

Video conferencing solution for Department

1. Purpose and Scope of the Solution

The video conferencing solution is designed to provide infrastructure for exchanging video and audio and conducting remote meetings among multiple agencies/organizations. As shown in the diagram, the system consists of video conferencing endpoints (VCS), IP10 equipment, MCU units at the organizational nodes, optical media-conversion equipment, a dedicated transmission network, and integrated audio-visual equipment in the meeting rooms.

This technical description follows the components and equipment labels shown in the diagram. Specific models, detailed interface standards, exact quantities of certain devices, and bandwidth parameters are not inferred where they are not explicitly shown in the diagram.

2. Overall Architecture

The architecture can be divided into four main layers: (1) the meeting-room conferencing endpoint layer; (2) the internal IP network layer of each agency/organization; (3) the inter-site connection/transmission layer; and (4) the conference coordination layer through the MCU.

1. At the meeting room, the VCS receives video from the camera and connects to the display, audio and control systems.
2. Within the local network, IP10 devices connect to the switches and provide connectivity to the VCS and MCU according to the architecture shown in the diagram.
3. On the transmission path, traffic passes through the SFP Media Converter and ODF before connecting to the dedicated transmission network.
4. At the organizational nodes, the MCU provides multipoint conference coordination according to the system design.
5. At the second agency/organization, the diagram shows SW-L2, SW-L3, IP-10, MCU, camera, access point and OPC, forming the corresponding connection point.

		transmission network.
MCU	Multipoint Control Unit	Multipoint conference coordination equipment; the diagram shows MCU units at State Organization 1 and State Organization 2.
SW-L2	Layer 2 Switch	Connects endpoint devices in the LAN, including IP10, camera/access point and other devices shown in the diagram.
SW-L3	Layer 3 Switch	Layer 3 switching equipment at the organizational node; the diagram shows connections to SW-L2, IP-10, MCU and OPC.
Media Converter SFP	Optical Media Converter	Converts the transmission interface for the optical link and is installed at both ends of the transmission path.
ODF	Optical Distribution Frame	Optical distribution/ patching frame on the optical path, connecting the Media Converter to the transmission network.
Military Transmission Network	Transmission Network	Intermediate transmission network connecting the organizational nodes/ sites in the solution.
Camera	Conference Camera	Provides meeting-room/ participant video to the VCS;

		cameras are shown at the conference points in the diagram.
Access Point	Wireless Access Point	Network access equipment shown at the organizational nodes and connected to the switches.
OPC	OPC Equipment as Shown in the Diagram	OPC equipment is shown connected to RCY at the agencies/organizations; the diagram does not provide a specific model or further functional details.
HDMI Matrix Switch (8×8)	HDMI Matrix Switch	Switches/ distributes HDMI signals; the diagram shows connections to the VCS and display devices.
LED Screen	LED Screen	Displays video from the conferencing system through the HDMI Matrix Switch.
Display/Monitor	Display / Monitor	Display devices connected to the HDMI Matrix Switch as shown in the diagram.
Mixer	Audio Mixer	Receives, processes and mixes audio signals from the microphone system before delivery to the amplification system/VCS.
Chairman Microphone	Chairman Microphone	Captures the chairman's speech and connects to the audio system.

Delegate Microphone	Delegate Microphone	Captures delegates' speech and connects to the audio system.
Power Amplifier	Power Amplifier	Amplifies the audio signal for delivery to the meeting-room loudspeaker system.

5. Meeting-Room Equipment System Description

The meeting-room area shown in the diagram is organized as an integrated video, audio and control system. The connected components include:

- VCS: the central video conferencing endpoint of the meeting-room system.
- Camera: provides the video source to the VCS for transmitting participant images.
- HDMI Matrix Switch (8×8): receives and distributes HDMI video signals to the display devices shown in the diagram.
- LED Screen and displays: provide visual presentation of conference content.
- Chairman Microphone and Delegate Microphone: capture the speech of the chairman and delegates.
- Mixer: processes and mixes audio sources from the microphone system and interfaces with the meeting-room audio system.
- Power Amplifier: amplifies the audio signal for the loudspeaker system.
- Central Control Processor: the central control processor installed in the meeting-room area to coordinate the equipment according to the system design.

6. Connection at State Organization 1

According to the diagram, State Organization 1 has a local network consisting of SW-L3 and SW-L2. The MCU and IP10 devices are connected to the switching infrastructure. The VCS endpoints connect through the IP10 devices and forward traffic to the transmission path.

- The MCU connects to SW-L3.
- IP10-1, IP10-2 and IP10-n connect to the switching infrastructure.
- VCS 1, VCS 2, VCS ... connect to the corresponding IP10 devices.
- The Camera and Access Point are shown connected to the network through SW-L2.

- SW-L2 uplinks to SW-L3, providing connectivity from the endpoint devices to the conferencing system.
- From the network, the connection passes through Media Converter SFP → ODF → Military Transmission Network.

7. Connection at State Organization 2

State Organization 2 is shown with a similar architecture, including SW-L2, SW-L3, IP-10, MCU, Camera, Access Point, RCY and OPC.

- SW-L2 connects the IP devices and network endpoints.
- SW-L2 uplinks to SW-L3.
- IP-10 is connected to SW-L3 and the MCU.
- The MCU is connected at the State Organization 2 node.
- The Camera and Access Point are connected to the switching infrastructure.
- RCY connects to OPC and is also connected to the network as shown in the diagram.
- The inter-site connection passes through the Media Converter SFP and ODF to the Military Transmission Network.

8. Inter-Site Connection and Transmission Path

The transmission path between the organizational nodes is represented by the following connection sequence:

IP/VCS → Switch → Media Converter SFP → ODF → Military Transmission Network → ODF → Media Converter SFP → Switch → MCU/VCS

This architecture separates the local network at each site from the inter-site transmission network. The ODF serves as the optical distribution/patching point, while the SFP Media Converter performs the interface conversion required for connection to the optical transmission path.

9. Operating Principle

1. Users in the meeting room participate in the conference through the VCS, camera and microphone system.

2. The camera captures the meeting-room video and sends the signal to the VCS. Audio signals are captured by the chairman/delegate microphones and processed through the Mixer.

3. The VCS processes the conference traffic and sends it into the network through the IP10 equipment.

4. At each organizational node, the IP10 devices and VCS endpoints connect to the switching infrastructure; the MCU performs multipoint conference coordination according to the deployed architecture.

5. Traffic between the sites is transmitted through the SFP Media Converter, ODF and Military Transmission Network.

6. At the remote site, the signal is delivered from the transmission network to the switch/MCU/VCS infrastructure for the conference session.

7. Video signals can be distributed to the LED Screen and displays through the HDMI Matrix Switch (8×8).

8. Meeting-room audio is processed through the Mixer and Power Amplifier for delivery to the loudspeaker system.

10. System Control and Management

The Central Control Processor is installed in the meeting room and serves as the central control component shown in the diagram. Using a central controller allows the system to be organized as a unified architecture and reduces the need to operate individual devices separately. However, the diagram does not specify the control protocols, management software or detailed control interface; these items should therefore be confirmed from the manufacturer's technical documentation when preparing the detailed technical proposal.

11. Solution Characteristics and Benefits

- Multi-site conference connectivity through an IP architecture and inter-site transmission network.
- Support for multipoint conferencing through MCU units at the organizational nodes.
- Integrated video, audio and control within the same meeting-room system.
- Centralized display distribution through the HDMI Matrix Switch, LED Screen and displays.
- Dedicated audio equipment consisting of microphones, mixer and power amplifier, suitable for meeting rooms with a chairman and multiple delegates.
- The transmission path incorporates an SFP Media Converter and ODF, consistent with the optical transmission architecture shown in the diagram.

- The architecture can be expanded according to the number of deployed VCS/IP10 endpoints, subject to the actual capacity of the equipment and transmission network.

12. Items Requiring Confirmation for the Final Technical Proposal

The diagram provides the connection architecture but does not show all technical specifications. When preparing the final design/technical proposal, the following items should also be confirmed:

- Exact models, manufacturers and quantities of the VCS, MCU, IP10, switches, Media Converters and other equipment.
- Interface standards and port speeds of SW-L2, SW-L3, IP10, VCS and Media Converter.
- Required bandwidth for each conference session and aggregate bandwidth for multipoint conferencing.
- Video encoding/compression standard, resolution and frame rate of the VCS.
- MCU connection and conference-coordination mechanism.
- HDMI standard, actual input/output quantity of the 8×8 HDMI Matrix Switch, and the distribution scheme to each display.
- Configuration of the Mixer, Power Amplifier and loudspeakers, and the actual number of microphones.
- Control protocols and control scope of the Central Control Processor.
- Power supply, power redundancy and network redundancy mechanisms if high availability is required by the project.
- Detailed specifications and roles of OPC and RCY, as the diagram only shows their names and connections.

13. Conclusion

The solution shown in the diagram is a multi-site integrated video conferencing architecture in which meeting-room VCS endpoints are connected through IP equipment and switches, using a dedicated transmission network to interconnect the sites. The MCU units at the organizational nodes provide conference coordination. In the meeting room, the VCS is integrated with the camera, HDMI Matrix Switch, LED Screen, displays, microphones, mixer, power amplifier and Central Control Processor. This architecture forms a unified system for organizing, conducting and participating in video conferencing sessions among agencies/organizations.

14. Selected Catalog Technical Specifications

Only catalog products that correspond to equipment or functions shown in the solution diagram are included below. Catalog items unrelated to the diagram are excluded.

Diagram Function	Selected Catalog Model	Key Catalog Specifications
VCS	IFORCETECH IFT-VCT-300CB	H.323 and SIP; H.264/H.264 High Profile/H.265; up to 1080p60; 3 HDMI inputs; 3 HDMI outputs; 2× RJ45 10/100/1000Base-T; 2× RS232; 2× USB 3.0; built-in MCU supporting 1+8 multipoint conference; IP bandwidth 64 kbps–10 Mbps; AES-128/256 encryption; AC 100–240 V; maximum 80W.
Camera	IFORCETECH IFT-PC-V60CB	1/2.8-inch CMOS, 2.07 MP effective pixels; Full HD 1080p60; 20× optical zoom; HDMI, 3G-SDI, USB 3.0 and LAN outputs; NDI/NDI HX2/TCP/IP/HTTP/RTSP/RTMP/RTMPS/ONVIF; ±170° pan; -30° to +90° tilt; 255 presets; PoE+ (802.3at) or 12 V DC; maximum 15 W.
SW-L2	IFORCETECH IFTS29C1-24T4X	24× Gigabit RJ45 + 4× 10G/GE SFP+; switching capacity 128 Gbps; VLAN, port isolation, port security, MAC limitation, IP+MAC+port binding; STP/RSTP/MSTP, LACP and Ethernet OAM; optical DDM/active-fiber monitoring.
SW-L3	IFORCETECH IFTS58C1-24X2C	24× 10G SFP+; 2× 100G/40G QSFP28; RS232 console; Gigabit RJ45 out-of-band management; switching capacity 880 Gbps; managed Layer 3 architecture; stacking support; dual power slots.
Media Converter SFP	IFORCETECH IFTMC-1000	RJ45 10/100/1000 Mbps; SFP optical interface; optical data rate 155 Mbps/1.25 Gbps; single-mode distance up to 20 km; built-in AC 100–240 V or DC adapter; power consumption <3 W; operating

		temperature 0–50 °C.
SFP+ Optical Module	IFORCETECH SFP+ LX-10	SFP+ form factor; 1310 nm; 10 km/20 km variants; optical output power -8.2 to +3 dBm (10 km) or -5.2 to +3 dBm (20 km); receiver sensitivity up to -12.6 dBm OMA; I2C digital diagnostics; IEEE 802.3ae and SFF-8472.
Access Point	IFORCETECH IFTAP3000	Dual-band 2.4 GHz/5 GHz; IEEE 802.11 a/b/g/n/ac/wave2/ax; 4-stream MIMO; up to 3000 Mbps air-interface rate; RF power 23 dBm; 1× Gigabit WAN with PoE + 1× Gigabit LAN; PoE or 12 V DC; ≤17 W; CAPWAP/ Web/ SNMP/ SSH/ Telnet/ TR069 management.
LED Screen	IFORCETECH IFTLED-1.86P	Indoor LED display; pixel pitch 1.860 mm; pixel density 288,906 dots/m ² ; input voltage 4.2–5.0 V; operating temperature -10 - 40 °C; humidity 10–65% RH; blind spot rate <0.0001; screen flatness <1 mm/m ² .
Mixer	IFORCETECH IFT-MX-0808CB	DSP capacity 400 MIPS / 1.6 GFLOPS; USB sound card 1-in/1-out; +48 V phantom power; frequency response 20 Hz–20 kHz ±0.15 dB; input dynamic range 110 dB; output dynamic range 112 dB; RS232/ RS485/ GPIO/ LAN control; AC 110–240 V, 50/60 Hz.
Chairman Microphone	IFORCETECH IFT-MFC-5540CB	DC 24 V; rated output power ≥2 W RMS; frequency response 100 Hz–12,000 Hz; operating temperature 0–40 °C.
Delegate Microphone	IFORCETECH IFT-MFM-5540CB	DC 24 V; rated output power ≥2 W RMS; frequency response 100 Hz–12,000 Hz; operating temperature 0–40 °C.
Power Amplifier	IFORCETECH IFT-AL-475CB	4×250 W/8 Ω or 4×450 W/4 Ω; frequency response 20 Hz–20 kHz ±1 dB; SNR >90 dB; THD <0.05%;

		4× XLR inputs; Speakon outputs; AC 220 V/50 Hz; operating temperature 0–40 °C.
Central Control Processor	IFORCETECH IFT-CC-5540CB	4× 8-core aviation microphone interfaces; up to 100 microphones, expandable to 250+ with microphone expansion; 1× RJ45 TCP/IP; 2× RS232 central-control ports; 1× RS232 video-switching interface; 4.3-inch capacitive touchscreen; USB recording; video tracking; AC 220 V/50 Hz; 120 W; 19-inch rack mounting.

Equivalent Product

- 1. IFSW29-24T4X - 10G Ethernet Switch**
- 2. IFSW39-24T6X - 10G Routing Switch**
- 3. IFT-VCT-CX300CB - Video Conferencing Terminal**
- 4. IFT-PC-V60CB – Conference Camera**
- 5. IFT-OM-702CB – Omnidirectional Microphone**
- 6. IFT-AL-475CB – Amplifier**
- 7. IFT-MX-0808CB – Mixer**
- 8. IFT-MFC-5540CB – Micro for Chairman**
- 9. IFT-MFM-5540CB – Micro for Member**
- 10. IFTMC-1000 – Media Converter**
- 11. IFT-LED-P186CB – LED Screen**
- 12. IFT-VCT-CX300H2 - Video Conferencing Terminal**
- 13. IFT-PC-V60H2 – Conference Camera**
- 14. IFT-OM-702H2 – Omnidirectional Microphone**
- 15. IFT-AL-475H2 – Amplifier**
- 16. IFT-MX-0808H2 – Mixer**
- 17. IFT-MFC-5540H2 – Micro for Chairman**
- 18. IFT-MFM-5540H2 – Micro for Member**
- 19. IFT-LED-P20H2 – LED Screen**
- 20. IFT-VCT-51GTT-H - Video Conferencing Terminal**
- 21. IFT-WS-CMR4KGTT-H – Conference Camera**
- 22. IFT-PC-51GTT-H – Conference Camera**
- 23. IFT-OM-51GTT-H– Omnidirectional Microphone**
- 24. IFTLED-1.25P**
- 25. IFTLED-1.53P**
- 26. IFTLED-1.86P**
- 27. IFTLED-2.0P**
- 28. Pigtail E2000-PS APC connector**