Konza Technoplis Development Authority

KONZA Technopolis

KONZA DATA CENTER AND SMART CITY FACILITIES PROJECT: VIDEO CONFERENCING SYSTEM

VIDEO CONFERENCING SYSTEM DESIGN PROPOSAL

Rev 001 May 2020

Content

1 Project Overview

1.1 Background

Intelligent conference facilities are important communication tools for enterprises and government departments to exchange ideas and make decisions remotely, they can greatly improve communication efficiency among different departments.

The Ministry of ICT, Innovation & Youth Affairs (MOICT). and Huawei Technologies Co. Ltd signed a Commercial Contract for Konza Data Centre and Smart City Facilities on 26th June 2017. In accordance to this Contract, the Government of Kenya was desirous of constructing Kenya Smart Konza City,the Project is currently on course of implementation involving the following key components.

1. National Data Centre

2. Smart City Facilities

3. Virtual Desktop Infrastructure (VDI)

4.Video Conferencing System

The implementation of Phase I Data Center has been completed and plans to commission are underway to enable the data center offer cloud services. It is on this note that the Project Implemenation Committee (PIC) initiate the implementation of video conference sets as per the contract to to allow two or more locations to communicate by simultaneous two-way video and audio transmissions. The solution will intergrate email, telephony, video, instant messaging and web conferencing which will give competitive adavantage across governement.

Video conferencing describes online meetings that take place over the internet to connect video conferencing systems in meeting rooms with personal devices such as laptops or mobile devices with embedded webcams. Utilizing a simple, unified video conferencing solution with support for screen sharing will empower government employees and departments to be more connected, productive and engaged.

1.2 Benefits

The desing will involve implementing video confererence at Konza Complex (Konza Technopolis) , KenInvest (Upperhill-Nairobi) and MoICT (CBD-Nairobi) and will benefit in the following ways:

a) **Enable the Digital Workforce** – The solution will enable employees working for and

outside these organizations maintain human connections, irrespective of physical location, which speeds up decision making and improves ability to collaborate.

b) **Save costs** – The solution will enable costs associated with physical meetings such as travel expenses, booking of conference rooms, snacks and time.

c) **Increase foreign investment** – The solution will enable KenInvest to engage prospect investors from around the globe. It will open up linkages with Konza – Kenya's first smart city projects and the rest of the country.

d) **Uniform Management** – The video conference management platform will be centrally managed from Konza data center and will support deployment of additional sets across the government which in return will boost interdepartmental collaboration/engagement.

2 Overall Solution Design

2.1 Smart Video Conferencing Solution

Huawei Smart Video Conferencing Solution is the next-generation universal transcoding video solution that was developed in November 2019, has been introduced to the market in early 2020.

The main components included are; Main Control Units (MCUs) platform and Ideal Hub Smart Screens.

The solution supports large capacity, high cost-effectiveness, flexible port allocation, and smooth capacity expansion.

The following are features of MCU:

1) The MCUs provide industry-leading 1080p 60fps full encoding and decoding capabilities and leverage the next-generation HD codec H.265SCC for data conferencing. The codec supports 4k resolution and integrates audio, video, presentation, and data to enable seamless communication and collaboration. The MCUs support resource pool management, backup between MCUs in a resource pool and delivering a superb meeting experience.
2) Build a New Video Conferencing Media Platform with Kunpeng+ Ascend chipset.
3) Next-Generation VP9800 Series MCU supporting secure and stable converged media platform for implementing collaboration functionality.
4) H.265 SCC Ultra-HD Data Sharing with a Low Latency which suports next-generation HD data codec.
5) Designed for improving the compression performance and display effect in text-only, video+text, rendering, and animation scenarios.

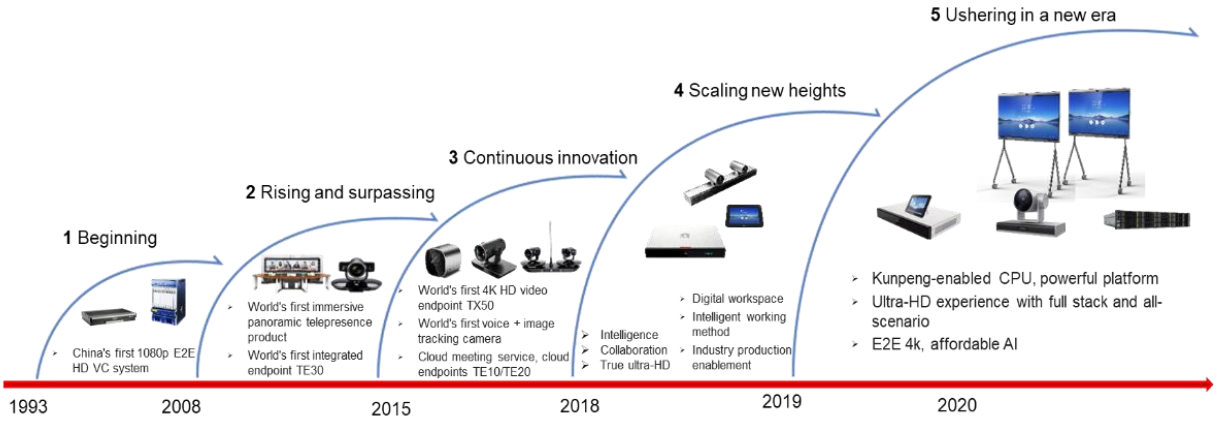
2.2 Video Conference Roadmap

Huawei Video conference solution has evolved since 1993 to the Huawei IdeaHub of 2020 which is a new-generation for smart office in meeting room, open office, executive boardroom, home office and many other scenarios.

It supports features as below;

1) 4K UHD Projection for better user experience;
2) Superb interactive whiteboard with ultra-low latency;
3) Device-Cloud Synergy, enormous Apps;
4) Open Software and hardware for industry applications.

Figure 2-1 Smart Video Conferencing System Evolution



2.3 Design Principle

The intelligent conference room solution fully converges videoconferencing, achieving visibility, manageability, and controllability, and building a secure, comfortable, efficient, and cost-effective smart conference operation environment.
According to the requirements of the conference room, we take the following factors into consideration when selecting devices and connecting systems:

- **Advanced solution**

Meet the system requirements for sound reinforcement in conference rooms, and providing advanced equipment to represent advanced technologies and lead the industry development trend.

- **Scientific system concept design**

1) Wide applicability: In addition to the basic requirements for sound reinforcement, interfaces are reserved to facilitate signal access.
2) High fidelity: control from the aspects of design (basic specifications and audio-visual positioning), product (international high-quality products with new technologies preferred), and commissioning (at the later stage of the project, as a preferred condition for suppliers)
3) High cost-effectiveness: The optimal cost-effectiveness is considered in terms of functions, practicability, performance, and investment.

- **Advanced and reliable**

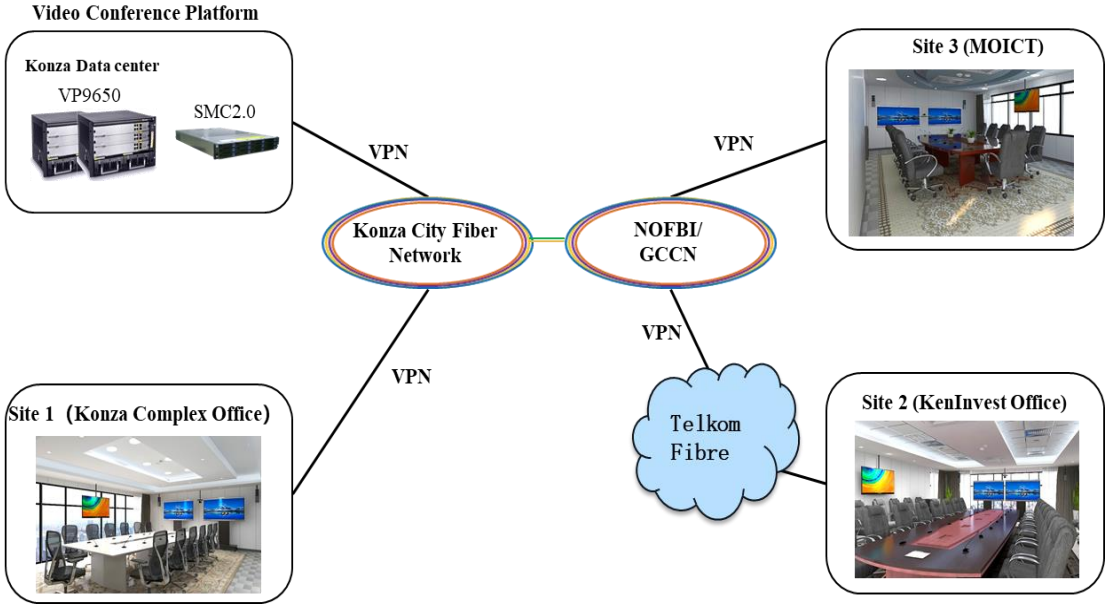
With the rapid development of technology, the system design should be advanced and reliable on the basis of generality and practicability, which is the second major idea of the system design. The system design uses the network digital audio processor and the network terminal interface equipment to compose a network architecture audio transmission mode.Power amplifiers also use advanced and reliable digital power amplifiers to amplify high-fidelity sound. The sound reinforcement system in the conference room must meet the user's requirements for system functions and levels. The system must be cost-effective, practical, high-end, and not extravagant. At the same time, the design must be realizable, easy to operate and easy to maintain.

2.4 Solution Architecture

2.4.1 Video Conferencing System design

The project will provide three sets of video conferencing system, they will be deployed in Konza City Complex office the 7th floor boardroom, KenInvest boardroom and MoICT Teleposta 10th floor boardroom.

Figure 2-2 Video Conferencing System



Network Design Principle:

1) The video conferencing platform will be deployed in Konza Data Center.
2) Konza Complex Office will be connected to Konza Data Center through Konza City fibre network and the connection will be through a VPN tunnel.
3) Teleposta MOICT 10th boardroom will connected to GCCN network and the backhaul will be through NOFBI network to Konza Data Center through a VPN.
4) KenInvest office boardroom will connected to telkom fibre and a VPN will be setup though the internet.

The video conferencing system function includes

1. Display & Video system
2. Sound reinforcement system
3. Signal Switching Intelligent Control System
4. Light control syste
5. Environment monitoring system
6. Conference audio system

The Video conference room system components is the following diagram

Figure 2-3 System Components

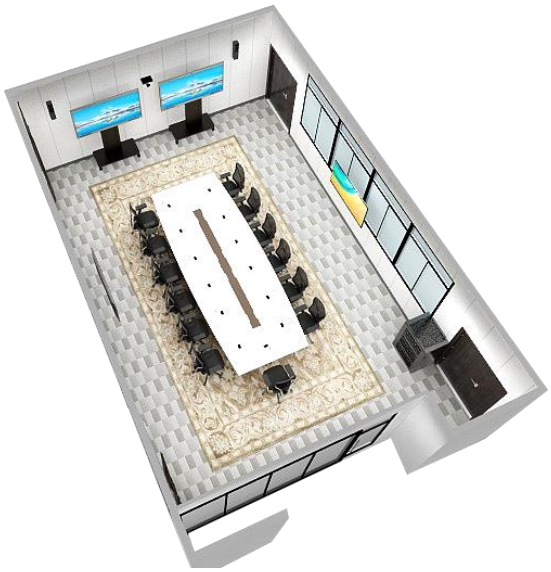
2.4.2 Konza Complex Office the 7th Floor Video Conferencing Boardroom Design

Konza Complex office 7th floor boardroom has an area of 69 ㎡ and is designed as a Intelligent conference room for 13 people. The display system is equipped with two smart whiteboards, and the auxiliary display is two 65-inch TVs; the sound reinforcement system is equipped with 2 main speakers and 4 ceiling speakers, which are pushed through one digital amplifier; the audio processor is configured for on-site audio routing and distribution And other functions; the sound pickup system includes a set of wireless conference discussions (including 14 wireless microphones), and 2 sets of wireless handheld microphones.

Figure 2-4 Overview of boardroom (2D from back to front)

Figure 2-5 Overview of boardroom (2D from front to back)

Figure 2-6 Overview of boardroom (3D)



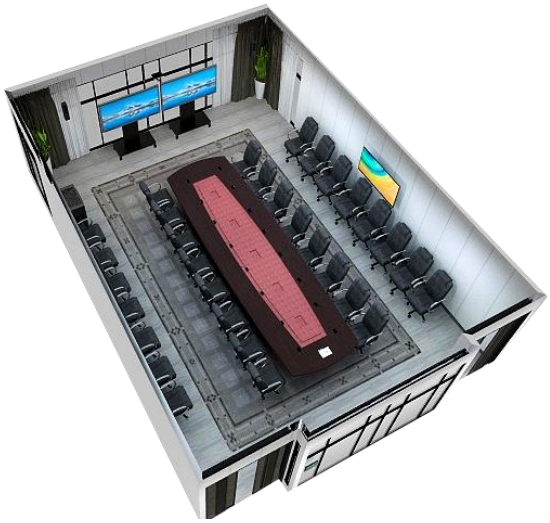
2.4.3 KenInvest Video Conferencing Boardroom Design

The Keninvest Video Conferencing Boardroom has an area of 73 ㎡ and is designed as a Intelligent conference room for 32 people. The display system is equipped with two enterprise smart screens, and the auxiliary display is two 65-inch TVs; the sound reinforcement system is equipped with 2 main speakers and 4 ceiling speakers, which are pushed through one digital amplifier; the audio processor is configured for on-site audio routing and distribution And other functions; the sound pickup system includes a set of wireless conference discussions (including 14 wireless microphones), and 2 sets of wireless handheld microphones.

Figure 2-7 Overview of boardroom (2D from back to front)

Figure 2-8 Overview of boardroom (2D from front to back)

Figure 2-9 Overview of boardroom (3D)



2.4.4 Teleposta MoICT 10th Floor Video Conferencing Boardroom Design

Teleposta MoICT 10th Floor Boardroom has an area of 62 ㎡ and is designed as a Intelligent conference room for 14 people. The display system is equipped with two enterprise smart screens, and the auxiliary display is two 65-inch TVs; the sound reinforcement system is equipped with 2 main speakers and 4 ceiling speakers, which are pushed through one digital amplifier; the audio processor is configured for on-site audio routing and distribution And other functions; the sound pickup system includes a set of wireless conference discussions (including 14 wireless microphones), and 2 sets of wireless handheld microphones.

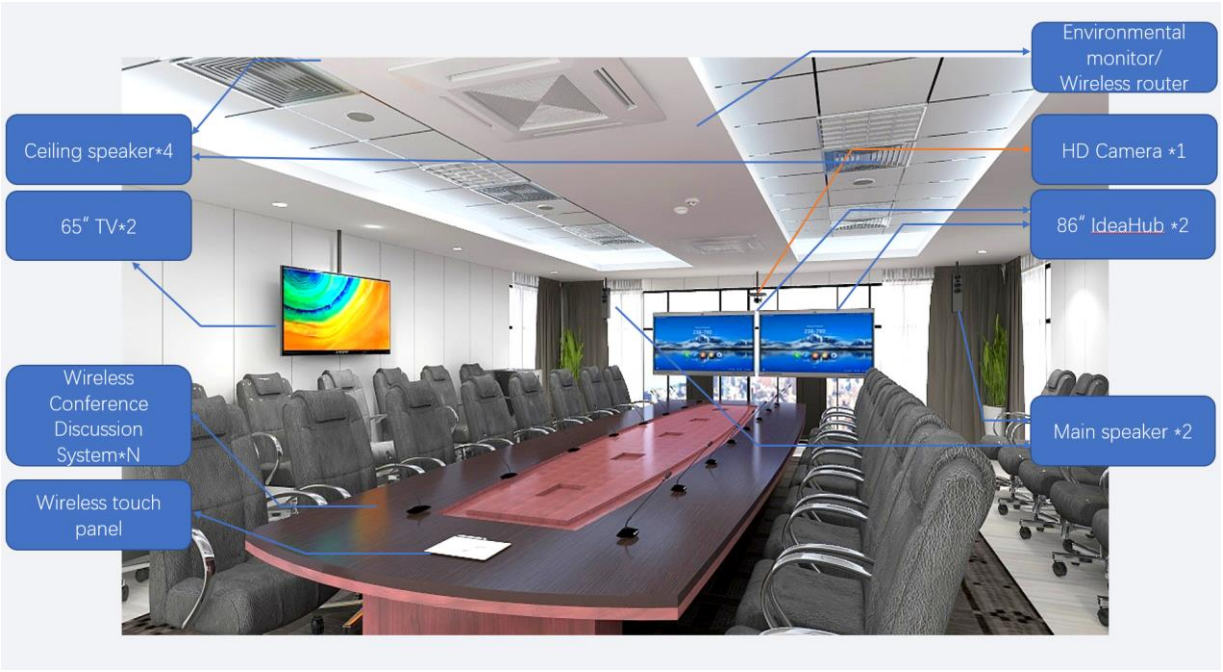
Figure 2-10 Overview of boardroom (2D from back to front)

Figure 2-11 Overview of boardroom (2D from front to back)

Figure 2-12 Overview of boardroom (3D)

2.5 Solution Highlights

Figure 2-13 Conference Room Layout



- Easy to use;
- The efficiency of employees is greatly improved;
- Easily incorporated into daily management;
- Easy to learn and maintain;
- It has long service life and high price performance ratio.
- Compatible with the environment Fitout style;
- High system stability, compatibility, and scalability.

3 Video Conferencing System Module Design

The intelligent conference system consists of the display/video conference system, sound reinforcement system, wireless conference discussion system/wired conference discussion system and intelligent control system.

Table 3-1 Video Conferencing System Module

System	Module
Display System	86-inch ideaHub Smart Display
	HD Camera
	65-inch TV
	Door Display
Audio System	Main Speaker
	Ceiling Speaker
	Power Amplifier
	Digital Audio Processor
	Wireless Handheld Microphone
Wired Conference Discussion System	Wireless Conference Access Point
	Wireless Conference Chairman Unit
	Wireless Conference Delegate Unit
	Conference Unit Microphone
	Conference Unit Battery
	Battery Charging Slot
Intelligent Control System	Central Control
	Intelligent Matrix Switcher
	Door Control Display
	Wireless Router
	Environmental Monitor
	Control Panel
	PAD Wireless Touchscreen
	Heavy-current Relay Box
	Power Sequencer
	Network switch

3.1 Display System

In this project, two enterprise smart whiteboards are used as the main display, and four LCD TVs are used as auxiliary display. One professional camera is configured to collect onsite video signals. A display is installed at the door of the conference room to display the conference room name. The strip light on both sides of the display displays the conference status.

The two enterprise smart screens are videoconferencing appliances and extended display applications. The HD matrix can be used to switch the output signals (only one type of signal can be output) of the all-in-one camera to other auxiliary displays, achieving a visual effect without blind spots.

3.1.1 86-inch ideaHub Smart Screen

The following is the Smart Conferencing Board Sample picture

Figure 4-1 Smart Screen Smart Conferencing Board

Function Description

Huawei enterprise smart screen is a smart device that integrates smart writing, ultra-HD projection, video conferencing, and open office applications.

Built-in 86-inch 4K ultra-HD Touch tablet, 20 touch points, standard pen, 35 ms ultra-low latency, and smooth writing experience; Adopts the superb anti-reflection glare technology to ensure that the screen content is clearly displayed in a bright environment.

Specifications

Table 4-1 Smart Conferencing Board

No.	Item	Specifications
1	86-inch Enterprise Smart Screen	CPU: dual-chip 4Core@1.5G+4Core@1.8G; Flash: 64 GB; RAM: 4 GB+8 GB; Dual-stream capability: 1080p 30 fps+4K 8 fps; data conference: 4K 8 fps; Supports built-in WeLink conferences, hard codec, one-click activation, seamless collaboration between PCs, mobile phones, and large screens, and joining conferences by scanning QR codes. Built-in 8-megapixel camera, 2x digital zoom, 4K@30 fps resolution, AutoFrame, voice tracking, and auto close-up of the speaker; Built-in microphone array, 8 m sound pickup distance, 180° forward sound pickup angle, echo cancellation, noise control, automatic gain control, and support for external microphones; The built-in intelligent voice assistant can perform voice control commands by waking up the phone. Video input interfaces: 2 x HDMI; video output interfaces: 1 x HDMI; audio input interfaces: 1 x 3.5 mm LINE IN and 1 x HDAI; audio output interfaces: 3.5 mm LINE OUT; Other interfaces: 3 x USB, 1 x COM, 1 x TOUCH, and 1 x Ethernet; Supports Bluetooth and Wi-Fi 2.4 GHz and 5 GHz frequency bands.

3.1.2 HD Camera

The following is the Figure 4-1 HD Camera Sample picture

Figure 4-1 HD Camera

Function Description

Video conferencing products are used with HD cameras and are of the same brand as videoconferencing products. Huawei's full series of HD videoconferencing endpoints or cloud conferencing soft clients are used to deliver a brand new video experience.

Specifications

Table 4-2 HD Camera

No.	Item	Specifications
1	HD Camera	The HD camera is a 1080p 60 fps full-HD PTZ camera that uses the 8.51-megapixel CMOS image sensor and provides an HDMI port to support 1080p 60 fps video output.

3.1.3 65-inch TV

Sample Picture

Figure 4-2 TV

Function Description

65-inch LCD TV, which is used as an auxiliary display in this project.

Specifications

Table 4-3 TV

No.	Item	Specifications
1	65-inch TV	4K，65-inch TV

3.2 Video Conference Solution

3.2.1 Video Conference Design

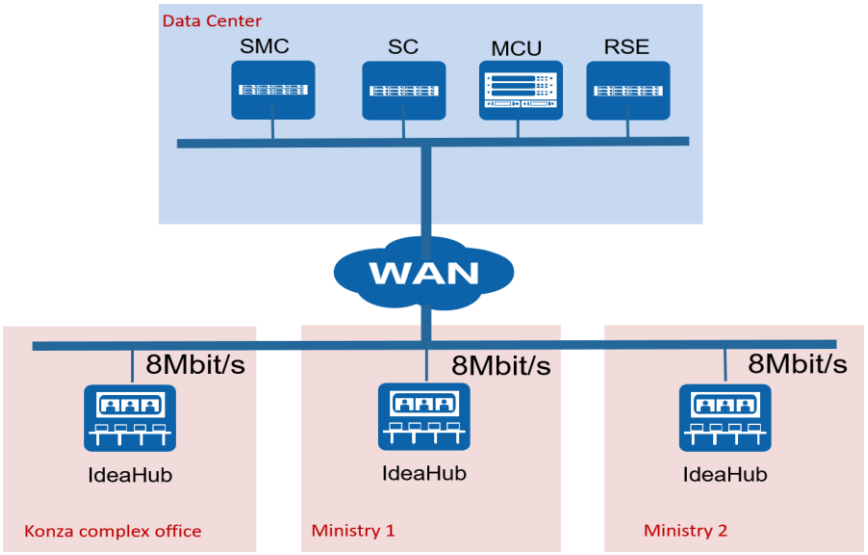
In order to provide a stable and flexible video conference experience, the solution is designed

to provide 50 hardware endpoints and 20 software client registration & management, allow 15 participants with 1Mbps per participant to join the conference from the internet. A recording server is also provided to record important conferences and make conference live broadcast to other people. With this system, employees can participate in meetings anytime, anywhere, even in different offices or cities. Thereby improving work efficiency and saving travel expenses

3.2.2 Video Conference Architecture Design

The below shows the overall architecture of Video Conference.

Figure 4-3 Overall Architecture of VC



1) Video conference platform such as management server, call control and firewall traversal server, MCU and recording server will deployed in the Data Center.
2) Hardware endpoints will deployed in the offices
3) People can install the APP on their PC, mobile and join the conference with it.

3.2.3 Network Bandwidth Plan

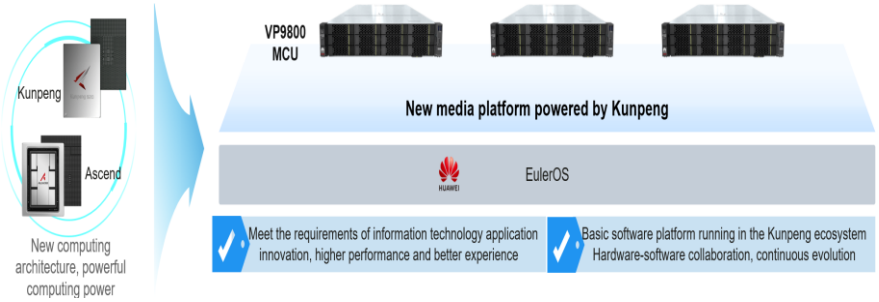
The bandwidth requirement for end-users
Each hardware endpoint will need 8Mbps bandwidth.
Each software client will need 1Mbps bandwidth.
The bandwidth requirement for Data Center
The bandwidth of the Data Center should support the access of all the endpoints provided this time, so it will need 8*3+1*15 = 39 Mbps bandwidth.

3.2.4 Video Conference Component

The video conference system will provide the components as follow

1) **Main Control Unit (MCU)**

Figure 4-4 Huawei VP9800 series MCU



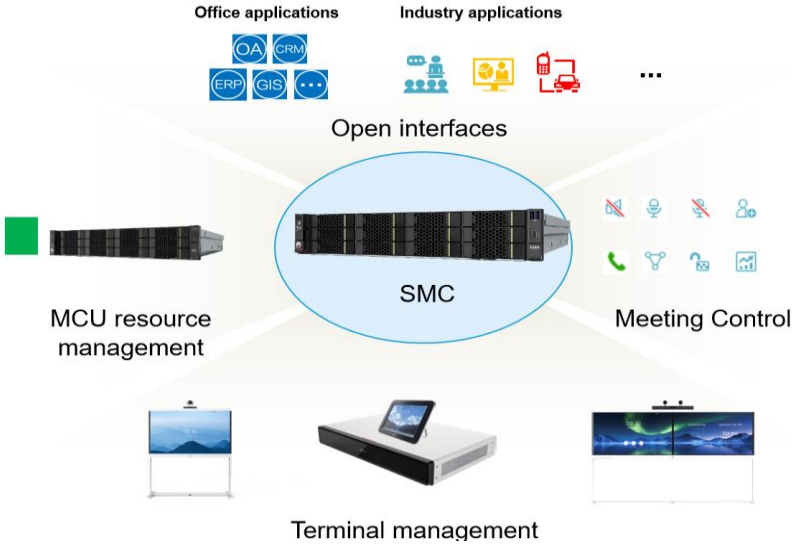
Huawei VP9800 series MCUs are next-generation universal transcoding MCUs that feature large capacity, high cost-effectiveness, flexible port allocation, and smooth capacity expansion. The MCUs provide industry-leading 1080p60 full encoding and decoding capabilities and leverage the next-generation HD codec H.265 SCC for data conferencing. The codec supports a resolution of up to 4K and integrates audio, video, presentation, and data to enable seamless communication and collaboration. The MCUs support resource pool management, backup between MCUs in a resource pool, and backup between MCU resource pools, delivering a superb meeting experience.

Table 4-4 MCU Specification

	VP9830	VP9850	VP9860
Maximum capacity	· Universal transcoding ports 12 1080p60 ports 25 1080p30 ports 50 720p ports 100 SD ports	· Universal transcoding ports 25 1080p60 ports 50 1080p30 ports 100 720p ports 200 SD ports	· Universal transcoding ports 50 1080p60 ports 100 1080p30 ports 200 720p ports 400 SD ports
	· SVC ports 400 720p ports	· SVC ports 400 720p ports	· SVC ports 400 720p ports
Power supply	AC: 100V - 240V < 900 W	AC: 100V - 240V < 900 W	AC: 200V - 240V < 2000 W
Protocols and Standards Compliance			
Multimedia framework protocols	ITU-T H.323 and IETF SIP		
Video codec protocols	H.265 SCC, H.264 SVC, H.264HP, H.264 BP, H.263		
Audio codec protocols	G.711a, G.711u, G.722, G.722.1, G.729, G.729A, iLBC, Opus, AAC-LD		
Dual-stream protocols	ITU-T H.239 and BFCP		
Network transmission protocols	IPv6/IPv4, TCP/IP, RTP, RTCP, HTTP/HTTPS, SNMP, and DNS/DDNS		
Other standards and protocols	H.225, H.235, H.245, H.281, FECC, RFC2833, DTMF, SRTP, TLS, T.120, T.140, and NTP		
Video resolution	1080p60, 1080p30, 720p60, 720p30, SD, CIF, QCIF, 180p, and 90p		
Presentation/Data resolution	4K, 1080p60, 1080p30, 720p, 16CIF, 4CIF, CIF, WXGA+, WXGA, XGA, SVGA, SXGA, SXGA+, UXGA+, WUXGA+		

2） Service Management Center (SMC)

Figure 4-5 Service Management Center (SMC)



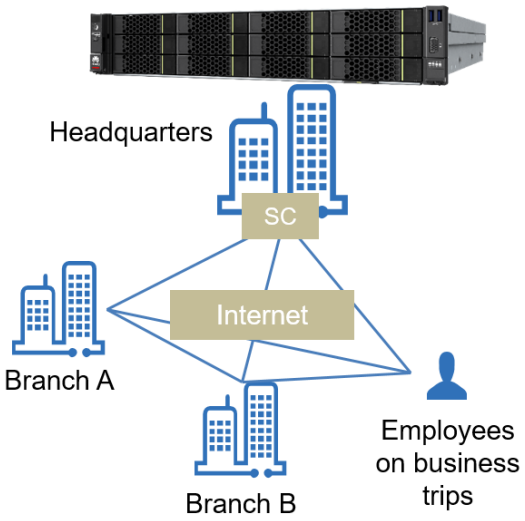
Huawei Service Management Center (SMC) is a next-generation video conferencing management system. It supports easy-to-use conference management and control, visualized O&M, and unified scheduling and management of video conference devices and media resources on the entire network. Its service-oriented architecture features high performance, large capacity, and elastic scaling, meeting the needs of video conferences at different scales.

Table 4-5 SMC Specification

Protocols and Standards	
Multimedia framework protocols	ITU-T H.323, IETF SIP
Other standards and protocols	IH.225, H.245, Q.931, H.235, SDP, TLS/SRTP, H.239, and BFCP H.460, ICE, STUN, TURN, SNP (Huawei patented technology), and SIP TRUNK TCP/IP, HTTP, HTTPS, SSH, LDAP/H350, TR-069, SNMP, RTP, RTCP, and DDNS
System Capacity	
Maximum concurrent conference ports	20,000
Maximum provisioned users and participants	200,000

3） Switch Center (SC)

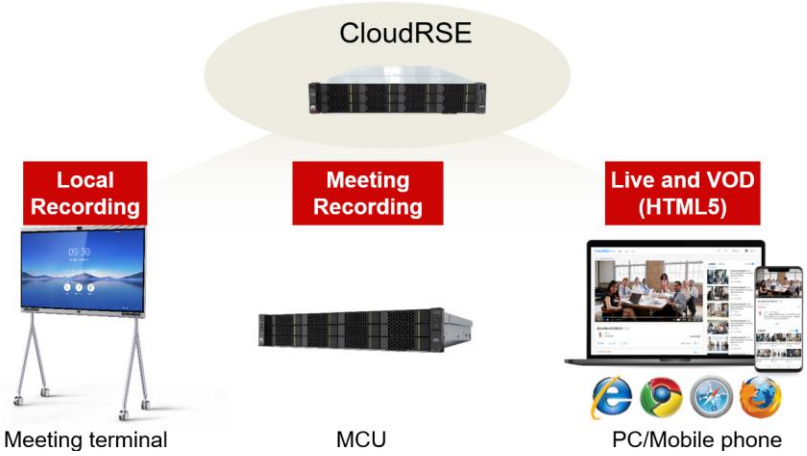
Figure 4-6 Huawei Switch Center (SC)



Huawei Switch Center (SC) is a SIP/H.323-compliant call control and firewall traversal server that allows for a massive number of registrations. The SC is ideal for seamless communications both within enterprises and with the wider world, between HQ and branches, and across enterprises.

4） RSE (Record System)

Figure 4-7 CloudRSE



CloudRSE is Huawei's next-gen platform for recording and streaming video conferences. Supporting 1080P60 HD recording, live streaming, video on demand (VOD), as well as mobile viewing, CloudRSE can connect to NAS storage to expand disk space, make it one of the most easy-to-use, reliable, full HD products available in the market.

Table 4-6 CloudRSE Specification

Protocols and Standards	
Multimedia framework protocols	ITU-T H.323, IETF SIP
Video codec protocols	H.264 HP, H.264 BP, H.263
Audio codec protocols	G.711a/u, G.722, G.722.1C, G.729A/AB, Opus, AAC-LD, AAC-LC
Dual-stream protocols	H.239, BFCP
Network transmission protocols	TCP/IP, HLS, RTP, RTCP, HTTP/HTTPS
Other standards and protocols	SRTP, TLS, RAID1, NTP
System Capacity	
Maximum concurrent recording/live streams	10-channel 1080p60, 20-channel 1080p30, or 40-channel 720p30 video streams
Maximum concurrent VOD/live video viewers	750 channels at 512 kbit/s; 500 channels at 768 kbit/s; 350 channels at 1 Mbit/s; 170 channels at 2 Mbit/s
Supported resolutions	1080p60, 1080p30, 720p30, and 4CIF
Maximum audio-only streams	300 channels
Storage capacity	Standard edition: 1.2 TB in RAID 1, up to 1,000-hour recording at 2 Mbit/s

3.2.5 Huawei Video Conference Highlights

- **Full HD Conference Experience**

Full HD provides the incredible clarity and lifelike detail, makes precision design and telemedicine through remote collaboration possible. H.265, combined with Huawei's Video Motion Enhance (VME) technology, delivers Full HD experience at the 720p bandwidth.

Figure 4-8 H.264 VS H.265

- **CD Quality Experience**

Huawei HD video system adopts the AAC-LD/Opus broadband voice technology. Its audio quality has improved to the CD standard.

The HD video system supporting a full range of speech processing, using fast adaptive echo cancellation (AEC), automatic gain control (AGC) and automatic noise suppression (ANS) technology, can provide the user with clear full duplex digital audio.

Use the input audio channel-independent processing technology, Audio Enhancer (speech enhancement) and Voice Clear (voice ringing) patent technologies make the voice sounds more full and rich.

Support Opus, FEC（Forward Error Correction）、backward errorcorrection, PLC（Packet Loss Concealment）, NetATE（Net Automatic-Transfer-Enhancement）and AJB（Audio JitterBuffer）

Table 4-7 Quality

Protocol	Sampling rate	Frequency band	Output bitrate	Latency
G.711	8KHz	300Hz~3,400Hz	64Kbps	<1ms
G.729A	8KHz	300Hz~3,400Hz	64Kbps	20ms
G.722	16kHz	50Hz~7kHz	64Kbps	3ms
G.722.1	16kHz	50Hz~7kHz	24、32Kbps	40ms
AAC-LD	48kHz	20Hz~20kHz	48～64Kbps	20ms
Opus	48kHz	20Hz~20kHz	8～64Kbps	20ms

- **Outstanding Network Adaptability**

Huawei video conference system adopts H.264 SVC and proprietary SEC3.0 packet loss resilience technology. The video maintains smooth at a packet loss rate of 20%. The IRC (Intelligent Rate Control) technology is adopted to dynamically adjust the bandwidth for video conference to ensure optimal audiovisual experience. Super powerful anti-network jitter capability up to 1000 ms guarantees the conference go smoothly.
The unique QoS-guaranteed solution includes Huawei patented Super Error Correction (SEC) technology. The system can guarantee optimal video and audio effects under the poor network by adjusting the error correction strategies on network transmission and audio and video processing. Compared with the international standard and other vendors in the industry, the system greatly improves in network jitter, latency and packet error.

- Packet loss retransmission technology: it is used in the case of a few lost packets.
- Intelligent Rate Control (IRC) technology: the technology is used to significantly reduce the packet loss rate over the network in the case of packet loss due to network congestion.
- Huawei patented packet loss concealment (PLC) technology: SEC1.0 (tolerate 3% packet loss), SEC2.0 (tolerate 5% packet loss), SEC3.0 (tolerate 20% packet loss).

Table 4-8 Video quality comparison

Packet Loss Rate	Huawei Product (SEC3.0 is enabled)	Other Vendor Product
< 1%	Deterioration is unnoticeable.	Deterioration is noticeable but not obvious.
1% to 3%	Deterioration is unnoticeable.	Video quality is seriously deteriorated.
3% to 10%	Deterioration is basically unnoticeable.	Video quality is poor and communication cannot continue.
10% to 20%	Deterioration is noticeable but not obvious.	Video quality is poor and communication cannot continue.

3.3 Audio System

The sound reinforcement system is configured with two main sound amplifying boxes based on the area of the current conference room. Six ceiling-mounted sound boxes are used for supplementary audio . Two power amplifiers are used for power amplification. All audio signals are processed by a digital audio processor. The digital audio processor provides functions such as audio routing, signal processing, echo cancellation, noise suppression, and squealing processing. Two sets of wireless handheld microphones are configured for onsite mobile sound pickup.

3.3.1 Main Speaker

The main speaker sample Picture

Figure 4-9 Main Speaker

Function Description

- The sound reinforcement system is usually a system that amplifies the speaker's voice to the listener in real time. The speaker and the listener are usually in the same acoustic environment;

Specifications

Table 4-9 Main Speaker

No.	Item	Specifications
1	Main Speaker	Frequency response: 180Hz-18KHz (± 3dB), 100Hz-20KHz (± 10dB); Sensitivity: 96dB; Nominal impedance: 8 Ohm; Rated power: 100W; Music power: 200W; Peak power: 400W; Crossover point: 200Hz; Sound pressure level: 118dB SPL, 121dB SPL peak; Speaker: 4 × 3 "Full Frequency (0.8" voice coil); Pointing angle: Lossless compression, Direct; Connection socket: 1 NL4MP connectors, Red and black terminal pillars;

3.3.2 Ceiling Speaker

Ceiling Speaker Sample Picture

Figure 4-10 Ceiling Speaker

Function Description

- No Two-way ceiling speaker;
- The color of the outer cover and mesh is fully integrated with the installation environment;
- Using precision parts and high-quality crossover design;
- Using coaxial rotatable silk film treble design;
- Use high-quality plastic edge material to enhance low frequency effect.

Specifications

Table 4-10 Ceiling Speaker

No.	Item	Specifications
1	Ceiling Speaker	Type: compact, two-way crossover Tweeter: 25mm (1 ") coaxial rotating silk membrane unit Woofer: 165mm (6.5 ") unit Impedance: 8Ω Frequency response: 50Hz ~ 20kHz Sensitivity:> 90dB Rated power: 60W Peak: 200W

3.3.3 Power Amplifier

Sample Picture

Figure 4-11 Power Amplifier

Function Description

- 4-channel stereo digital power amplifier;
- Class D digital power amplifier;

- Use HIFI level SANKEN transistor;
- Configure short circuit protection button;

Specifications

Table 4-11 Power Amplifier

No.	Item	Specifications
1	Power Amplifier	Power amplifier parameter: 1.RMS (EIAJ) power: 4X600W @ 8Ω; 4X1100W @ 4Ω; Bridge: 2X1100W @ 8Ω; 2. Output connectors: 4 SPEAKON and four pairs of binding posts 3. Distortion rate: 0.05%, 20Hz-20KHz 4. Frequency response: 20-25KHz + 0 / -1dB 5. Signal to noise ratio: 20Hz-20kHz> 100dB

3.3.4 Digital Audio Processor

Sample Picture

Figure 4-12 Digital Audio Processor

Function Description

- New and powerful hardware architecture and software platform, next-generation signal processing algorithms for echo cancellation and noise suppression;
- Provides different models for conferences or audio reinforcement systems. The system can be expanded from four channels to 96 channels.
- Provide you with a more accurate solution, the maximum use range of 100 meters, ideal use range of 60 meters.

Specifications

Table 4-12 Digital Audio Processor

No.	Item	Specifications
1	Digital Audio Processor	1. 12-channel microphone/line input and 8-channel microphone/line output; Automatic squealing suppressor with DARE Feedback Elimination 2. One built-in telephone coupler and built-in USB transmission port, supporting input and output on the PC; 3. Provides 12 channels of distributed echo cancellation (AEC) function, professional noise suppression (NC) function, industry-leading noise cancellation, and

		environment adaptive technology to eliminate the noise from fans, air conditioning/ventilation system, and other relatively constant noise sources. 4. Provide a first microphone priority function. Support for Macquarie Chair is a plus. 5. Dedicated control devices can be developed through the GPIO interface. 6. Supports RS232 control, USB control, and network control. 7. SNMP and HTML remote control, automatic system detection, and device self-discovery 8. Highly integrated audio processing modules, such as audio processing, audio mixing, matrix, equalization, compression, delay, and feedback suppression modules 9. Supports APP software control, dedicated dial plate control, central control, and panel control. 10. Larger-scale systems can be expanded through the unique Clink bus, supporting a maximum of 64 audio channels.

3.3.5 Wireless Handheld Microphone

Sample Picture

Figure 4-13 Wireless Handheld Microphone

Function Description

- Wireless sound quality, stable, excellent.

Specifications

Table 4-13 Wireless Handheld Microphone

No.	Item	Specifications
1	Wireless Handheld Microphone	40 channels per frequency band can be used at the same time. Minimum frequency interval: 25 kHz Modulation Mode FM Frequency Modulation Two groups of independent tuners of the receiving system, diversity automatic selection.

		Image suppression: 60 dB (normal) RF sensitivity: 20 dBV to 60 dB (50 terminals) Maximum output level balance (XLRM XLR male): +14 dBV Unbalanced (6.3 mm socket): +8 dBV Antenna input BNC type, 50 Antenna power supply: 12 V DC, 160 mA in total RF power output: high output: 30 mW; low output: 10 mW Dynamic range: ≥ 108 dB, A weighted The transmitter has a one-click frequency switching function. When there is interference, a special multi-function button is provided on both the handheld transmitter and the box-type transmitter to switch to the standby frequency (switch on both the transmitter and the receiver).

3.4 Wireless Conference Discussion System

Select the world's top wireless desktop communication system based on the application level of the site. The system easy installation, secure use, and stable application. The system configuration is simple, flexible, and highly scalable.

3.4.1 Wireless Conference Access Point

Sample Picture

Figure 4-14 Wireless Conference Access Point

Function Description

- Plug and Play features for quickly and easily connecting up to 80 discussion devices
- Visual Web Browser Control for Advanced Configuration and Control
- Built-in digital acoustic feedback suppression (DAFS) for excellent voice clarity

Specifications

Table 4-14 Wireless Conference Access Point

No.	Item	Specifications
1	Wireless Conference Access Point	Supply voltage 24 DC (+/- 10%) Ethernet port LAN, TCP / IP Modem OFDM Transmit power <20 dBM Sampling frequency max. 32 kSps Sampling width max. 24 bits Frequency response 20-16000 Hz

3.4.2 Wireless Conference Chairman Unit

Sample Picture

Figure 4-15 Wireless Conference Chairman Unit

Function Description

- The chairman unit can directly authorize the requesting representative unit to speak through the "Next" button.
- The chairman unit can turn off other activated microphones through the “Priority” button.

Specifications

Table 4-15 Wireless Conference Chairman Unit

No.	Item	Specifications
1	Wireless Conference Chairman Unit	The chairman unit can directly authorize the requesting Supply voltage Battery module Audio quality 16 bit digital @ 32 kHz Power consumption max 3.5W RF Power output <20 dBm Audio delay 23 ms

3.4.3 Wireless Conference Delegate Unit

Sample Picture

Figure 4-16 Wireless Conference Delegate Unit

Function Description

- Auxiliary materials, system dedicated connection cable.
- The discussion unit provides each delegate with a microphone and a corresponding microphone switch button. This button can activate the microphone immediately, or when the system is in "Request to Speak" mode,
- The discussion unit can be authorized to speak on behalf of the discussion unit.
- The microphone (sold separately) is connected via a threaded connector and is resistant to signal interference from mobile devices.

Specifications

Table 4-16 Wireless Conference Delegate Unit

No.	Item	Specifications
1	Wireless Conference Delegate Unit	Supply voltage Battery module Audio quality 16 bit digital @ 32 kHz Power consumption max 3.5W RF Power output <20 dBm Audio delay 23 ms

3.4.4 Conference Unit Microphone

Sample Picture

Figure 4-17 Conference Unit Microphone

Function Description

- Anti-GSM mobile phone signal interference microphone
- Directivity number, high microphone clarity

Specifications

Table 4-17 Conference Unit Microphone

No.	Item	Specifications
1	Conference Unit Microphone	Audio delay: 20 ms Directivity: unidirectional Sensitivity: -43.4 dBV / Pa Frequency response: 130 Hz-15kHz Impedance: 680 Ω Microphone pickup directivity range: heart-shaped

3.4.5 Conference Unit Battery

Sample Picture

Figure 4-18 Conference Unit Battery

Function Description

- The high capacity Lithium-ion rechargeable battery pack provides power to the wireless Confidea units.
- Lithium-ion rechargeable cells have a long lifespan as they do not have charging degradation issues associated with other rechargeable battery types.

Specifications

Table 4-18 Conference Unit Battery

No.	Item	Specifications
1	Conference Unit Battery	Output voltage 7.2 VDC Capacity 6600 mAh Autonomy 20 h Charging time 4 h

3.4.6 Battery Charging Slot

Sample Picture

Figure 4-19 Battery Charging Slot

Function Description

- The Confidea Charging Tray is a rack-mountable device of 3 U high that can recharge 6 Confidea Battery Packs at once. It has an auto-ranging power supply and a loop- though mains connector. Maximum 4 chargers can be daisy-chained for 110 VAC regions and 8 for 220 VAC regions.

Specifications

Table 4-19 Battery Charging Slot

No.	Item	Specifications
1	Battery Charging Slot	Power Supply 110 - 230 VAC +/- 10% Power consumption 200 W

3.5 Intelligent Control System

The control system of the conference room uses a wired wall-mounted touch screen with a powerful quad-core CPU at the front and rear doors for touch control and an intelligent centralized control host as the core brain of the system. One HD hybrid matrix is used to route, distribute, and switch video signals, and de-embed audio applications. One 10.1-inch wireless touchscreen is used to control the device movement. One dual-band wireless router provides Wi-Fi. One programmable control panel with customized buttons is used, three strong-current relay boxes with at least eight 16 A relays are used for onsite electric curtain control and light on/off control. Two power sequencers that support user-defined power switches are used to control the power switch sequence, one set of control system software that compiles programs for the audio, optical, and electrical modules and customizes the APP control interface based on site requirements.

Comply with the principles and user requirements of powerful functions, stable and reliable, easy operation, cost-effectiveness, high integration, high compatibility and scalability, and embodying the spirit of the design scheme.

The intelligent control system, as the highest control layer of the remote video conference room, has special requirements on the stability, efficiency, and intelligence. The high-quality products of well-known brands in China are to be used and rationalized according to the actual situation, this will greatly facilitate the construction and operation of the intelligent conference room system.

With flexible modules, flexible programming, and intelligent control, the VCM system can perfectly reflect the intelligent effects of modern science and technology and life. The VCM system has been favored by designers and well received by users. The VCM system has been successfully used in hotels, governments, enterprises, exhibition centers, and science and technology museums.

3.5.1 Door Display

Sample Picture

Figure 4-20 Door Display

Function Description

- Displays the conference usage information.
- Displays the control status of the conference room and the information such as CO2, PM2.5, temperature, and humidity based on the air quality sensor installed in the conference room.
- The color of the indicator varies according to the conference status. For example, the indicator turns red during a conference, green during a conference.

Specifications

Table 4-20 Door Display

No.	Item	Specifications
1	Door Display	1. CPU: quad-core, 1.8 GHz frequency; 2. 10.1-inch, 2 GB memory, 8 GB flash memory, touch control, wall-mounted or embedded installation; 3. Display ratio: 16:9; resolution: 1280 x 800; 4. Built-in network port, USB port, and I/O, supporting Wi-Fi and PoE; 5. The display has an RGB feedback indicator.

3.5.2 Central Control System

Sample Picture

Figure 4-21 Central Control System

Function Description

- The front LCD screen displays the device status and IP address, which can effectively and quickly connect to the host.
- The front infrared learning window can be used to learn the infrared code directly.
- Front LED status indicator, directly reflecting the connection status;
- Supports eight RS232 ports, two of which can be set to RS422/RS485.
- One ECBUS interface, providing 12 V/3 A power supply and supporting bus data communication;
- Two USB ports for expansion and firmware upgrade;

Specifications

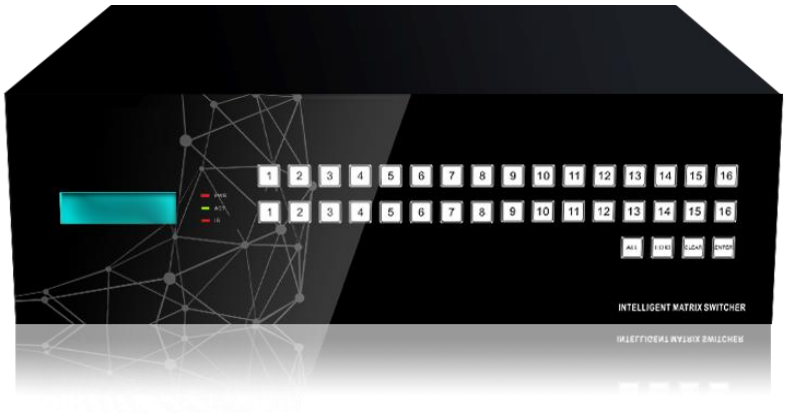
Table 4-21 Central Control

No.	Item	Specifications
1	Central Control	1. The front LCD can display the device status and IP address, which helps you quickly connect to the telepresence host. 2. The front infrared learning window can be used to directly learn the infrared code. 3. Processing speed of the mainboard card: 64-bit quad-core, 1.2 GHz CPU; 1 GB memory and 8 GB flash memory; 4. HTTPS is supported, and no PC is required for forwarding. The embedded iFLYTEK offline speech synthesis technology enables real-time packet-to-speech interaction through the audio system. 5. 3.5 mm stereo audio output interface, which can be used to play lossless audio files in MP3 format; 6. Eight RS232 ports, two of which can be configured as RS422/RS485 serial ports. 8*RELAY,8*IR,8*I/O ,1*RJ45; 7. One ECBUS interface, providing 12 V/3 A power supply and supporting bus data communication; Provides USB ports for expansion and firmware upgrade.

3.5.3 Intelligent Matrix Switcher

Sample Picture

Figure 4-22 Intelligent Matrix Switcher



Function Description

- Supports a maximum of 16 x 16-channel audio and video signal switching card interfaces and hot swap.
- Supports seamless switching between the input and output of CVBS, YPbPr, VGA, DVI, HDMI, 3G/HD/SDSDI, HDBT, and Fiber signals.
- 4K I/O card with the transmission rate of 10.2 Gbit/s, supporting a maximum of 4K/60 Hz 4:2:0, 4K/30 Hz 4:4:4 when the 4K card is used;
- Supports quick switching control of the front panel, RS232 control, and tablet control. Locking the front panel
- HDMI 1.4a standard, implementing 4K and 3D signal input and output
- Supports 24/7 power-off operation.

Specifications

Table 4-22 Intelligent Matrix Switcher

No.	Item	Specifications
1	Intelligent Matrix Switcher	1. Supports a maximum of 16 x 16-channel audio and video signal switching card interfaces and hot swap. 2. Provides 16 input and 16 output shortcut keys to quickly switch signals. 3. Transmission rate: 10.2 Gbit/s; 4. Supports seamless switching between CVBS, YPbPr, VGA, DVI, HDMI, 3G/HD/SDSDI, HDBT, and optical fibers. 5. Supports the HDMI 1.4a standard to implement 4K and 3D signal input and output. 6. Supports quick switch control, RS232 control, and tablet control on the front panel. Locking the front panel;

3.5.4 Door Control Display

Sample Picture

Figure 4-23 Door Control Display

Function Description

- Realize the control function of conference room video conference and conference room equipment

Specifications

Table 4-23 Door Display

No.	Item	Specifications
1	Door Control Display	1. CPU: quad-core, 1.8 GHz frequency; 2. 10.1-inch, 2 GB memory, 8 GB flash memory, touch control, wall-mounted or embedded installation; 3. Display ratio: 16:9; resolution: 1280 x 800; 4. Built-in network port, USB port, and I/O, supporting Wi-Fi and PoE;

3.5.5 Wireless Router

Sample Picture

Figure 4-24 Wireless Router

Function Description

- Realize the networking function of touch control screen

Specifications

Table 4-24 Wireless Router

No.	Item	Specifications
1	Wireless Router	1. Dual-band four-antenna wireless router; 2. Transmission frequency band: 2.4 GHz; 5 GHz frequency band; 1200 MHz dual-band concurrency; 3. Transmission standard: IEEE 802.11n; IEEE 802.11g; IEEE 802.11b; IEEE 802.11.ac; IEEE 802.11.a; IEEE 802.3; IEEE 802.3u 4. One Internet port, four LAN ports, and five 100 Mbit/s network ports.

3.5.6 Environmental Monitor

Sample Picture

Figure 4-25 Environmental Monitor

Function Description

- With temperature, humidity, carbon dioxide, formaldehyde, organic pollution, PM2.5 six major functions;
- Seamless interconnection with intelligent control, intuitively displaying the environment quality and values of the conference room.
- The conference management system automatically switches on and off air conditioners and fresh air system to adjust the temperature and humidity in the conference room.

Specifications

Table 4-25 Environmental Monitor

No.	Item	Specifications
1	Environmental Monitor	1. Ceiling installation; 2. Six functions: temperature, humidity, carbon dioxide, formaldehyde, organic pollution, and PM2.5; 3. Seamless interconnection with intelligent control, intuitively displaying the

		environment quality and values of the conference room;

3.5.7 Control Panel

Sample Picture

Figure 4-26 Control Panel

Function Description

- Auxiliary control equipment

Specifications

Table 4-26 Control Panel

No.	Item	Specifications
1	Control Panel	1. Black double six blank keys, LED feedback, and programmable customized keys; 2. The panel is applicable to the standard 86-type base box. 3. The network intelligent panel communicates through the host bus. 4. The interval between two commands is about 100 ms. 5. The read interval is about 20 ms. 4. The interval between two commands is about 100 ms. 5. The read interval is about 20 ms.

3.5.8 PAD Wireless Touchscreen

Sample Picture

Figure 4-27 PAD Wireless Touchscreen

Function Description

- Screen size: 10.8 inches
- RAM: 4 GBROM: 64 GB
- Resolution 2560 x 1600 pixels, supporting a microSD card

Specifications

Table 4-27 PAD Wireless Touchscreen

No.	Item	Specifications
1	PAD Wireless Touchscreen	HUAWEI PAD M6 (with a tabletop support)

3.5.9 Heavy-Current Relay Box

Sample Picture

Figure 4-28 Heavy-current Relay Box

Function Description

- Eight inputs and eight outputs at the control end. The channels are independent of

each other.

- The bus supports RS232 and RS485 direct control, real-time feedback.

Specifications

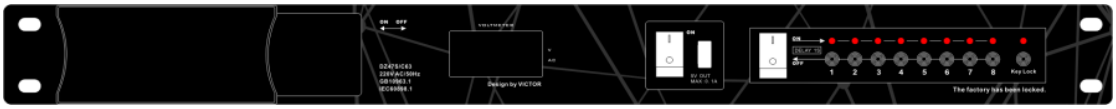
Table 4-28 Heavy-current Relay Box

No.	Item	Specifications
1	Heavy-current Relay Box	1. Input voltage: 12 V DC2. Control port: RS485 x 2; 3. Switch output: eight 16 A relays and eight 220 V 80 A maximum loads; 4. Other ports: eight Boolean value inputs (supporting 064 V) 5. Installation mode: 35 mm standard guide rail installation, size: 158*88*59mm (L*W*T); 6. The control end supports eight inputs and eight outputs. The channels are independent of each other. 7. The 6.35 mm copper-core wiring terminal is used on the control end to connect to the 4 mm2 cable. 8. The bus supports RS232 and RS485 direct control and real-time feedback,

3.5.10 Power Sequencer

Sample Picture

Figure 4-29 Power Sequencer



Function Description

- Automatic timing control and manual control;
- 8-channel power sequencer, supporting I/O and RS232 control, 10 A for each channel, total power not greater than 63 A;
- The power switch can be customized.
- Configure cascading ports to cascade three devices of the same type.

Specifications

Table 4-29 Power Sequencer

No.	Item	Specifications
1	Power Sequencer	Eight power sequencers, supporting I/O control, RS232 control, 10 A for each, total power not greater than 63 A, and user-defined power switch control;

3.5.11 Network Switch

Sample Picture

Figure 4-30 Network Switch

Function Description

- Sixteen 10/100/1000BaseT Ethernet ports
- AC power supply
- Packet forwarding rate: 24 Mpps
- Switching capacity: 32 Gbit/s

Specifications

Table 4-30 Network Switch

No.	Item	Specifications
1	Network Switch	16-port gigabit non-NMS switch with PoE power supply

4 Video Conference Room Fitout

4.1 Scope of Fitout

Based on the site survey, we will provide new soundproof materials on the wall and absorbing curtain for the windows. The following table is the detailed scope of boardroom fitout.

Table 5-1 Boardroom Fitout Scope

No.	**Scope**	**Konza Complex office**	**KenInvest**	**MoICT**
1	Wall Sound Proofing	To be Provided	To be Provided	To be Provided
2	Windows -Electric curtains	To be Provided	To be Provided	To be Provided
3	Integrated Cabling & Cabinet	To be Provided	To be Provided	To be Provided
4	Storage Cabinet	To be Provided	To be Provided	To be Provided
5	Screen hanging Mounting	Floor & Ceiling	Floor & Ceiling	Wall & Ceiling
6	Lighting	Reuse Existing	Reuse Existing	Reuse Existing
7	Ceiling	Reuse Existing	Reuse Existing	Reuse Existing
8	Furniture *	Reuse Existing	Reuse Existing	Reuse Existing
9	Grounding	Reuse Existing	Reuse Existing	Reuse Existing
10	Fire Extinguishing System	Reuse Existing	Reuse Existing	Reuse Existing
11	Ventilation System	Reuse Existing	Reuse Existing	Reuse Existing

*Worn out furniture and fitout will be replaced with concurrence of the end users and will be incorporated into the detailed design. The objective will be to make the three sites aesthetically identical.

5 Responsibility Matrix

5.1 The Responsibility Matrix for VC Deployment

Responsibility Matrix for Video Conferencing Room implementation. It includes survey, design, supply, delivery, installation, testing and acceptance of the equipment included in the scope of the Intelligent Conference Room project as well as related works to be fulfilled to ensure proper implementation.

The main responsibilities are separated between

- End users (MDAs)
- Huawei.

Activities that are the responsibility of Huawei can be performed by Huawei or a sub-contractor appointed by Huawei but are still under Huawei's responsibility. The same is valid for activities where End users are responsible.
For the tasks listed below the responsibility can be with:
R – Denotes the Responsibility required from the party
S – Denotes the Support required form the party

Table 5-1 Responsibility Matrix Table

No	Description	Huawei	End users
1	Site Preparation		R
2	Site Survey and Design	R	S
3	Output site detail design	R	
4	Approve the site survey report and detail design		R
5	Site acquisition		R
6	Entry permit		R
7	Existing facility relocation if any		R
8	Power Access &Preparation.		R
9	Network preparation (provide ethernet port which bandwith more than 8M)		R
10	Conference Room Fitout	R	S
11	Provide air conditioning system		R
12	Reuse the existing Furnitures	S	R
13	Room Space for Hardware installation.	S	R
14	Hardware Installation.	R	S
15	Platform Installation and commssioning.	R	S
16	Distribute spareparts in end users store		R
17	Acceptance Procedure, Criterion and Plan submission	R	S

6 Bill of Quantity (BOQ)

6.1 BOQ Configuration List

The following table is the BOQ configuration list for Part I: Video Conferencing Facilities, Part II Video Conferencing Server & Platform and Part III Boardroom Fitout and Engineering Service.

NB: Huawei will provide maintenance service of all the supplied equipment of the three video conference sets as per the contract.

Table 6-1 Configuration List

Part I: Video Conferencing Facilities										
No	Part Number	Item	Specifications	KenInvest Boardroom	Konza Complex office Boardroom	Teleposta 10th Floor Boardroom	Spare Parts	Total Qty.	Unit Price (USD)	Total Price (USD)
Audio System										
1	02490007-2	Ceiling Speaker	Type: compact, two-way crossover Tweeter: 25mm (1 ") coaxial rotating silk membrane unit Woofer: 165mm (6.5 ") unit Impedance: 8Ω; Frequency response: 50Hz ~ 20kHz Sensitivity:> 90dB Rated power: 60W Peak: 200W	4	4	4	6	18	690.00	12,420.00
2	02490007-1	Main Speaker	Frequency response: 180Hz-18KHz (± 3dB), 100Hz-20KHz (± 10dB); Sensitivity: 96dB; Nominal impedance: 8 Ohm; Rated power: 100W; Music power: 200W; Peak power: 400W; Crossover point: 200Hz; Sound pressure level: 118dB SPL, 121dB SPL peak; Speaker: 4 × 3 "Full Frequency (0.8" voice coil); Pointing angle: Lossless compression, Direct; Connection socket: 1 NL4MP connectors, Red and black terminal pillars;	2	2	2	3	9	1,200.00	10,800.00

No	Part Number	Item	Specifications	KenInvest Boardroom	Konza Complex office Boardroom	Teleposta 10th Floor Boardroom	Spare Parts	Total Qty.	Unit Price (USD)	Total Price (USD)
3	02490007-3	Power Amplifier	Power amplifier parameter: 1.RMS (EIAJ) power: 4X600W @ 8Ω; 4X1100W @ 4Ω; Bridge: 2X1100W @ 8Ω; 2. Output connectors: 4 SPEAKON and four pairs of binding posts 3. Distortion rate: 0.05%, 20Hz-20KHz 4. Frequency response: 20-25KHz + 0 / -1dB 5. Signal to noise ratio: 20Hz-20kHz> 100dB	1	1	1	1	4	5,750.00	23,000.00
4	02490007-4	Digital Audio Processor	1. 12-channel microphone/line input and 8-channel microphone/line output; Automatic squealing suppressor with DARE Feedback Elimination 2. One built-in telephone coupler and built-in USB transmission port, supporting input and output on the PC; 3. Provides 12 channels of distributed echo cancellation (AEC) function, professional noise suppression (NC) function, industry-leading noise cancellation, and environment adaptive technology to eliminate the noise from fans, air conditioning/ventilation system, and other relatively constant noise sources. 4. Provide a first microphone priority function. Support for Macquarie Chair is a plus.	1	1	1	1	4	19,200.00	76,800.00

			5. Dedicated control devices can be developed through the GPIO interface. 6. Supports RS232 control, USB control, and network control. 7. SNMP and HTML remote control, automatic system detection, and device self-discovery 8. Highly integrated audio processing modules, such as audio processing, audio mixing, matrix, equalization, compression, delay, and feedback suppression modules 9. Larger-scale systems can be expanded through the unique Clink bus, supporting a maximum of 64 audio channels.							
No	Part Number	Item	Specifications	KenInvest Boardroom	Konza Complex office Boardroom	Teleposta 10th Floor Boardroom	Spare Parts	Total Qty.	Unit Price (USD)	Total Price (USD)
5	02490007-5	Wireless Handheld Microphone	40 channels per frequency band can be used at the same time. Minimum frequency interval: 25 kHz Modulation Mode FM Frequency Modulation Two groups of independent tuners of the receiving system, diversity automatic selection.	2	2	2	3	9	3,100.00	27,900.00
Wireless Conference Discussion System										
1	02490007-6	Wireless Conference Access Point	Supply voltage 24 DC (+/- 10%) Ethernet port LAN, TCP / IP Modem OFDM; Transmit power <20 dBM Sampling frequency max. 32 kSps Sampling width max. 24 bits Frequency response 20-16000 Hz	1	1	1	1	4	4,660.00	18,640.00

No	Part Number	Item	Specifications	KenInvest Boardroom	Konza Complex office Boardroom	Teleposta 10th Floor Boardroom	Spare Parts	Total Qty.	Unit Price (USD)	Total Price (USD)
2	02490007-7	Wireless Conference Chairman Unit	The chairman unit can directly authorize the requesting Supply voltage Battery module Audio quality 16 bit digital @ 32 kHz Power consumption max 3.5W RF Power output <20 dBm Audio delay 23 ms	1	1	1	3	3	1,950.00	11,700.00
3	02490007-8	Wireless Conference Delegate Unit	Supply voltage Battery module Audio quality 16 bit digital @ 32 kHz Power consumption max 3.5W RF Power output <20 dBm; Audio delay 23 ms	13	13	13	6	45	1,800.00	81,000.00
4	02490007-9	Conference Unit Microphone	Audio delay: 20 ms Directivity: unidirectional Sensitivity: -43.4 dBV / Pa Frequency response: 130 Hz-15kHz Impedance: 680 Ω Microphone pickup directivity range: heart-shaped	14	14	14	6	48	540.00	25,920.00
5	02490007-10	Conference Unit Battery	Output voltage 7.2 VDC Capacity 6600 mAh Autonomy 20 h Charging time 4 h	14	14	14	6	48	550.00	26,400.00
6	02490007-11	Battery Charging Slot	Power Supply 110 - 230 VAC +/- 10% Power consumption 200 W	2	2	2	3	9	1,900.00	17,100.00

No	Part Number	Item	Specifications	KenInvest Boardroom	Konza Complex office Boardroom	Teleposta 10th Floor Boardroom	Spare Parts	Total Qty.	Unit Price (USD)	Total Price (USD)
Intelligent Control System										
1	02490007-12	Door Display	Displays the conference usage information. Displays the conference room information, including the number of participants and conference room functions. Displays the control status of the conference room and the information such as CO2, PM2.5, temperature, and humidity based on the air quality sensor installed in the conference room.	1	1	1	3	6	2,500.00	15,000.00
2	02490007-13	Central Control	1. The front LCD can display the device status and IP address, which helps you quickly connect to the telepresence host. 2. The front infrared learning window can be used to directly learn the infrared code. 3. Processing speed of the mainboard card: 64-bit quad-core, 1.2 GHz CPU; 1 GB memory and 8 GB flash memory; 4. The Linux system architecture is used, which is more stable and secure. 5. HTTPS is supported, and no PC is required for forwarding. 6, embedded iFLYTEK offline speech synthesis technology, real-time broadcast message word-to-speech through the sound system interactive broadcast; 7. 3.5 mm stereo audio output interface, which can be used to play lossless audio files in formats such as MP3; 8. The front LED indicators show the connection status. The LED indicators include the serial port transmit/receive signal, infrared transmit signal, relay switch signal, and I/O switch signal. 9. Eight	1	1	1	1	4	17,000.00	68,000.00

			RS232 ports, two of which can be configured as RS422/RS485 serial ports. 8*RELAY, 8*IR,8*I/O ,1*RJ45;							
No	Part Number	Item	Specifications	KenInvest Boardroom	Konza Complex office Boardroom	Teleposta 10th Floor Boardroom	Spare Parts	Total Qty.	Unit Price (USD)	Total Price (USD)
3	02490007-14	Intelligent Matrix Switcher	1. The front panel has a built-in liquid crystal display (LCD) to display the device IP address in real time, facilitating maintenance. 2. Supports a maximum of 16 x 16-channel audio and video signal switching card interfaces and hot swap. 3. Built-in control host, supporting tablet app control, control interface customization, input and output name customization, contingency plan, and graphics dragging control; 4. Provides 16 input and 16 output shortcut keys to quickly switch signals.	1	1	1	1	4	18,000.00	72,000.00
4	02490007-15	Door Control Display	1. CPU: quad-core, 1.8 GHz frequency; 2. 10.1-inch, 2 GB memory, 8 GB flash memory, touchscreen, and wall-mounted installation; 3. Display ratio: 16:9; resolution: 1280 x 800; 4. Built-in network port, USB port, I/O port, and serial port, supporting Wi-Fi and PoE;	1	1	1	3	6	3,500.00	21,000.00
5	02490007-16	Wireless Router	1. Dual-band four-antenna wireless router; 2. Transmission frequency band: 2.4 GHz; 5 GHz frequency band; 1200 MHz dual-band concurrency; 3. One Internet port, four LAN ports, and five 100 Mbit/s network ports.	1	1	1	3	6	170.00	1,020.00

No	Part Number	Item	Specifications	KenInvest Boardroom	Konza Complex office Boardroom	Teleposta 10th Floor Boardroom	Spare Parts	Total Qty.	Unit Price (USD)	Total Price (USD)
6	02490007-17	Environmental Monitor	1. Six functions: temperature, humidity, carbon dioxide, formaldehyde, organic pollution, and PM2.5; 2. Seamless interconnection with intelligent control, intuitively displaying the environment quality and values of the conference room;	1	1	1	3	6	790.00	4,740.00
7	02490007-18	Control Panel	1. Black double six blank keys, LED feedback, and programmable customized keys; 2. The panel is applicable to the standard 86-type base box. 3. The network intelligent panel communicates through the host bus. 4. The interval between two commands is about 100 ms.	1	1	1	3	6	300.00	1,800.00
8	02490007-19	PAD Wireless Touchscreen	Screen type: IPS; Screen size: 10.1 inches; screen aspect ratio: 16:10; screen resolution: 1920 x 1200	1	1	1	3	6	960.00	5,760.00
9	02490007-20	Heavy-current Relay Box	1. Maximum output current of a single channel: 20 A; 2. The status of the eight-channel switch can be displayed by the LED indicator on the panel. 3. The channel can be separately enabled or disabled by using the buttons on the panel or the timing. 4. Lock and unlock the buttons on the panel through software and hardware operations. Provides RS232, RS485, and ports. 5. Provides eight independent contact control interfaces, which can be connected to buttons or the central control system to enable or disable the channel switch.	3	3	3	3	12	880.00	10,560.00

No	Part Number	Item	Specifications	KenInvest Boardroom	Konza Complex office Boardroom	Teleposta 10th Floor Boardroom	Spare Parts	Total Qty.	Unit Price (USD)	Total Price (USD)
10	02490007-21	Power Sequencer	Eight power sequencers, supporting I/O control, RS232 control, 10 A for each, total power not greater than 63 A, and user-defined power switch control;	2	2	2	3	6	980.00	8,820.00
11	02490007-22	Control System Software	1. Compile the audio, optical, and electrical programs and typeset the system logic based on the site requirements. 2. Customize the app control interface based on the owner's requirements and provide UI options. 3. The control matrix supports signal switching in drag-and-drop mode.	1	1	1	0	3	38,000.00	114,000.00
Display System										
1	02312YNQ 02170469	86-inch Smart IdeaHub	HUAWEI IdeaHub Pro 86-inch smart integrated whiteboard, IdeaHub Share, OPS, Touch Control	2	2	2	0	6	55,947.00	335,682.00
2	02412409	HD Camera	HD camera, Huawei Camera 200 (4K-12X-HDMI, English,12v adapter, remote control)	1	1	1	0	3	4,806.00	14,418.00
Others Auxiliary Materials										
1	02290489	UPS	UPS 3KVA rack mounting Backup (4mins), 1 YR Warranty.	1	1	1	0	3	2,000.00	6,000.00
2	02490007-23	Network Switch	16-port gigabit non-NMS switch with PoE power supply	1	1	1	3	6	1,570.000	9,420.00
3	02490007-24	22U Cabinet	600 x 600 x 22 U, including baffles and laminates	1	1	1	0	3	900.0	2,700.00
4	02490007-25	Cable Material	Including HD video cables, audio cables, and audio and video connectors (excluding tubes and sockets)	1	1	1	0	3	24,333.33	73,000.00

Part II Video Conferencing Server and Platform (To be installed in Konza Data Center)						
No	Part Number	**Item**	**Specifications**	**Qty.**	**Unit Price (USD)**	**Total Price (USD)**
1	02312WRL 88036DQF	Multipoint Control Unit-MCU	VP9860 Series Universal Transcoding MCU: VP9860, Multipoint Control Unit, Universal Transcoding MCU, including 32*1080P30 Concurrent ports license, support maximal 100*1080P30/200*720p concurrent license expansion in future.	2	74,281.00	148,562.00
2	02312WTS 02312WTY	Service Management Platform-SMC	Service Management Platform-SMC: SMC Basic Integrated Device with 32 terminal management License and 32 hard terminal registration licenses, and 2*SC Base Server, support external 32 users access.	1	52,805.00	52,805.00
3	02312YHH 88036JTL	Videoconference Recording Server	Video Conferencing Recording Server: CloudRSE Standard Basic Integrated Device, including 10*1080P30 dual stream Video Recording License, 4*1080P30 Video Living License. Support maximal 20*1080P30/40*720p concurrent license expansion in future	1	17,638.60	17,638.60

Part III Boardroom Fitout and Engineering Service					
No	**Item**	**Service Description**	**Qty (Set)**	**Unit Price (USD)**	**Total Price (USD)**
1	Engineering Service for Video Conferencing Facilities	**The engineering service for video conferencing** It is included installing the equipment and auxiliary materials and powering on the equipment, and purchase some local material and 6 TV screens and boardroom fitout service. The equipment installation service includes: • Environment evaluation and survey • Detailed solution design • Hardware Transportation from warehouse to site, • Unpacking and Checking • Hardware installation and commissioning • Cabling interconnection service • Hardware self-check/power-on **Fitout service for boardroom** • Wall: Add sound-absorbing material; • Glass windows: Add electric curtains; • Light: optimize light base on survey; • Integrated Cabling: including piping/cabling reserving works for fibre/cable/audio systems etc; • Screen hanging or stand in the conference room.	3	61,448.003	184,344.01
2	Engineering Service for Video Server and Accessories	The Engineering Service for Video Server and Accessories is focus on the network design, data configuration and system interconnection commissioning and test. The content as follows, • Environment evaluation and survey • Network connection design • Detailed solution design • Cabling connection design • the SMC and MCU software upgraded service • The basic configuration on the device: Add Area Add Member Rule, Add Service Area, Configuring the SC, Basic MCU Configuration, Basic Configurations on the Terminal Side • The software configuration: Adding a manageable MCU; Adding a Manageable Participant; Adding a Manageable Recording Server • Verifying the Commissioning based on the function list • System integration test and acceptance	1	185,709.92	185,709.92

6.2 Video Conferencing System Price in Contract

Refer to the Supplementary Agreement II BOQ from Project Contract, the Video Conferencing System price has been indicated in the Video Conferencing System Section, which are matched the above BOQ breakdown price, they are described as below:

Unit: USD

Reference				
2.2	**Video Conferencing System, Video Server and Accessory Facilities**			**1,314,605.60**
	Video Conferencing Facilities	Video Conferencing Facilities	3 Sets	1,095,600.00
	Video Conferencing Server platform	Video Server and Accessories	1 Set	219,005.60

Reference			
7.2	**Engineering Service for Video Conferencing Facilities**		**370,053.92**
	Engineering Service for Video Conferencing Facilities	3 Sets	184,344.01
	Engineering Service for Video Server and Accessories	1 Set	185,709.92

7 Video Conference System Training

7.1 Video Conference System End User Training

Training programs (Onsite Training) are designed as follows:

Table 7-1 Training Courses

Training Courses	Level	Course Duration	Training Location	Total Trainees	Class Quantity
Onsite Training					
Video Conference System End User Operation Training	II	5	Customer Site	12	1

7.2 Video Conference System Operation Training

Table 7-2 Training Path

1	Video Conference System Operation Training	
	Lecture	5.0 days

Target Audience

End User -Video Conference Operators

End User - IT Staff Administrators

The users of the 3 locations will be trained at the same time at one of the locations.

Prerequisites

- A general familiarity with PC operation system
- A basic understanding of computer technology

Objectives

On completion of this program, the participants will be able to:

- Know video Conference communication basic knowledge of IdeaHub
- Describe camera commissioning
- Describe starting a video conference
- Master conference schedule and control

Training Contents

Video Conference System Overview

- Video Conference System Overview
- Video conference system definition
- Video conference development process
- Huawei Video Conference System Overview
- Huawei video conference technology innovations
- Huawei video conference solution
- Video Conference Configuration and Operation and Maintenance
- Schedule video conference meeting
- Configuring Conference Microphone
- Commissioning Conference Microphone
- System structure
- Basic introduction
- Conference management
- Conference preparation
- Conference schedule
- Conference control
- Routine fault and exclude methods

8 Recommendation

Sign-off to this design document constitutes a recognition that it has been reviewed, found adequate by the committee and is hereby recommended for approval to support implementation of the Video Conference Facilities.

9 Sign Off

Name	Organization	Designation	Date	Signature