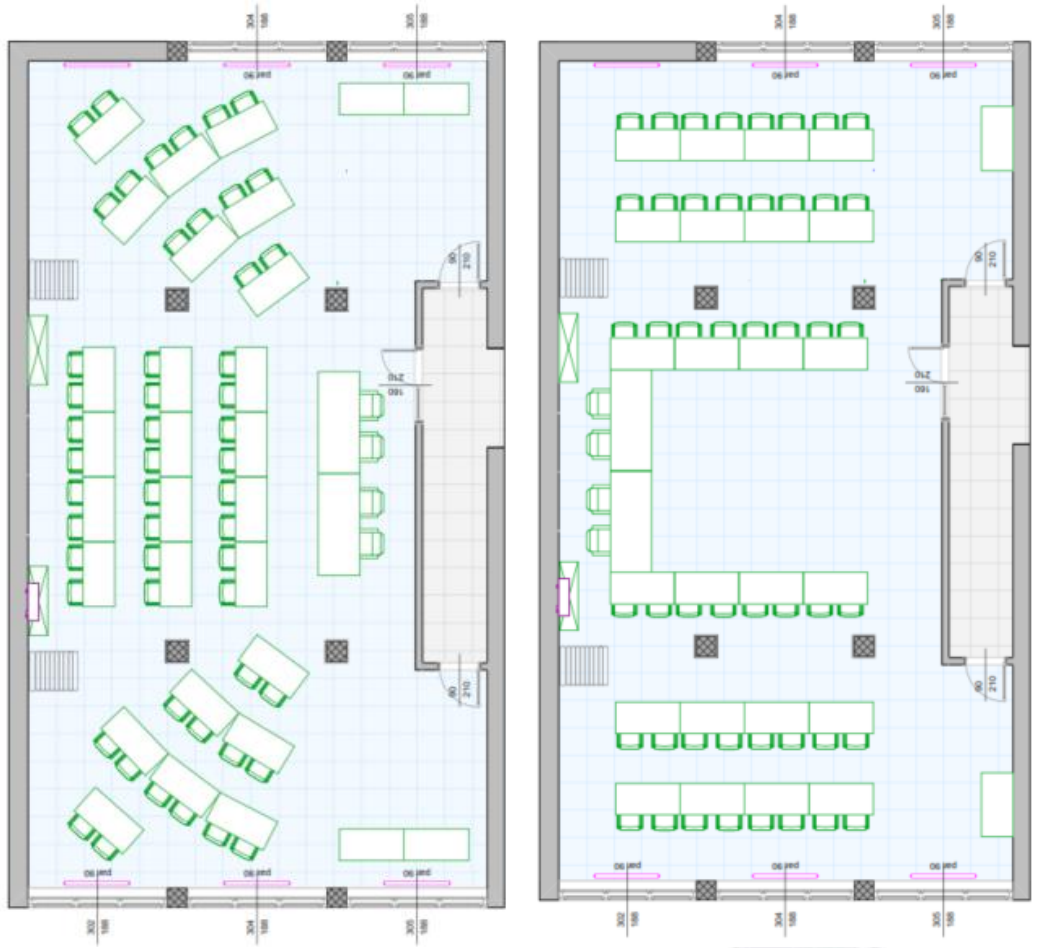
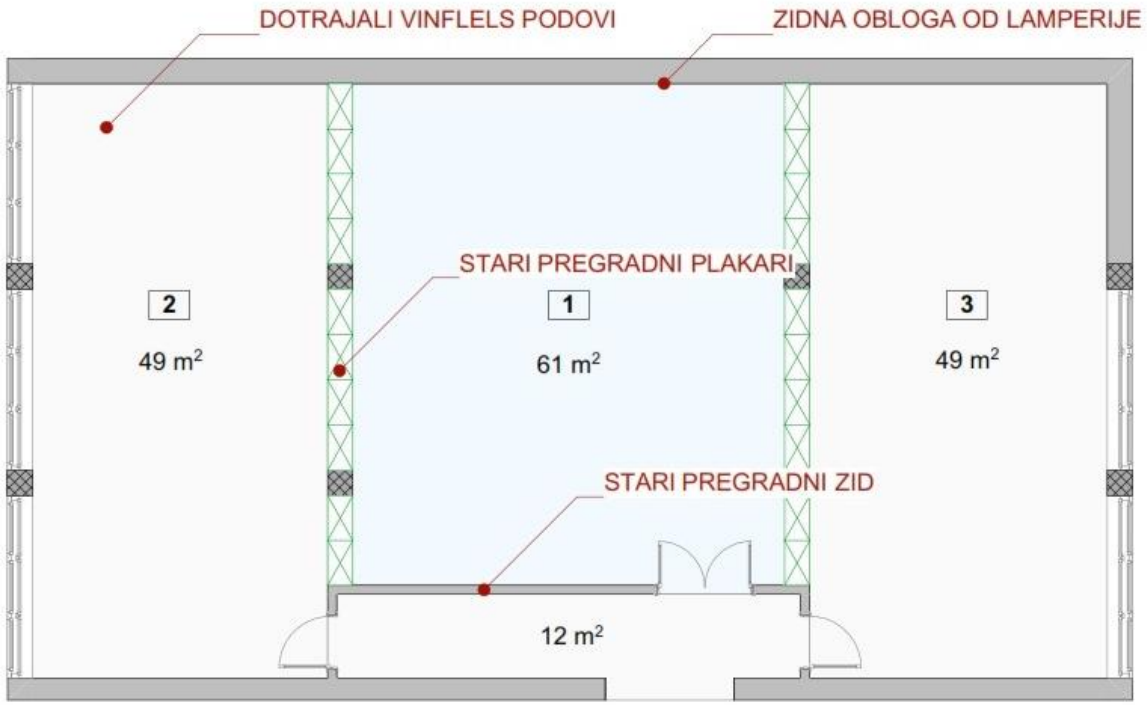
Practical example at the Faculty of Technical Sciences

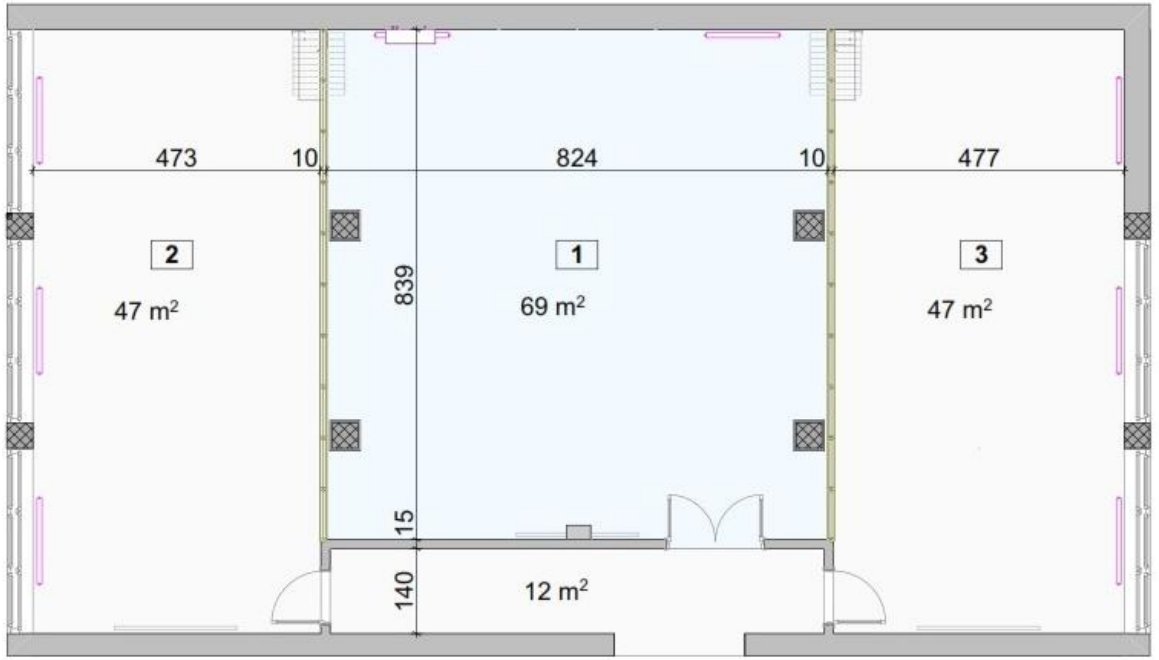
Practical example at the Faculty of Technical Sciences





Practical example at the Faculty of Technical Sciences





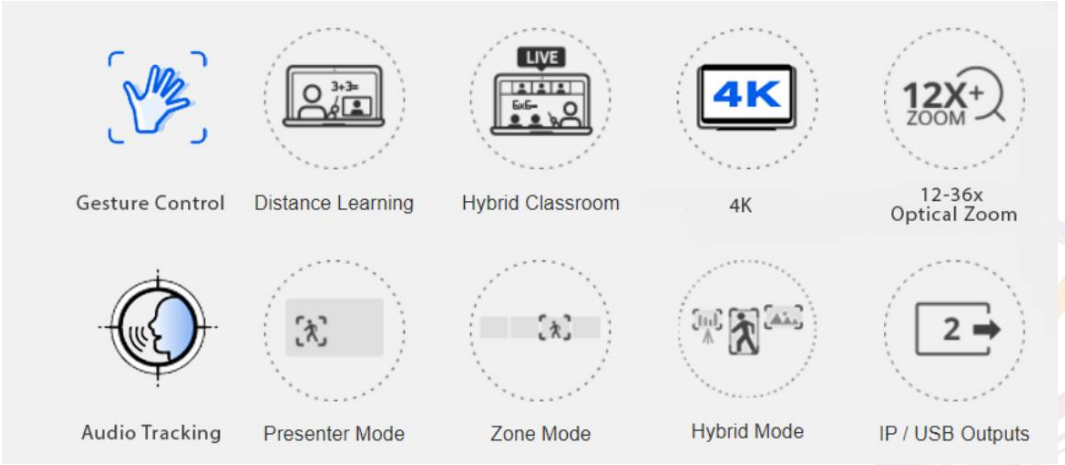
What equipment was needed?

- Cameras
- Wireless microphones
- Audio monitoring
- Projectors
- Video matrix
- Video montoring
- Multimedia presenter
- Cables
- Other

What equipment was needed?

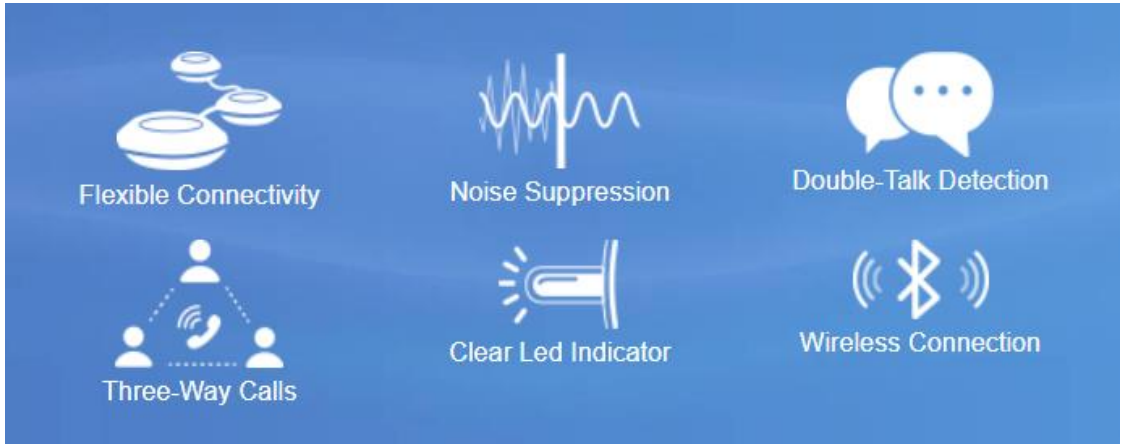
Video

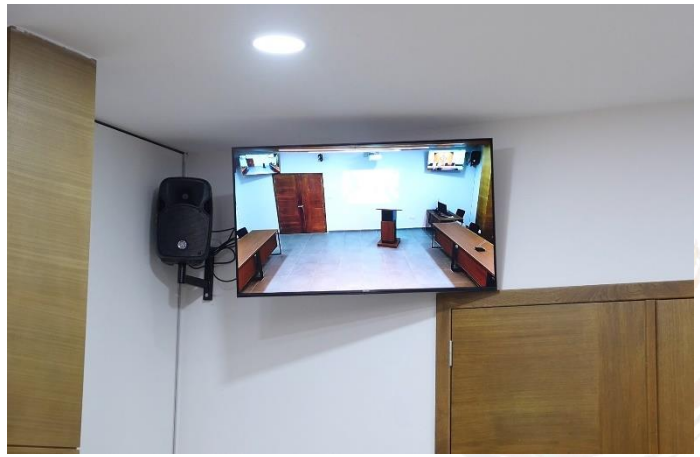
- 36x zoom
- Speaker Tracking
- Presenter Tracking
- Predefined Zones
- PoE
- Multiple output interfaces
- Video matrix



Sound

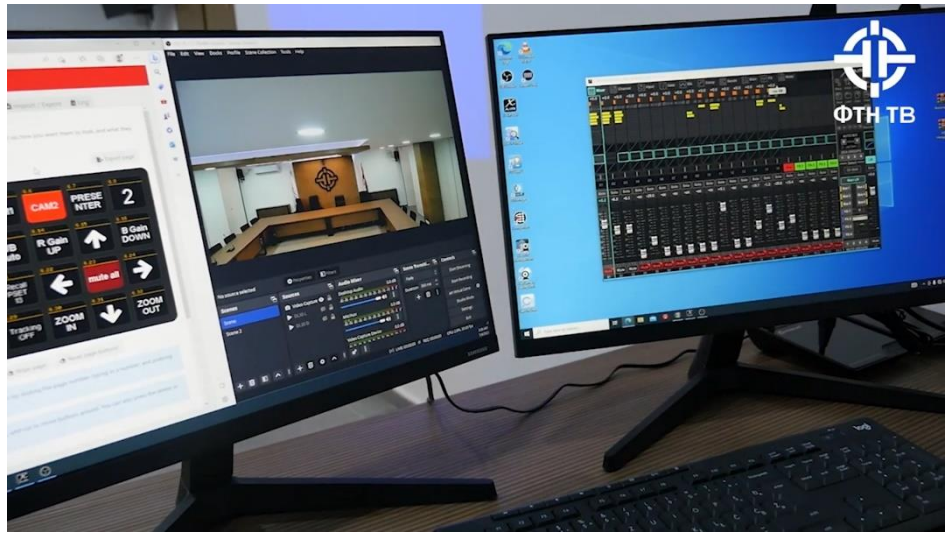
- Goosneck microphones
- Ceiling microphones/speakers
- AEC
- EQ
- Noise suppression
- AutoMix
- Remote Control
- Manual control

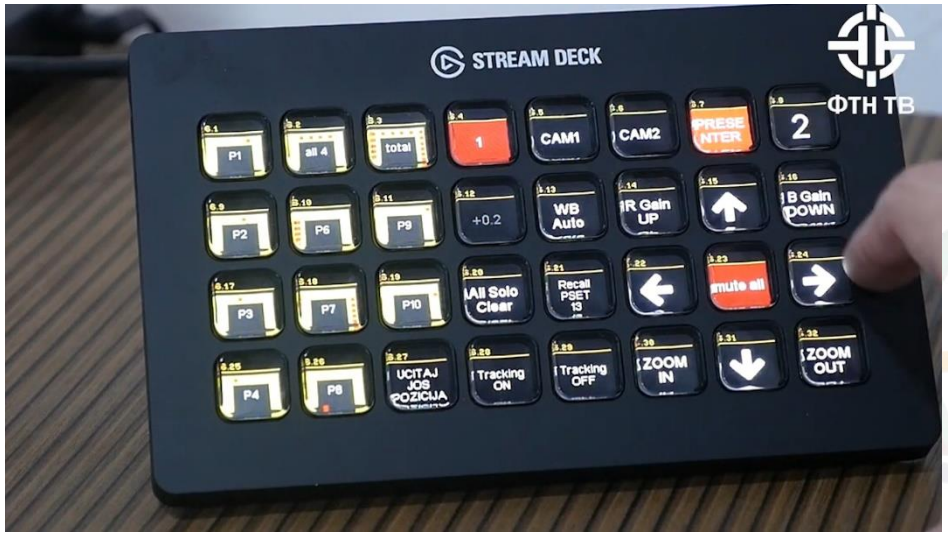




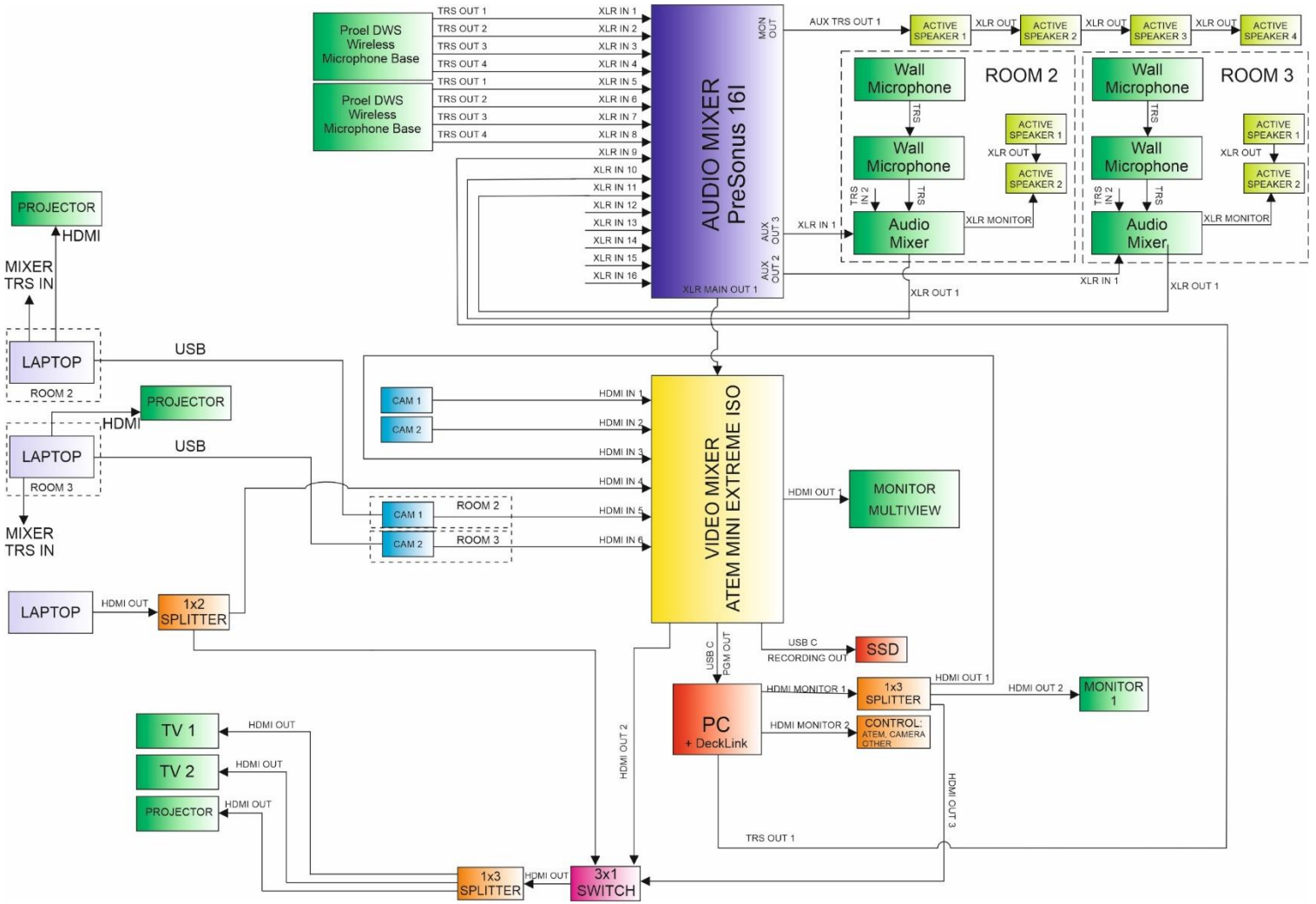
Control

- Automated
- Via tablets
- Via StreamDeck
- Via PC
- PoE
- Multiple output interfaces
- Video matrix
- Monitroing

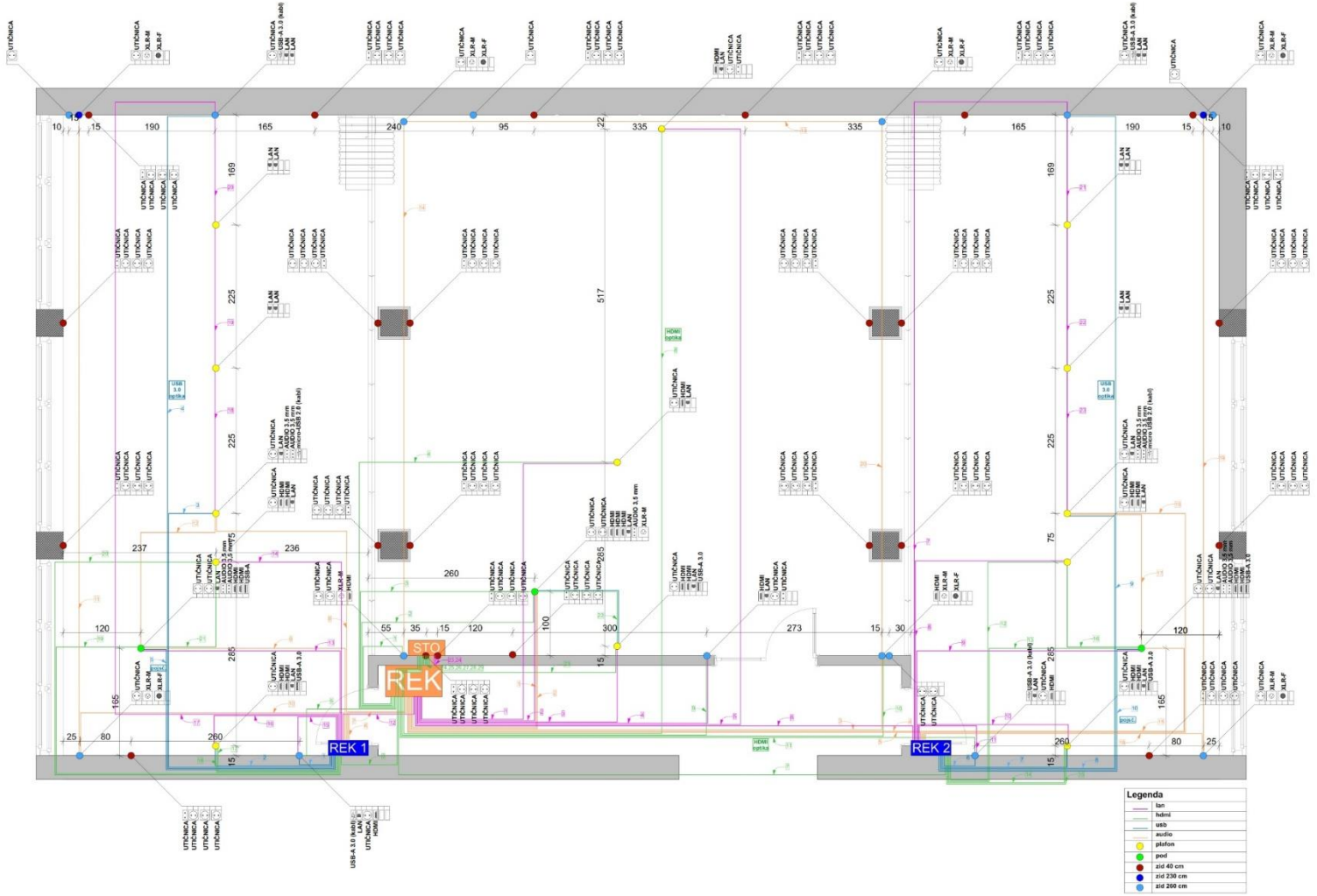




Video and audio diagram



Cable diagram



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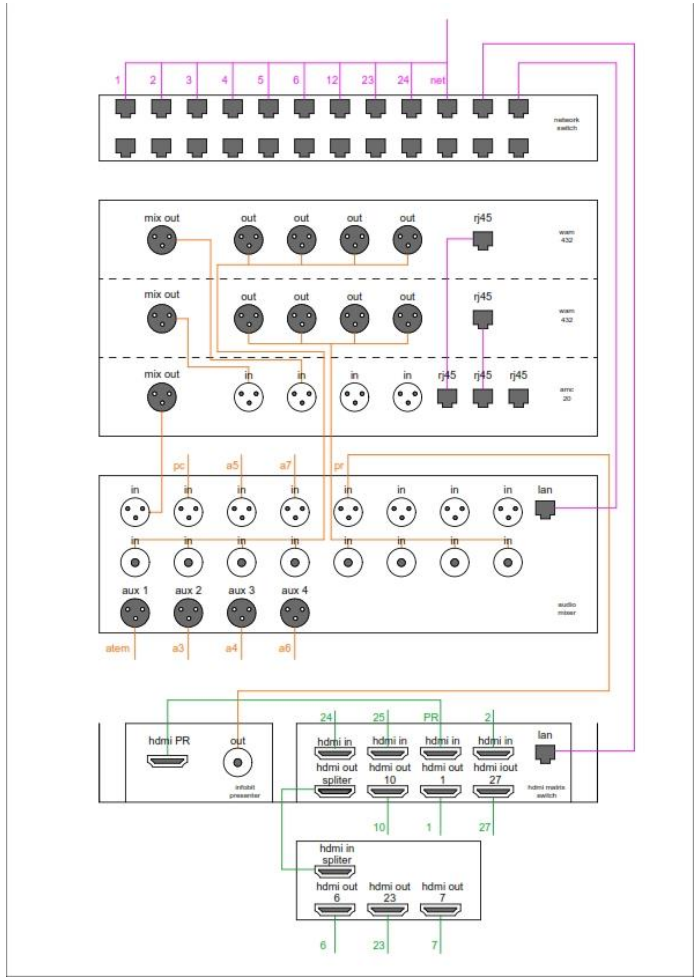
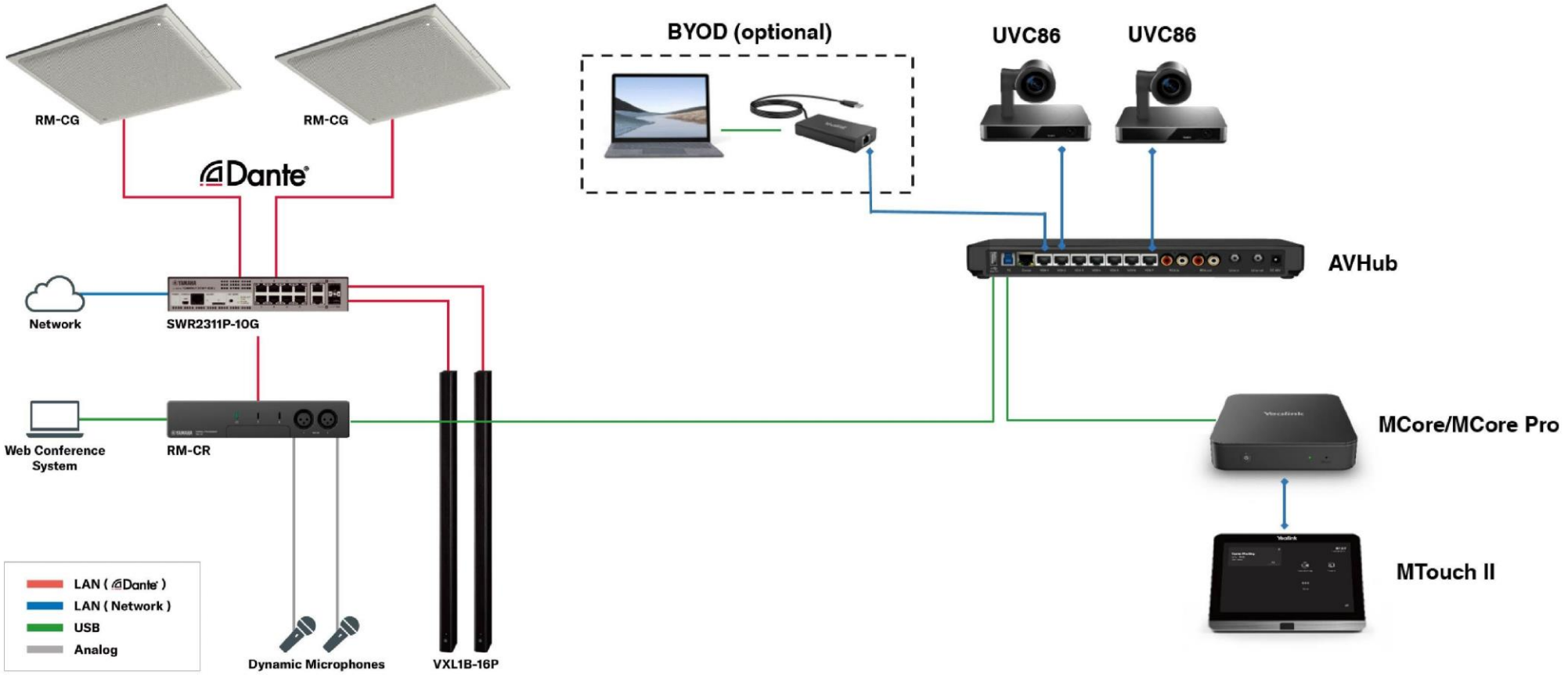
Spell bonding scheme



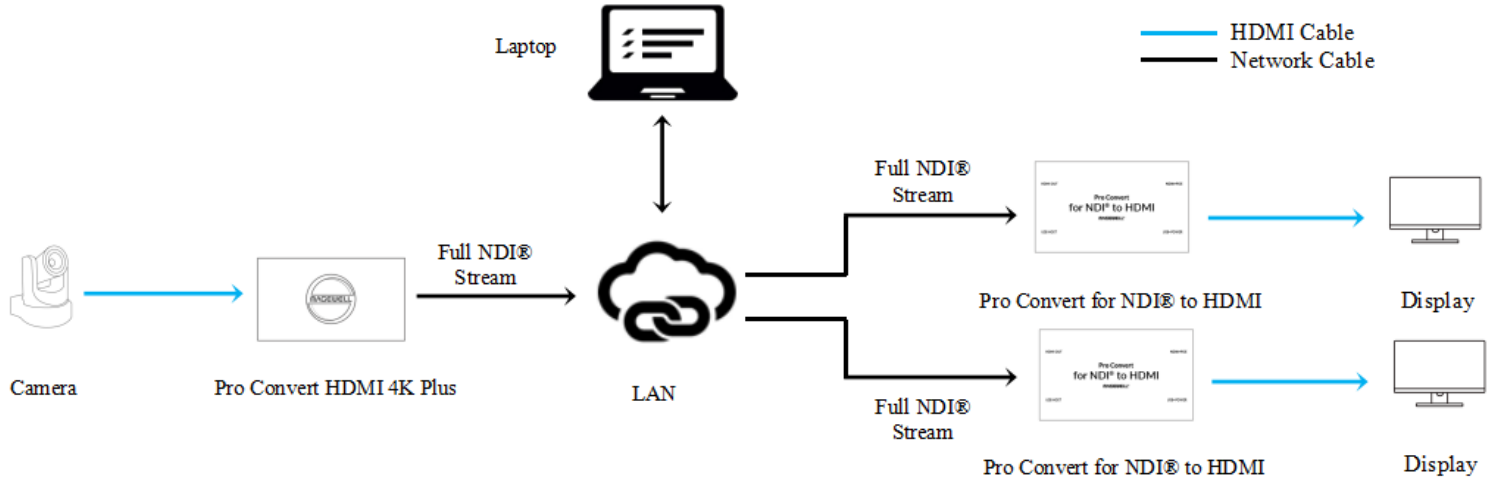
Practical example at the Faculty of Technical Sciences

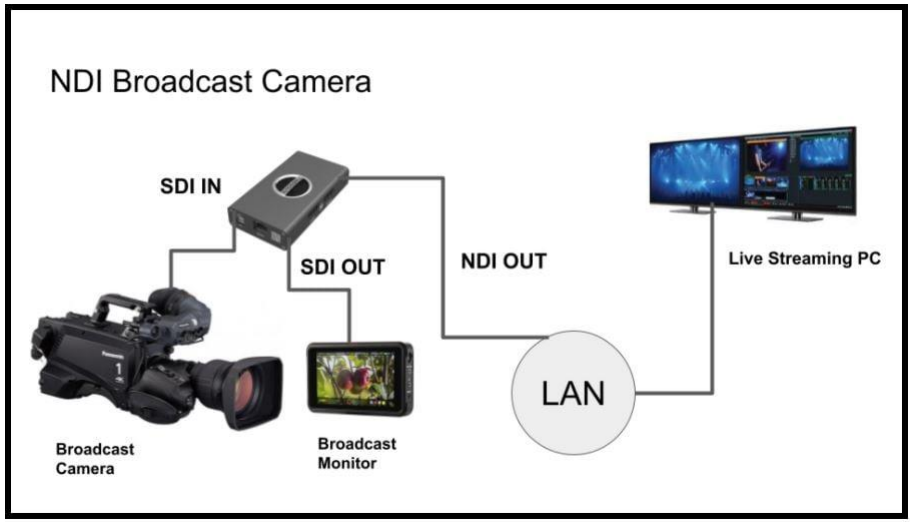
Example


RM-CG
RM-CG
Dante
BYOD (optional)
UVC86
UVC86
AVHub
Network
SWR2311P-10G
Web Conference System
RM-CR
MCore/MCore Pro
MTouch II
LAN (Dante)
LAN (Network)
USB
Analog
Dynamic Microphones
VXL1B-16P

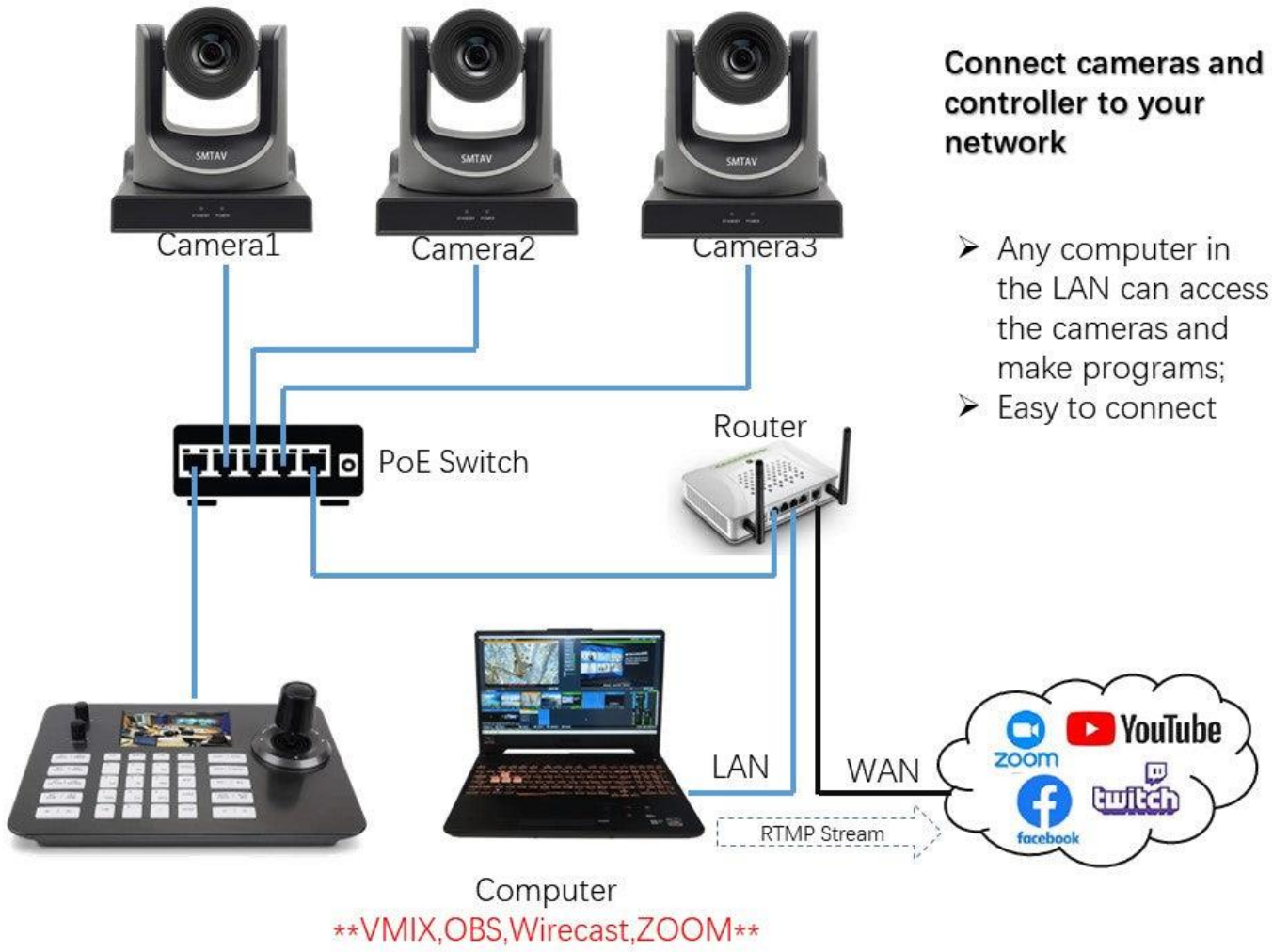
Example


KILOVIEW
HDMI
N5 FOR NDI
IN
OUT
DC 5-18V
Tally
NDI | PoE
IN
OUT


Laptop
HDMI Cable
Network Cable
Full NDI® Stream
Full NDI® Stream
Full NDI® Stream
Camera
Pro Convert HDMI 4K Plus
LAN
Pro Convert for NDI® to HDMI
Pro Convert for NDI® to HDMI
Display
Display


NDI Broadcast Camera
SDI IN
SDI OUT
NDI OUT
Live Streaming PC
LAN
Broadcast Camera
Broadcast Monitor

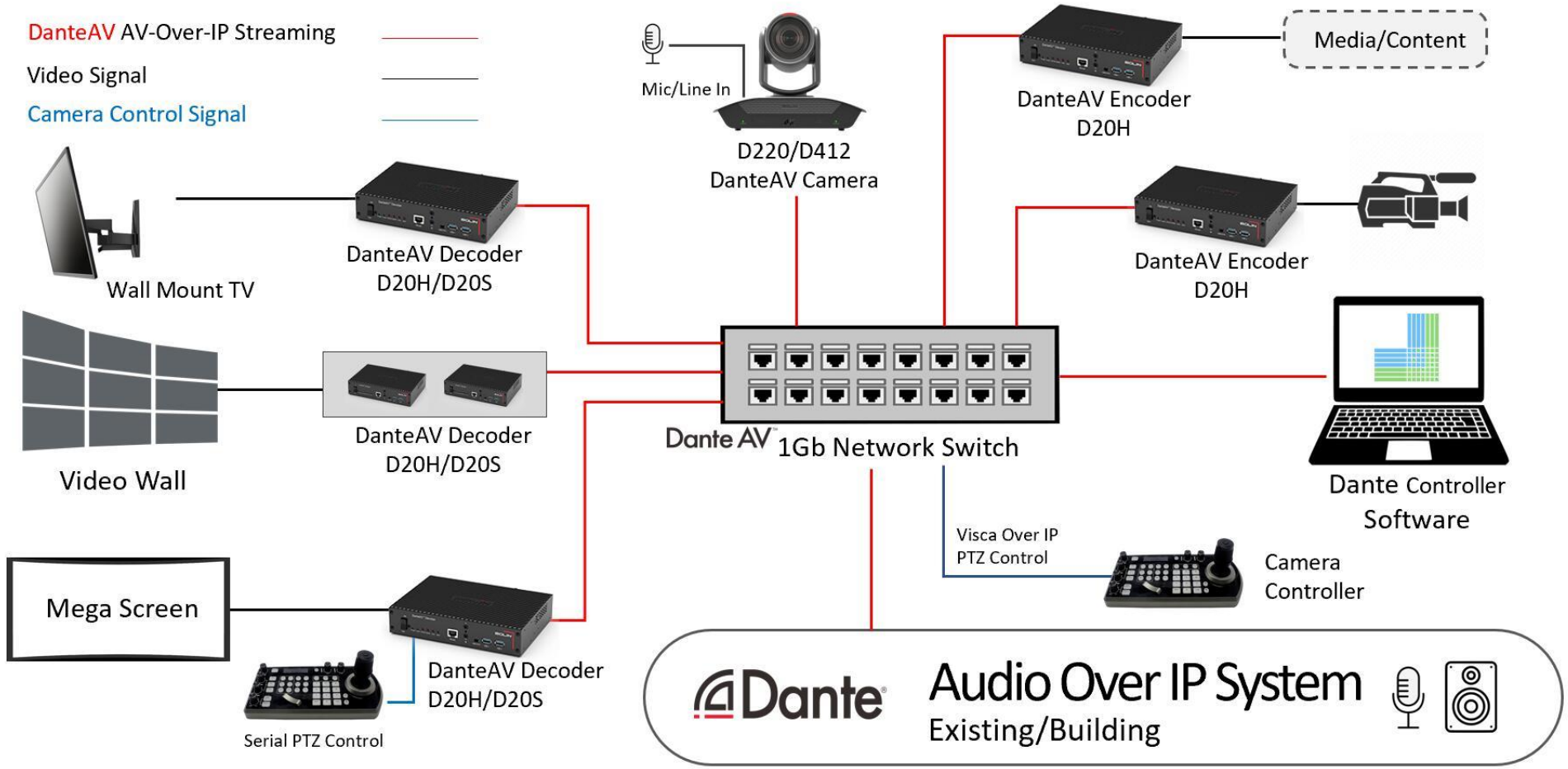
Example



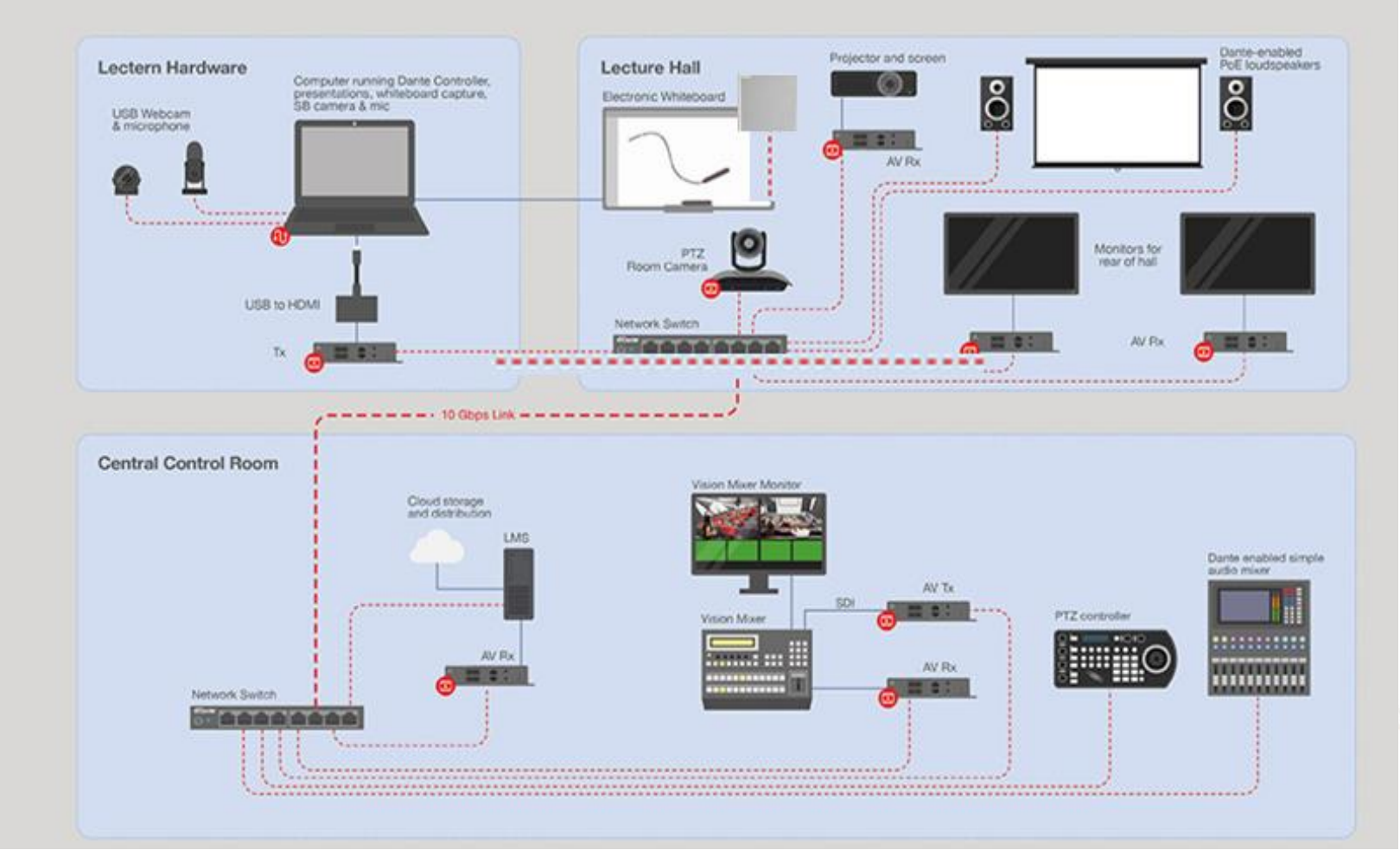
Connect cameras and controller to your network

- Any computer in the LAN can access the cameras and make programs;
- Easy to connect

Example


DanteAV AV-Over-IP Streaming
Video Signal
Camera Control Signal
Mic/Line In
D220/D412
DanteAV Camera
DanteAV Encoder
D20H
Media/Content
DanteAV Encoder
D20H
Wall Mount TV
DanteAV Decoder
D20H/D20S
Video Wall
DanteAV Decoder
D20H/D20S
Dante AV 1Gb Network Switch
Dante Controller
Software
Visca Over IP
PTZ Control
Camera
Controller
Mega Screen
DanteAV Decoder
D20H/D20S
Serial PTZ Control
Dante Audio Over IP System
Existing/Building

Example


Lectern Hardware
Computer running Dante Controller, presentations, whiteboard capture, SB camera & mic
USB Webcam & microphone
USB to HDMI
Tx
Lecture Hall
Electronic Whiteboard
Projector and screen
AV Rx
Dante-enabled PoE loudspeakers
PTZ Room Camera
Network Switch
Monitors for rear of hall
AV Rx
10 Gbps Link
Central Control Room
Cloud storage and distribution
LMS
AV Rx
Network Switch
Vision Mixer Monitor
Vision Mixer
SDI
AV Tx
AV Rx
PTZ controller
Dante enabled simple audio mixer

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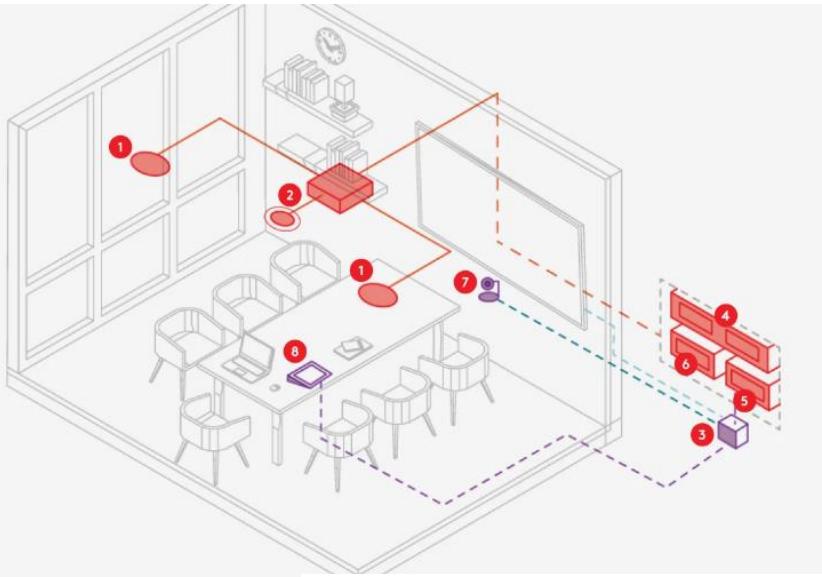
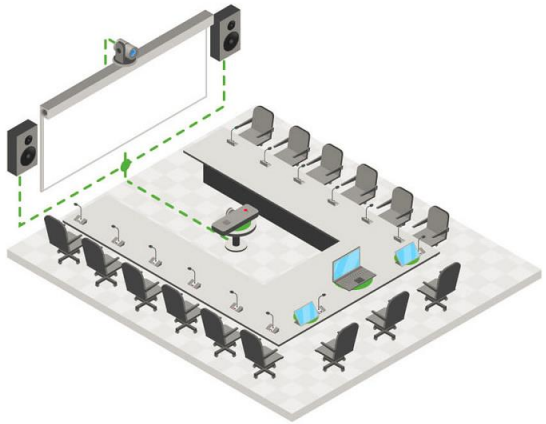
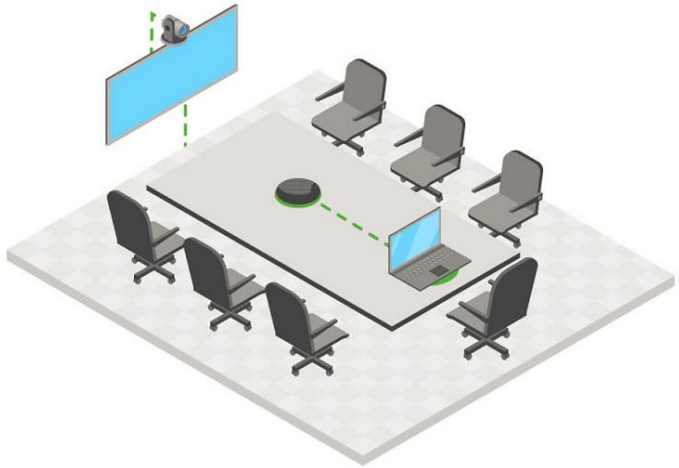
Example

LEGEND:

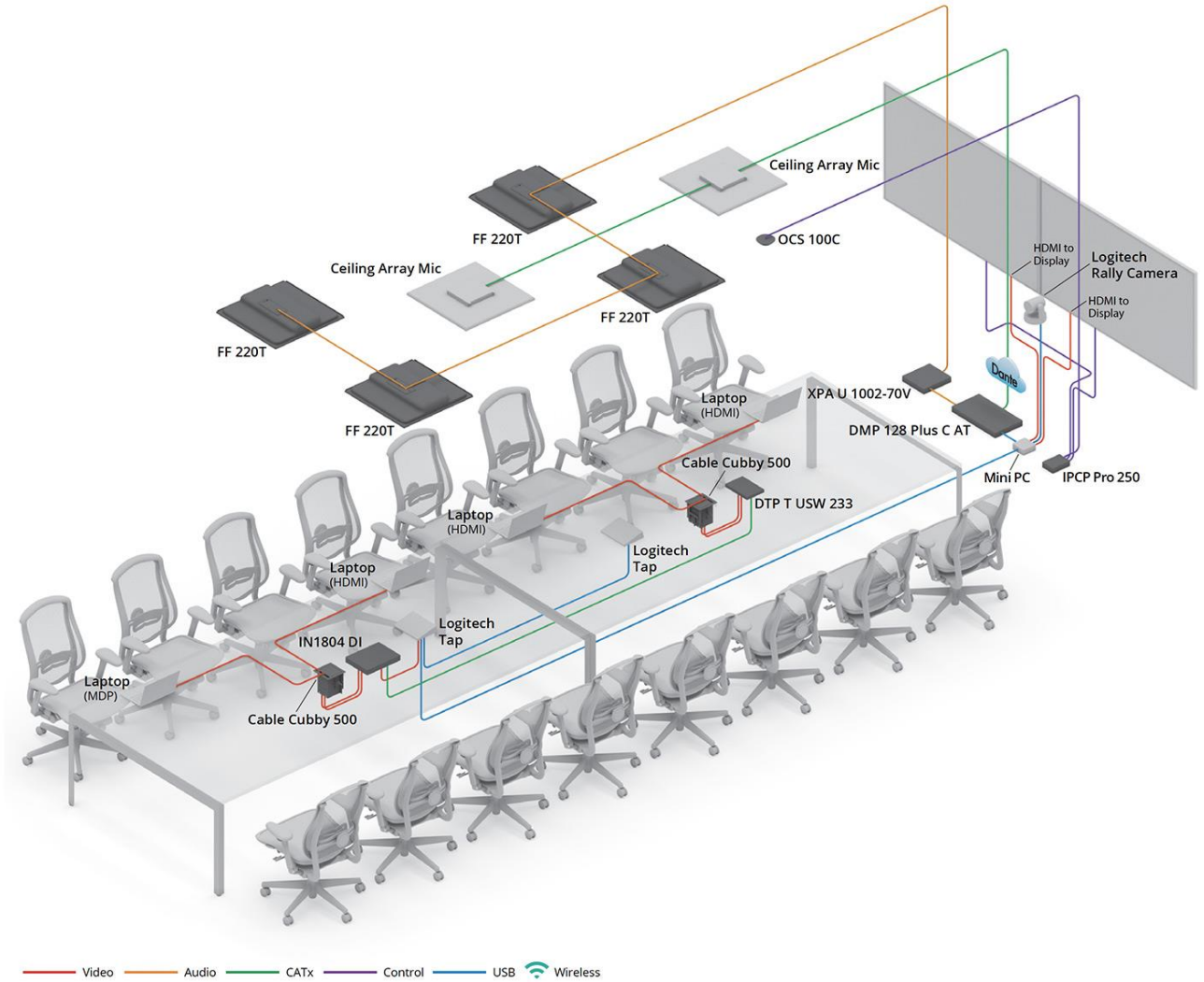
1. Desono C-IC6 Ceiling Speakers (2)
2. Parlé TCM-XA Ceiling Microphone
3. Logitech RoomMate
4. TesiraFORTÉ AVB VT4
5. TesiraFORTÉ EX-UBT
6. TesiraFORTÉ Connect TC-5
7. Logitech Rally Camera
8. Logitech Tap IP



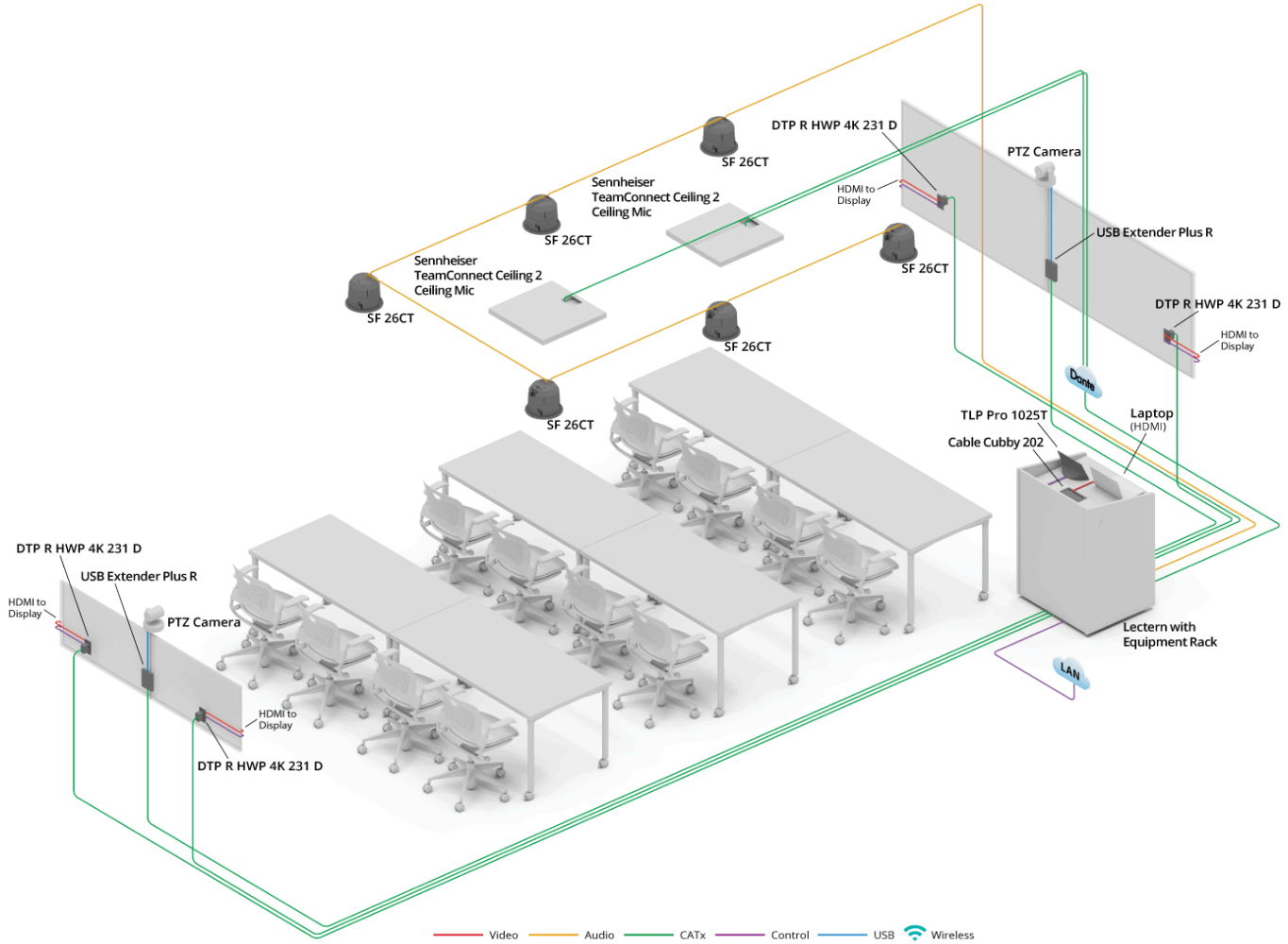




Example


FF 220T
Ceiling Array Mic
OCS 100C
HDMI to Display
Logitech Rally Camera
HDMI to Display
Ceiling Array Mic
FF 220T
FF 220T
FF 220T
Dante
Laptop (HDMI)
XPA U 1002-70V
DMP 128 Plus C AT
Cable Cubby 500
Mini PC
IPCP Pro 250
DTP T USW 233
Laptop (HDMI)
Logitech Tap
Laptop (HDMI)
Logitech Tap
IN1804 DI
Laptop (MDP)
Cable Cubby 500
Video
Audio
CATx
Control
USB
Wireless

Example


DTP R HWP 4K 231 D
PTZ Camera
SF 26CT
Sennheiser
TeamConnect Ceiling 2
Ceiling Mic
HDMI to
Display
USB Extender Plus R
DTP R HWP 4K 231 D
Dante
TLP Pro 1025T
Laptop
(HDMI)
Cable Cubby 202
Lectern with
Equipment Rack
LAN
DTP R HWP 4K 231 D
USB Extender Plus R
PTZ Camera
Video
Audio
CATx
Control
USB
Wireless

Multi-camera synchronization techniques

- **Using a clapperboard** – Allows easy synchronization of audio and image in post-production.
- **Automatic synchronization in software** – Programs such as Adobe Premiere Pro and DaVinci Resolve can automatically synchronize recordings using audio tracks.
- **Timecode synchronization** – All cameras use the same timecode to facilitate editing.
- **Live switching (for live events)** – Cameras are connected to the control room system where the director selects shots in real time.

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Questions & Answers

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Network of centers for regional short study programs in the countries of the Western Balkans

Call: ERASMUS-EDU-2023-CBHE

Project number: 101128813

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