

## **TERMS OF REFERENCE**

### ***MOUNTAIN PROVINCE STATE UNIVERSITY***

## **E-LEARNING PLATFORM DEVELOPMENT WITH INTEGRATED DATA AND COMMUNICATIONS SYSTEM**

### **1 Project Summary**

This project encompasses a wide range of technological aspects, from high-level AI tools and robust security measures to the fundamental IT equipment. It covers the entire spectrum of technological needs, from the cutting-edge advancements of artificial intelligence to the essential hardware components that underpin digital operations.

Driven by the recent elevation of MPSU status as a state university, this project aims to modernize the current digital infrastructure to cater the growing needs in network connectivity, data management and resiliency, and smart classrooms.

### **2 Project Description**

#### **2.1 Purpose**

As part of the continuous effort of MPSU to deliver quality education, this project aims to enhance, scale and strengthen the IT infrastructure including the university information systems.

#### **2.2 Key Elements of the Project**

##### **2.2.1 Command Center and Datacenter**

2.2.1.1 The Command Center and Datacenter will be designed to support centralized operations and core IT infrastructure as part of a modern refresh of the facility. The Command Center will be equipped with modern technology, including a video display wall, dedicated operator workstations with ergonomic tables and chairs, desktop computers, and UPS units to ensure uninterrupted power. Security and facility controls are integrated via a door access system, dome cameras, and comprehensive electrical and auxiliary works. The Data Center portion is fortified with specialized rack and containment systems to house critical server infrastructure, creating a highly productive, secure, and controlled environment for campus-wide IT operations.

##### **2.2.2 Core Network and Security**

2.2.2.1 Continuous enhancement of the MPSU university requires additional network and security equipment. These shall strengthen the cybersecurity and scale the network to

cover new facilities.

### 2.2.3 Virtualized Infrastructure

- 2.2.3.1 A new datacenter that can house all of the university systems and applications as well as data backups will be built as part of MPSU's redundancy initiative.

### 2.2.4 Administrative and Educational Systems

- 2.2.4.1 A modernized digital tool with a focus on centralizing and streamlining both administrative and educational systems that will enhance productivity efficiency, and improve resource allocation. This ensures that MPSU staff and educators can focus more on their students

### 2.2.5 E-classrooms

- 2.2.5.1 Equipped Visual representations and interactive elements significantly enhance information comprehension and retention. By presenting information visually, complex ideas can be simplified and made more accessible to a wider audience. Additionally, interactive features allow users to actively engage with the content.

### 2.2.6 Computer Laboratory

- 2.2.6.1 The university shall have dedicated spaces equipped with computers and essential software, providing a platform for learning, research, and creative exploration. These labs offer access to technology and resources that empower individuals to develop digital skills, solve problems, and innovate.

### 2.2.7 Auditorium Refresh

- 2.2.7.1 The main auditorium should be designed to accommodate both in-person and virtual events as part of a modern refresh of the existing space. It will be equipped with modern technology, including large LED display screens, high-performance sound systems, wireless microphones, and dedicated live streaming mixers. Additionally, the space will undergo complete renovation and retrofit services to create a productive and inviting atmosphere for both in-person and remote participants.

### 2.2.8 University Productivity

- 2.2.8.1 University staff and offices shall be provided with digital equipment to aid with their functions and improve efficiency.

### **3 General Scope of Works**

#### **3.1 Requirement Analysis**

3.1.1 Project key elements shall undergo requirement analysis with all the stakeholders.

#### **3.2 The winning bidder must submit the Detailed Business User Requirements, Technical Design Requirements, Implementation Plan, and System Manuals**

A comprehensive business user requirement, technical design requirements, implementation plan and system manuals. The implementation plan will show the details of the project's timeline, milestones, deliverables, and resources required for the successful execution.

#### **3.3 Infrastructure Setup**

The project team will install and set up the necessary digital infrastructure required for the project, including servers, routers, switches, and related equipment.

#### **3.4 Software Implementation**

Based on the business user requirements and technical design requirements, installation, customization, and testing of all software and applications shall be performed to ensure full integration of all systems that form part of this project.

#### **3.5 Testing and Quality Assurance**

3.5.1.1 The project team will perform individual component testing, and system integration testing for all components to ensure that they meet the specified requirements and are free from defects and errors.

3.5.1.2 Test scripts and user acceptance testing (UAT) documents should be provided for a smoother handover to end users.

#### **3.6 Training**

Facilitate the delivery of knowledge transfer through technical orientation and training sessions.

### **4 Command and Control Center Equipment Requirements**

The Command-and-Control Center is to be located at the administration building of Bontoc Main Campus. Components to be included in this project includes the following:

#### **4.1 Auxiliary Works and Services**

4.1.1 The winning bidder must provide all essential works to prepare the area nominated by for MPSU to be its Command-and-Control Center. At a minimum, it must include the following:

- 4.1.1.1 Wall, ceiling, and floor finish
- 4.1.1.2 Lighting works
- 4.1.1.3 Electrical works
- 4.1.1.4 2 Units 2.5 HP Air Conditioner Split Type
- 4.1.1.5 Provision of network nodes
- 4.1.1.6 2 Units Dome Camera
- 4.1.1.7 Door Access System
- 4.1.1.8 Provision of furnishings and other fixtures necessary for a Command Center
- 4.1.1.9 Provision of 6 x 55” Display Monitor (Video Wall 3 x 2 Setup)(see 14.10 for specification)
- 4.1.1.10 Electrical Works for connecting electricity supply wiring to electrical equipment.
- 4.1.1.11 Fixtures, Tables and Chairs for the Command Center

#### **4.2 Provision of 6 Units Desktop Computers**

4.2.1 The winning bidder must provide the following desktops to MPSU for its Command- and-Control Center. At a minimum, it must include the following:

- 4.2.1.1 Minimum of 10 Core Processor with 20MB Cache Memory
- 4.2.1.2 16GB Memory
- 4.2.1.3 512GB SSD Storage
- 4.2.1.4 34” curved Monitor
- 4.2.1.5 Keyboard
- 4.2.1.6 Mouse
- 4.2.1.7 UPS 650 VA
- 4.2.1.8 Windows Operating System (Version 11 or better)
- 4.2.1.9 Office Productivity Software (Word Processor, Spreadsheet, Slide Presentation)

### **4.3 Security Surveillance System**

- 4.3.1 TCP/IP Based CCTV Cameras
- 4.3.2 Should support 12 VDC or 24 VAC.
- 4.3.3 Should support 1920 x 1080 Resolution.
- 4.3.4 Should support 25/30/50/60 fps.
- 4.3.5 Should be at least IP66 Ingress protection.

## **5 All In One Rack**

### **5.1 Server Racks**

The winning bidder must provide 4 units of server racks to MPSU Bontoc Campus for its datacenter. At a minimum, it must include the following:

#### **5.1.1 Rack configuration**

- 5.1.1.1 UPS Capacity – Must be able to support at least 6kVA.
- 5.1.1.2 Rack PDU Type
  - 5.1.1.2.1 With 1.5m input cable and indicator light
  - 5.1.1.2.2 At least 10A input
  - 5.1.1.2.3 12 x C13 + 4 x C19, 1 pc (PDU)
- 5.1.1.3 Rack Dimensions (H x W x D) - 2000 x 800 x 1100 (mm)
- 5.1.1.4 Door Lock Type – Smart lock, must integrate with the Video Management System, and provide a perpetual license for integration
- 5.1.1.5 Usable Rack Space – Must be able to have at least 30U usable rack space.
- 5.1.1.6 Monitoring – In-built infrastructure monitoring
- 5.1.1.7 Monitoring Interface
  - 5.1.1.7.1 At least 7-inch LCD Touchscreen.
  - 5.1.1.7.2 IP-based web interface

## **6 Structured Cabling Requirements**

### **6.1 Cabling**

Supply and installation of at least 8-core single mode os2 fiber optic cable that will link select buildings to the data center. The backbone will serve as the network gateway throughout the following target MPSU campuses.

6.1.1 Bontoc Main Campus

6.1.1.1 Administration Building

6.1.1.2 Old Academic Building

6.1.1.3 New Academic Building

6.1.1.4 Quadrangle

6.1.1.5 Sciences Building

**7 Electrical Works**

**7.1 MPSU Bontoc**

7.1.1 Supply, deliver, install, test, and commission three (3) units of 167 kVA pole-mounted oil-immersed distribution transformers, connected in a Delta/Wye transformer bank, with a total rated capacity of 500 kVA, for MPSU Bontoc, complete with all necessary mounting hardware, accessories, and protection devices. At a minimum, it must include the following specifications:

7.1.1.1 Designed for pole or pad mounting and must include necessary hardware and enclosed in a weatherproof robust casing and built to endure various environmental conditions.

7.1.1.2 Total rated power(Bank): 500kVA

7.1.1.3 Individual Transformer Rating: 167 kVA each

7.1.1.4 Primary Voltage Ratings: Varies as per distribution utility.

7.1.1.5 With HV Tap Changer

7.1.1.6 Complete sets of protective devices shall be used in accordance with the latest edition of Philippine Electrical Code (PEC).

7.1.1.7 Must include lightning arresters.

7.1.1.8 Must have Surge Protection Device.

7.1.2 Supply, install, test, and commission an Automatic Transfer Switch (ATS) and Main & Sub Distribution Panel (MDP & SDP) to serve as the primary low-voltage distribution and switching system for the projects. At a minimum, it must include the following specifications:

7.1.2.1 Rated Capacity: Not less than 500 kVA / 1600 A (or as required by load calculations).

- 7.1.2.2 Voltage Rating: 230 V, 3-Phase, 4-Wire, 60 Hz
- 7.1.2.3 Enclosure: NEMA 1 / IP-rated steel enclosure, powder-coated, indoor type
- 7.1.2.4 Electrically and mechanically interlocked
- 7.1.2.5 Capable of automatic and manual operation
- 7.1.2.6 Provided with control panel, status indicators, and alarms
- 7.1.3 Supply, deliver, install, test, and commission one (1) unit 75 kVA, 230 V, 3-Phase, 60 Hz Silent Diesel Generator Set suitable for continuous standby operation for the Data Center. At a minimum, it must include the following specifications:
  - 7.1.3.1 Type: Diesel Engine-Driven Generator, Sound-Attenuated Canopy (Silent Type)
  - 7.1.3.2 Rated Output: 75 kVA (Standby Rating)
  - 7.1.3.3 Voltage: 230 V, 3-Phase, 4-Wire, 60 Hz
  - 7.1.3.4 Starting System: Electric start with battery and charger
  - 7.1.3.5 Control Panel: Digital controller with monitoring and protection features
  - 7.1.3.6 Mechanical Accessories
    - 7.1.3.6.1 Exhaust piping system with silencers
    - 7.1.3.6.2 Radiator ducting and ventilation system
    - 7.1.3.6.3 Vibration isolators and mounting pads
- 7.1.4 Supply and install a comprehensive Surge Protection System (SPS) and Grounding/Earthing System for all Data Center electrical equipment and distribution systems. At a minimum, it must include the following specifications:
  - 7.1.4.1 Type 1 and Type 2 Surge Protection Devices (SPD) for the following:
    - 7.1.4.1.1 Transformer secondary
    - 7.1.4.1.2 ATS
    - 7.1.4.1.3 MDP
  - 7.1.4.2 Grounding System:
    - 7.1.4.2.1 Copper-clad ground rods, ground conductors, and grounding busbars
    - 7.1.4.2.2 Resistance to ground not exceeding 5 ohms or as

required by PEC and utility standards.

- 7.1.4.2.3 Bonding of all metallic parts, enclosures, and structures.

## **8 Network Security**

The winning bidder shall provide the network security for MPSU Bontoc.

### **8.1 Next Generation Firewall (NGFW)**

The winning bidder shall supply, install, and configure 2 units of NGFW for MPSU Bontoc. At a minimum, it must include the following specifications:

#### **8.1.1 Performance and Hardware specifications**

- 8.1.1.1 The system must have the minimum throughput capacity listed below.

- 8.1.1.1.1 Firewall Inspection at 18 Gbps

- 8.1.1.1.2 Threat Prevention at 9.5 Gbps

- 8.1.1.1.3 Application inspection at 11 Gbps

- 8.1.1.1.4 IPS at 10 Gbps

- 8.1.1.1.5 Anti-malware inspection at 9.5 Gbps

- 8.1.1.1.6 TLS/SSL decryption and inspection (DPI SSL) at 5 Gbps

- 8.1.1.1.7 VPN at 11 Gbps

- 8.1.1.2 The system must be capable of handling:

- 8.1.1.2.1 At least 115,000 Connections per second

- 8.1.1.2.2 Max connections (SPI) of 4,000,000

- 8.1.1.2.3 Max DPI-SSL Connections of 350,000

- 8.1.1.2.4 Max connections (DPI) of 2,000,000

- 8.1.1.3 The system's interface must include the following interfaces.

- 8.1.1.3.1 6 x 10G/5G/2.5G/1G SFP+

- 8.1.1.3.2 24 x 1GbE Cu

8.1.1.3.3 2 USB 3.0

8.1.1.3.4 1 Console

8.1.1.3.5 1 Management port

8.1.1.4 Storage of at least 128 GB that is expandable up to 1 TB

## 8.1.2 Capabilities and Features

8.1.2.1 Must perform stream-based, bi-directional traffic analysis, without proxying or buffering, to uncover intrusion attempts and malware and to identify application traffic regardless of port.

8.1.2.2 Must scan for threats in both inbound and outbound traffic simultaneously to ensure that the network is not used to distribute malware and does not become a launch platform for attacks in case an infected machine is brought inside.

8.1.2.3 Must have proxy-less and non-buffering inspection technology provides ultra-low latency performance for DPI of millions of simultaneous network streams without introducing file and stream size limitations and can be applied on common protocols as well as raw TCP streams.

8.1.2.4 Must have a single-pass DPI architecture simultaneously scans for malware, intrusions and application identification, drastically reducing DPI latency and ensuring that all threat information is correlated in a single architecture.

8.1.2.5 Must have an engine with the multi-core architecture to provide high DPI throughput and extremely high new session establishment rates to deal with traffic spikes in demanding networks.

8.1.2.6 Must identify and mitigate even the most insidious modern threats, including future Meltdown exploits. Detects and blocks malware that does not exhibit any malicious behavior and hides its weaponry via encryption.

8.1.2.7 Must prevent potentially malicious files from entering the network, files sent to the cloud for analysis can be held at the gateway until a verdict is determined.

8.1.2.8 Must have multi-engine sandbox platform, which includes virtualized sandboxing, full system emulation and hypervisor level analysis technology, executes suspicious code and analyzes behavior, providing comprehensive visibility to malicious activity.

8.1.2.9 Must have a Secure SD-WAN that enables distributed enterprise organizations to build, operate and manage secure, high-performance networks across remote sites for the purpose of sharing data, applications and services using

readily available, low-cost public Internet services without additional license cost.

- 8.1.2.10 Must have a wizard to automatically configure SDWAN Policy on the firewall
- 8.1.2.11 Must displays SD-WAN Performance probes and top connections.
- 8.1.2.12 All network traffic must be inspected, analyzed and brought into compliance with firewall access policies.
- 8.1.2.13 Must supports Active/Passive (A/P) with state synchronization. The proposed solution should support Hardware redundancy using only single security license in both primary & secondary appliance
- 8.1.2.14 Must have block until verdict to prevent potentially malicious files from entering the network, files sent to the cloud for analysis can be held at the gateway until a verdict is determined.
- 8.1.2.15 Must have zero-day protection to protect the network against zero-day attacks with constant updates against the latest exploit methods and techniques that cover thousands of individual exploits.
- 8.1.2.16 Must have Bi-directional raw TCP inspection that scans raw TCP streams on any port and bi-directionally to detect and prevent both inbound and outbound threats.
- 8.1.2.17 Must have application control that controls applications, or individual application features that are identified by the engine against a continuously expanding database of over thousands of application signatures. That increases network security and enhances network productivity.
- 8.1.2.18 Must have DDoS/DoS attack protection. SYN flood protection provides a defense against DOS attacks using both Layer 3 SYN proxy and Layer 2 SYN blacklisting technologies. Additionally, it protects against DOS/DDoS through UDP/ICMP flood protection and connection rate limiting.
- 8.1.2.19 Must be capable of load-balances multiple WAN interfaces using Round Robin, Spillover or Percentage methods. Policy-based routing creates routes based on protocol to direct traffic to a preferred WAN connection with the ability to fail back to a secondary WAN in the event of an outage
- 8.1.2.20 Must display rules which are actively used or not being used.
- 8.1.2.21 Must be able to simplify and reduce complex distributed firewall deployment down to a trivial effort by automating the initial site-to-site VPN gateway provisioning between

firewalls while security and connectivity occurs instantly and automatically.

- 8.1.2.22 Must guarantee critical communications with 802.1p, DSCP tagging and remapping of VoIP traffic on the network.
- 8.1.2.23 The system Intrusion Prevention System must be capable of Signature-based scanning, Automatic signature updates, Bi-directional inspection, Granular IPS rule capability, GeoIP enforcement, Botnet filtering with dynamic list, Regular expression matching.
- 8.1.2.24 The Anti-Malware System must be capable of Stream-based malware scanning, Gateway anti-virus, Gateway anti-spyware, Bi-directional inspection, No file size limitation
- 8.1.2.25 The system must have traffic visualization that can monitor User activity, application, bandwidth, and threat.
- 8.1.2.26 Must have a HTTP/HTTPS Web content filtering that is capable of URL filtering, Proxy avoidance, Keyword blocking, Policy-based filtering (exclusion/inclusion), HTTP header insertion, Bandwidth manage, and rating categories.
- 8.1.2.27 Must have a VPN that is capable of Secure SD-WAN, Auto-provision VPN, IPSec VPN for site-to-site connectivity, SSL VPN and IPSec client remote access, Redundant VPN gateway, and Mobile client for iOS, Mac OS X, Windows, Chrome, Android and Kindle Fire.
- 8.1.2.28 Must have networking capabilities such as PortShield, Path MTU discovery, Enhanced logging, VLAN trunking, Layer-2 QoS, Port security, Dynamic routing (RIP/OSPF/BGP), Policy-based routing (ToS/metric and ECMP), NAT, DHCP server, Bandwidth management, A/P high availability with state sync, Inbound/outbound load balancing, L2 bridge, wire/virtual wire mode, tap mode, NAT mode, Asymmetric routing, and Common Access Card (CAC) support.
- 8.1.2.29 The system management and monitoring must have Web GUI, Command Line Interface (CLI), SNMP v2/v3 support, centralized management and reporting, NetFlow/IP Fix exporting, cloud-based configuration back up, and Zero-Touch registration & provisioning.
- 8.1.2.30 Must have 24x7 support that includes firmware updates and hardware replacement. Support includes around-the-clock access to telephone and web-based support for basic configuration and troubleshooting assistance, as well as hardware replacement in the event of failure.

8.1.3 8 units of Short Range 10G Transceivers.

## **9 Core Network**

The winning bidder shall provide the network infrastructure for MPSU Bonto

### **9.1 Enterprise Router**

The winning bidder shall supply, install, and configure 1 unit of enterprise routers for MPSU Bontoc. At a minimum, it must include the following specifications:

- 9.1.1 Must have minimum Service forwarding performance (NAT/QoS/ACL, 1400Bytes, Gbps)  $\geq 4$  Gbps.
- 9.1.2 Must have minimum IPsec (1400Bytes, Gbps)  $\geq 1.6$  Gbps.
- 9.1.3 Must have SD-WAN performance (1400Bytes) \*  $\geq 2$  Gbps.
- 9.1.4 The equipment must have minimum Fixed WAN ports: 2xGE
- 9.1.5 Fixed LAN ports\*: 8 x GEElectrical
- 9.1.6 The proposed equipment must be 1RU
- 9.1.7 Support Application-based A-FEC or QoS Traffic-Shape/GTS.
- 9.1.8 Support IPSLA, IPFIX, BSM

### **9.2 Core Switch**

The winning bidder shall supply, install, and configure 2 units of Core Switch for MPSU Bontoc. At a minimum, it must include the following specifications:

- 9.2.1 Must support 28 x 1/10 Gig SFP+, 6 x 40/100 Gig QSFP28, One extended slot.
- 9.2.2 Must provide minimum of 2 power modules.
- 9.2.3 Must have minimum 4 core CPU, minimum 4GB DRAM memory.
- 9.2.4 Must have five modular Fan slots and two power slots.
- 9.2.5 The proposed equipment must have switching capacity of minimum
- 9.2.6 1.6Tbps and forwarding performance of 490Mpps.
- 9.2.7 Must support minimum 380K MAC address entries.
- 9.2.8 Must support minimum 256K of IPv4 and 80K IPv6 host route.
- 9.2.9 Must support RIP, OSPF, IS-IS, and BGP for IPv4.
- 9.2.10 Must support IPv6 routing protocols, such as RIPng, OSPFv3, IS-ISv6, and BGP4+.

- 9.2.11 Must support ERPS, ULPP, Monitor Link, VRRP, VRRPv3, VBRP, BFD.
- 9.2.12 Must support ARP Check, AARF
- 9.2.13 Must support TRILL, VXLAN, M-LAG
- 9.2.14 ARP-Guard, CPU Protection.
- 9.2.15 Supports up to 4K VLANs
- 9.2.16 Support QinQ and Port-based flexible QinQ
- 9.2.17 Support BGP-EVPN and NLB
- 9.2.18 Must support SPAN, RSPAN, ERSPAN, BSM.
- 9.2.19 Must support H-VST, M-VST.
- 9.2.20 Must be able to provide necessary transceivers for the core switches with the following quantities below:
  - 9.2.20.1 MPSU Bontoc
    - 9.2.20.1.1 100G QSFP28 Stacking cable – 2 pcs
    - 9.2.20.1.2 10G SFP+ SM – 12 pcs
    - 9.2.20.1.3 10G SFP+ MM – 12pcs
    - 9.2.20.1.4 1G SFP – 8pcs

### **9.3 Distribution Switch**

The winning bidder shall supply, install, and configure 2 units of Distribution Switch for MPSU Bontoc. At a minimum, it must include the following specifications:

- 9.3.1 Must support 24 x 1/10 Gig SFP+, 6 x 40/100 Gig QSFP28.
- 9.3.2 Must provide minimum of 2 power modules
- 9.3.3 Must have minimum 4 core CPU, minimum 4GB DRAM memory.
- 9.3.4 The proposed equipment's typical power consumption can't exceed
- 9.3.5 165W.
- 9.3.6 The proposed equipment must have switching capacity of minimum
- 9.3.7 1.6Tbps and forwarding performance of 490Mpps.
- 9.3.8 Support minimum 64K MAC address entries.
- 9.3.9 Support minimum 64K of IPv4 and 32K IPv6 host route.

- 9.3.10 Support RIP, OSPF, IS-IS, and BGP for IPv4.
- 9.3.11 Support IPv6 routing protocols, such as RIPng, OSPFv3, IS-ISv6, and BGP4+.
- 9.3.12 Must support ERPS, ULPP, Monitor Link, VRRP, VRRPv3, VBRP, BFD.
- 9.3.13 Must support TRILL, VXLAN, M-LAG, M-LAG Lite, MLAG for VXLAN
- 9.3.14 Supports up to 4K VLANs
- 9.3.15 Support QinQ and Port-based flexible QinQ
- 9.3.16 Support BGP-EVPN and NLB
- 9.3.17 Must support H-VST, M-VST.
- 9.3.18 Must be able to provide necessary transceivers for the core switches with the following quantities below:
  - 9.3.18.1 MPSU Bontoc
    - 9.3.18.1.1 40G QSFP+ Stacking cable – 2 pcs
    - 9.3.18.1.2 10G SFP+ SM – 16 pcs

#### **9.4 Aggregation Switch**

The winning bidder shall supply, install, and configure 5 units of Aggregation Switch for MPSU Bontoc. At a minimum, it must include the following specifications:

- 9.4.1 Must support 24 x 1/10 Gig SFP+, 6 x 40/100 Gig QSFP28.
- 9.4.2 Must provide minimum of 2 power modules
- 9.4.3 Must have minimum 4 core CPU, minimum 4GB DRAM memory.
- 9.4.4 The proposed equipment's typical power consumption can't exceed
- 9.4.5 165W.
- 9.4.6 The proposed equipment must have switching capacity of minimum
- 9.4.7 1.6Tbps and forwarding performance of 490Mpps.
- 9.4.8 Support minimum 64K MAC address entries.
- 9.4.9 Support minimum 64K of IPv4 and 32K IPv6 host route.
- 9.4.10 Support RIP, OSPF, IS-IS, and BGP for IPv4.
- 9.4.11 Support IPv6 routing protocols, such as RIPng, OSPFv3, IS-ISv6, and

BGP4+.

9.4.12 Must support ERPS, ULPP, Monitor Link, VRRP, VRRPv3, VBRP, BFD.

9.4.13 Must support TRILL, VXLAN, M-LAG, M-LAG Lite, MLAG for VXLAN

9.4.14 Supports up to 4K VLANs

9.4.15 Support QinQ and Port-based flexible QinQ

9.4.16 Support BGP-EVPN and NLB

9.4.17 Must support H-VST, M-VST.

9.4.17.1 MPSU Bontoc

9.4.17.1.1 40G QSFP+ Stacking cable – 2 pcs

9.4.17.1.2 10G SFP+ SM – 50 pcs

## **9.5 Access Switch**

The winning bidder shall supply, install, and configure 15 units of Access Switch for MPSU Bontoc. At a minimum, it must include the following specifications:

9.5.1 Must support 48 x 10/100/1000Base-T ports, 4 x 10 GE SFP+ ports

9.5.2 Must have dual power supply.

9.5.3 Must support Local SPAN, RSPAN, VLAN SPAN

9.5.4 The proposed equipment must have switching capacity of minimum 176Gbps and forwarding performance of 132Mpps.

9.5.5 Support minimum 16K MAC address entries.

9.5.6 Support minimum 2K of IPv4 and 1K IPv6 host route.

9.5.7 Supports up to 4K VLANs

9.5.8 Must support ULPP, Monitor Link, VRRP, VRRPv3, VBRP, BFD.

9.5.9 Must support H-VST, M-VST.

## **9.6 Wireless Access Point**

The winning bidder shall supply, install, and configure 150 units of Access points for MPSU. At a minimum, it must include the following specifications:

9.6.1 The AP should support IEEE 802.11a/b/g/n/ac/ax/be

9.6.2 The AP should support triple radios, 2.4GHz (2x2 MU-MIMO and 2

spatial streams) + 5GHz (2x2 MU-MIMO and 2 spatial streams) + 6GHz (2x2 MU-MIMO and 2 spatial streams).

- 9.6.3 The AP should support 1x 1/2.5/5GE Base-T + 1x GE Base-T
- 9.6.4 The AP should support 1x 10/100/100Mbps Base-T port with POE out.
- 9.6.5 The AP should support Bluetooth 5.1 and support Bluetooth serial port for remote maintenance.
- 9.6.6 The AP should support minimum 16 SSIDs for each radio.
- 9.6.7 The AP should support minimum 1000 users.
- 9.6.8 The AP should support built-in smart antennas.
- 9.6.9 The AP should support smart roaming.
- 9.6.10 The AP should support Transmit Power Control and Automatic Channel Scanning.

## **9.7 Network Controller**

The winning bidder shall supply, install, and configure 1 unit of Network Controller for MPSU Bontoc. At a minimum, it must include the following specifications:

- 9.7.1 Must support 2 x 10GE optical interfaces and 10 x GE electrical interfaces, supporting up to 10 Gbit/s forwarding performance.
- 9.7.2 The proposed equipment's power consumption must not exceed 80W.
- 9.7.3 Must support management of up to 512 Access Points
- 9.7.4 Support up to 8K MAC Addresses
- 9.7.5 Support up to 4k VLANs
- 9.7.6 Support up to 4k ACLs
- 9.7.7 Support WIDS, User Isolation, SSID Hidden, SAVI, Anti-Rogue, Service Status Control, Wireless Access Control, ARP Attack Suppression, DTLS
- 9.7.8 Support L2 Roaming & L3 Roaming, 802.11k/v Fast Roaming, PMK Caching
- 9.7.9 Support WPA-PSK, WPA-802.1X, WPA2-PSK, WPA2-802.1X, WPA3-PSK, WPA3-802.1X, Portal Authentication (External Portal, Local Portal, MAC Authentication, No-perception Authentication.), Portal URL Redirection, Portal Server Escape
- 9.7.10 Support 1+1 Backup, 1:1 Backup, HAP (Hybrid Access Point, AP Escape), Uplink Integrity Detection, Uplink Track Check, Wireless-related Configuration Synchronization

- 9.7.11 Must have the necessary licenses for management of all network appliances managed by the network controller.
- 9.7.12 Support smart management capabilities include automatic software upgrades, configuration delivery, and SNMP, SDN, Cloud management for monitored APs.

## **9.8 Out-Of-Band Switch**

The winning bidder shall supply, install, and configure 1 unit of Network Controller for MPSU Bontoc. At a minimum, it must include the following specifications:

- 9.8.1 Must support 48 x 10/100/1000Base-T ports, 4 x 1 GE SFP+ ports.
- 9.8.2 Must have dual fixed power supply
- 9.8.3 The proposed equipment's typical power consumption can't exceed 60W.
- 9.8.4 The proposed equipment must have switching capacity of minimum 104Gbps and forwarding performance of 78Mpps.
- 9.8.5 Support minimum 32K MAC address entries.
- 9.8.6 Support minimum 4K of IPv4 and 1K IPv6 host route.
- 9.8.7 Supports up to 4K VLANs
- 9.8.8 Must support ULPP, Monitor Link, VRRP, VRRPv3, VBRP, BFD.
- 9.8.9 Must support H-VST, M-VST.

## **9.9 Network Management System**

The winning bidder shall supply, install, and configure 1 set of Network Management System for MPSU Bontoc. At a minimum, it must include the following specifications:

- 9.9.1 Support Zero Trust Network Security
- 9.9.2 Support Multi-factor Access Policy Control
- 9.9.3 Support for 802.1x, MAC authentication, and portal among various authentication methods to achieve more secure and detailed login control.
- 9.9.4 Support Policy Following: Regardless of changes in the office location, the access control policies remain consistent.
- 9.9.5 Support Dynamic Policy Support: User access control policies can adapt flexibly despite changes in the office location.
- 9.9.6 Software-Defined Access Control based on a unified identity engine and a unified policy engine to determine a user's policies from multiple

dimensions.

- 9.9.7 Integration with Traditional Security to fully accommodate traditional security networks.
- 9.9.8 Network Escape: In case of controller anomalies, the forwarding path can be dynamically adjusted according to real-time network conditions to ensure orderly traffic forwarding.
- 9.9.9 Underlay Link Failure Detection: By sending test messages to detect link connectivity and notifying network administrators promptly upon failures.
- 9.9.10 Overlay Link Failure Detection: Providing tools for overlay network troubleshooting, accurately locating node and link failures, and ensuring precise recovery from network outages.
- 9.9.11 Zero-Touch Provisioning: Support for plug-and-play deployment, where devices are immediately operational upon connection.
- 9.9.12 Service Orchestration via a Jigsaw Approach: Based on users, resources, and policies, orchestrate network services. The controller automatically recognizes the orchestration language, translates it into device language, and automatically distributes it to the corresponding devices for rapid service activation.
- 9.9.13 One-Click Replacement: Support for quick and efficient substitution of malfunctioning equipment.
- 9.9.14 Scheduled Firmware Upgrade/Configuration Backup: Capability to schedule firmware updates and back up configurations systematically.
- 9.9.15 Automatic Network Topology Discovery: Automatically detect network topology and map device interconnections within the network topology.
- 9.9.16 Port Traffic Statistics and Output: Support for monitoring and displaying real-time traffic on ports.
- 9.9.17 IP Resource Management: Capabilities for managing and recycling IP addresses.
- 9.9.18 Large Screen Display: Support for displaying geographic locations of devices, network TOPO, OVERLAY topo, device status, traffic, and other system monitoring components.
- 9.9.19 1 Unit Hardware Server : General-purpose 2U rack server, equipped with 2 × processors, 8 cores/16 threads per processor, up to 3.0 GHz, 64 GB memory, 3 × 1.8 TB enterprise high-performance hard drives, 2 × 1GbE electrical ports, 2 × 10GbE optical ports, and redundant dual power supplies.

## **9.10 University Internet**

Winning bidder shall provide internet subscription for the MPSU Bontoc with 1 Gbps speed for 1 year.

## **10 Virtualized Infrastructure**

The winning bidder shall provide virtualized infrastructure for the university applications and other essential IT systems, and database.

### **10.1 Server Switch**

The winning bidder shall supply 2 Leaf switch where the server computers will be directly connected and 2 Spine switch for MPSU Bontoc. It shall include 56 pcs SR transceivers and services for configuration and integration.

#### **10.1.1 Interface**

10.1.1.1 The proposed equipment shall have at least the following specifications:

10.1.1.1.1 24\*10Gigabit SFP+ optical ports

10.1.1.1.2 2\*40G QSFP+ optical ports

#### **10.1.2 Management Port**

10.1.2.1 The proposed equipment shall have console port and 1 manage port.

#### **10.1.3 Working Mode**

10.1.3.1 The proposed equipment shall support standalone with Web GUI management and controller-based management.

#### **10.1.4 Capability**

10.1.4.1 The proposed equipment should have switching capacity of at least 2.56Tbps.

10.1.4.2 The proposed equipment shall have packet forwarding of at least 720Mpps

#### **10.1.5 ACL**

10.1.5.1 The proposed equipment shall support ACL policies based on single-port and aggregation of interfaces.

10.1.5.2 The proposed equipment shall support ACL policies based on source IP address and MAC address.

10.1.5.3 The proposed equipment shall support ACL policies

based on protocols (OSPF, UDP, ARP).

10.1.5.4 The proposed equipment shall support time-based ACL policies.

10.1.5.5 The proposed equipment shall support 802.1p, IP and service level, DSCP priority settings.

#### 10.1.6 QoS

10.1.6.1 The proposed equipment shall support traffic shaping; packet forwarding rate setting based on the outbound and inbound directions of switch ports.

10.1.6.2 The proposed equipment shall support COS and DSCP priority mapping based on switch groups

10.1.6.3 The proposed equipment shall support congestion management that supports multiple scheduling modes to implement traffic based on packet or port priority.

#### 10.1.7 Traffic Mirror

10.1.7.1 The proposed equipment shall support port mirroring and redirection.

#### 10.1.8 DHCP

10.1.8.1 The proposed equipment shall support DHCP snooping, DHCP server

#### 10.1.9 Spanning-tree

10.1.9.1 The proposed equipment shall support Spanning tree protocol (STP, RSTP, MSTP)

#### 10.1.10 Multicast

10.1.10.1 The proposed equipment shall support IGMP v1/v2/v3 Snooping

#### 10.1.11 VLAN

10.1.11.1 The proposed equipment shall support 4,000 VLAN

#### 10.1.12 MAC

10.1.12.1 The proposed equipment shall support 32,000 MAC address

10.1.12.2 The proposed equipment shall support MAC address dynamic learning

10.1.12.3 The proposed equipment shall support MAC address filtering

10.1.12.4 The proposed equipment shall support MAC address learning limit

10.1.13 Link Aggregation

10.1.13.1 The proposed equipment shall support link aggregation

10.1.14 M-LAG

10.1.14.1 The proposed equipment shall support M-LAG technology, cross device link aggregation

10.1.15 Layer 3 function

10.1.15.1 The proposed equipment shall have layer 3 routing protocols such as static routing, RIP, OSPF, VRRP

10.1.16 Traffic security

10.1.16.1 The proposed equipment shall support east-west traffic security with policies based on area or user role, and prevent the virus spread within intranet

10.1.17 Smart network topology

10.1.17.1 The proposed equipment shall support to show topology in the software controller, configuration and status checking can be done via the clicking the topology.

10.1.18 One-click replacement

10.1.18.1 The proposed equipment shall support the replacement by one click on the controller platform to replace the defective device

10.1.19 Power Supply

10.1.19.1 The proposed equipment shall support dual power supply

10.1.20 Accessories

10.1.20.1 The proposed equipment shall include 2\*3meter 40G QSFP+ Active Optical Module (AOC)

10.1.21 Service

10.1.21.1 The vendor should provide the lifetime remote technical support for free.

10.1.22 Brand Requirement

10.1.22.1 The proposed equipment manufacturer shall have CMMI5 certificate to ensure the maturity of the product software

10.1.22.2 In order to ensure compatibility and unified management, the switch of this bidding is required to be the same brand as

controller.

#### 10.1.23 56 units of Short Range 10G Transceivers

### 10.2 Compute Nodes

The winning bidder shall supply 4 units of rack mounted HCI Servers for MPSU Bontoc. It shall include 56 pcs SR transceivers and services for configuration and integration.

#### 10.2.1 Hardware

10.2.1.1 At least a 2 x Intel Xeon Gold processor

10.2.1.2 At least a 24 Core per processor

10.2.1.3 At least a 24 x 32G DDR4 RDIMM or similar type or equivalent per node.

10.2.1.4 4 x Port 10GbE (SFP+)

10.2.1.5 2 x 480 GB system disk per node

10.2.1.6 Atleast 30 TB total storage capacity for the HCI stack

10.2.1.7 Redundant Power Supply

#### 10.2.2 Software

##### 10.2.2.1 Technology

10.2.2.1.1 Hyper-Converged Infra (HCI) is a software-defined IT infrastructure that virtualizes all the elements of conventional “hardware-defined” systems. HCI includes, at a minimum, virtualized computing (hypervisor) and virtualized SAN (software-defined storage). The HCI must be also capable and ready for network virtualization, network virtual security (Virtual Firewall, Bandwidth Manager etc.) or virtual Load balancing.

10.2.2.1.2 The HCI solution should start with minimum two nodes, and still expandable from two nodes to more nodes directly without redo of implementation or reinitialization of HCI.

10.2.2.1.3 The management platform is integrated and distributed, not relied on a certain virtual machine or physical machine, which is more reliable.

- 10.2.2.1.4 Do not require installing additional management software after deployment of the hypervisor to achieve basic web-based access to GUI, granular management and easy operation.
- 10.2.2.1.5 The crucial components for virtualization of compute, storage, networking, network functions, application firewall, application delivery controller, are provided by the same vendor, to ensure scalability and compatibility
- 10.2.2.1.6 Support correlated security service with intelligent threat detection and response platform to automatically take actions (such as quarantine VM by distributed firewall, take snapshot for VM, etc.,) against malicious activities that are detected by the security platform.

### 10.2.3 Compute Virtualization

- 10.2.3.1 Should have High-Availability. In case host fails, all the VMs running on that host can be recovered to another clustered host to ensure business continuity.
- 10.2.3.2 Backup is built-in by default and support agent-less incremental VM-level backup. For Windows VMs, filelevel recovery must be supported.
- 10.2.3.3 Should have built-in back-up and support agent-less incremental VM-level back-up. For Windows VMs, file level recovery must be supported without using 3rd Party solutions.
- 10.2.3.4 Support snapshot consistent group and scheduled snapshots.
- 10.2.3.5 Able to evaluate performance of virtual machines and hot-add resources (vCPU and vRAM) when they are running out of CPU or memory, minimizing business downtime.
- 10.2.3.6 Must be ready support module Activated CDP
- 10.2.3.7 (Continues Data Protection) capable of recording VMs' IOs at an interval as minimum as 1 second, data can be restored at any point of time in the past 3 days for both clusters.
- 10.2.3.8 AI-Enhanced database performance optimization with built-in self-adaptive performance optimization engine.
- 10.2.3.9 Support host health monitoring, when a host is deemed

10.2.3.10 unhealthy, it will be put in an unhealthy host list, VM placement and HA failover will avoid using the unhealthy host as a destination. When the host is back to normal, it can be taken out of the unhealthy host list automatically.

#### 10.2.4 Storage Virtualization

10.2.4.1 Support striping function, and support setting different number of strips in units of virtual disks.

10.2.4.2 Support data reconstruction priority adjustment, users able to view the data reconstruction task list information and can click the priority in the operation to prioritize data reconstruction.

10.2.4.3 A full copy of VM's data should be existed on the node where the VM is running on to facilitate faster read and write.

10.2.4.4 Support striping function, and support setting different number of strips in units of virtual disks.

10.2.4.5 Support disk bad sector prediction, scanning and repair to maximize data security.

10.2.4.6 Support storage capacity prediction based on historical usage statistics and consumption behavior.

10.2.4.7 Support disk remaining lifecycle prediction.

#### 10.2.5 Network Virtualization

10.2.5.1 Natively Support deploying virtual routers, virtual switches and firewalls.

10.2.5.2 Built-in distributed firewall to apply granular access control policy between VMs, securing east-west traffic (also known as Micro-segmentation).

10.2.5.3 The virtual router supports high availability. A failed virtual router can be automatically recovered upon host failure, to ensure high availability of routing service.

10.2.5.4 Visualized Network topology can be completed simply by dragging objects and drawing connections via a visualized web-based management panel

##### 10.2.5.4.1 CDP Function

10.2.5.4.1.1 CDP must support recording VMs' IOs at an interval as minimum as 1 second, data can

be restored at any point of time in the past 3 days.

10.2.5.4.1.2 CDP must be integrated without additional 3rd party software.

10.2.5.4.1.3 The CDP must be agent-less to avoid any negative

impact on VMs' stability and performance.

10.2.5.4.1.4 Support fast browsing files from CDP backups, able to fast retrieve data or files from CDP backups.

#### 10.2.5.5 Warranty and support

10.2.5.5.1 At least three (3) years software license subscription & upgrade, and technical support 7\*24.

10.2.5.5.2 Vendor must have direct local support in the Philippines.

10.2.5.6 Must include RHEL license for unlimited number of virtual machines

10.2.5.7 Must include all required cables and connectors to make the servers/nodes operational

#### 10.2.5.8 Certification

10.2.5.8.1 To ensure the maturity of Hyper-converged Infrastructure solution, the vendor must be CMMI L5 certified.

## 11 Systems

### 11.1 Administrative Systems

Winning bidder shall develop, install and configure the following systems for MPSU.

#### 11.1.1 Financial Management System

##### 11.1.1.1 General Ledger

11.1.1.1.1 Must maintain a comprehensive general ledger, including a chart of accounts.

##### 11.1.1.2 Financial Reporting

11.1.1.2.1 Must generate various financial reports, such as income statements, balance sheets, and cash flow statements.

11.1.1.3 User Access Control

11.1.1.3.1 Must implement strong access controls to protect sensitive financial information.

11.1.1.3.2 Must assign roles and permissions to different users to limit access to specific functions.

11.1.1.4 Procurement Module Vendor Management

11.1.1.4.1 Must allow for the creation and maintenance of a vendor database, including vendor information, contact details, and payment terms.

11.1.1.5 Procurement Module Purchase Order Management

11.1.1.5.1 Must track student attendance, including class attendance and event attendance.

11.1.1.5.2 Must generate attendance reports to monitor student engagement.

11.1.1.6 Financial Management

11.1.1.6.1 Must generate purchase orders, track order status, and manage purchase order approvals.

11.1.1.6.2 Must integrate with the inventory system to update stock levels upon receipt of goods.

11.1.1.7 Procurement Module Receiving and Inspection

11.1.1.7.1 Must facilitate the process of receiving goods, verifying quantities, and inspecting quality.

11.1.1.8 Procurement Module Accounts Payable

11.1.1.8.1 Must process vendor invoices, match them with purchase orders and receiving documents, and generate payment vouchers.

11.1.1.8.2 Must manage vendor payments and reconcile accounts.

11.1.1.9 Point-of-Sale (POS) Module Product and Service Catalog

11.1.1.9.1 Must maintain a comprehensive product and service catalog, including pricing, taxes, and discounts.

11.1.1.10 Point -of-Sale (POS) Module Sales Transactions

11.1.1.10.1 Must process sales transactions, including cash, credit card, and other payment methods.

11.1.1.10.2 Must generate sales receipts and invoices.

11.1.1.11 Point-of-Sale (POS) Module Inventory Management

11.1.1.11.1 Must track inventory levels, manage stock replenishment, and generate inventory reports.

11.1.1.11.2 Must integrate with the procurement module to initiate purchase orders when stock levels fall below a certain threshold.

11.1.2 Campus-wide Online Portal

11.1.2.1 Personalized Dashboard

11.1.2.1.1 Must display relevant information, such as announcements, notifications, and upcoming deadlines.

11.1.2.2 Student Services

11.1.2.2.1 Must provide access to student information systems, including academic records, course schedules, and financial aid.

11.1.2.2.2 Must enable online registration, fee payment, and other student- related transactions.

11.1.2.3 Campus News and Events

11.1.2.3.1 Must display the latest campus news, events, and announcements.

11.1.2.3.2 Must allow users to subscribe to relevant news and event notifications.

11.1.3 Executive Management System

#### 11.1.3.1 Dashboard and Key Performance Indicators (KPIs)

- 11.1.3.1.1 Must provide a centralized dashboard with real-time key performance indicators (KPIs) to track the overall performance of the institution.
- 11.1.3.1.2 Must allow for customization of dashboards to suit individual preferences and roles.

#### 11.1.3.2 Data Visualization and Reporting

- 11.1.3.2.1 Must offer powerful data visualization tools to represent complex data in easy-to-understand charts and graphs.
- 11.1.3.2.2 Must generate comprehensive reports on various aspects of the institution's operations, such as financial performance, student enrollment, and faculty productivity.

#### 11.1.3.3 Decision Support Tools

- 11.1.3.3.1 Must provide decision support tools, such as forecasting, scenario analysis, and what-if analysis, to assist in strategic planning.

#### 11.1.3.4 Collaboration Tools

- 11.1.3.4.1 Must facilitate collaboration among executives and other stakeholders through features like document sharing, messaging, and video conferencing.

#### 11.1.3.5 Security and Access Control

- 11.1.3.5.1 Must implement robust security measures to protect sensitive information and ensure data privacy.
- 11.1.3.5.2 Must provide role-based access control to limit access to authorized users.

#### 11.1.3.6 Attendance Management

- 11.1.3.6.1 Must track student attendance, including class attendance and event attendance.
- 11.1.3.6.2 Must generate attendance reports to monitor student engagement.

#### 11.1.3.7 Integration with Other Systems

- 11.1.3.7.1 Must integrate with other campus systems, such as the SIS, HRMS, and Financial System, to provide a unified view of institutional data.

## **11.2 Educational Systems**

Winning bidder shall develop, install and configure the following systems for MPSU.

### **11.2.1 Learning Management System**

#### **11.2.1.1 Course Management**

11.2.1.1.1 Must allow instructors to create and manage online courses, including organizing course content, setting deadlines, and assigning grades.

11.2.1.1.2 Must support various content formats, such as text, images, videos, and multimedia files.

#### **11.2.1.2 Student Enrollment**

11.2.1.2.1 Must allow students to enroll in courses and access course materials.

#### **11.2.1.3 Communication Tools**

11.2.1.3.1 Must provide tools for communication between instructors and students.

#### **11.2.1.4 Assessment Tools**

11.2.1.4.1 Must allow instructors to create and administer various types of assessments, including quizzes, exams, and assignments.

11.2.1.4.2 Must provide automated grading and feedback features.

#### **11.2.1.5 Content Delivery**

11.2.1.5.1 Must support various content delivery methods, such as streaming video, downloading files, and online lectures.

#### **11.2.1.6 Progress Tracking**

11.2.1.6.1 Must track student progress and provide timely feedback on assignments and assessments.

11.2.1.6.2 Must generate reports on student performance and course completion rates.

## **12 E-Classrooms**

The winning bidder shall develop 27 e-classrooms for MPSU Bontoc. Each e-classroom should include quantities based on the specifications below:

- 12.1** Must include 1-unit Interactive Display of at least 75” with the specifications below.
  - 12.1.1 CPU: 8 cores; CPU Frequency: 2.4 GHz
  - 12.1.2 Operating System: Android 15
  - 12.1.3 RAM: 8 GB; Internal Storage: 128 GB
  - 12.1.4 Screen Size: 75 inches; Aspect Ratio: 16:9; Resolution: 3840 x 2160 pixels
  - 12.1.5 Brightness: 400 cd/m<sup>2</sup> (typical); Color Gamut: 90% NTSC; Color Accuracy:  $\Delta E \leq 1.5$
  - 12.1.6 Refresh Rate: 60 Hz; Panel Response Time: 8 ms; Display Lifespan: At least 50,000 hours
  - 12.1.7 Touch Technology: Infrared; Touch Points: 64 under Android and 64 under Windows
  - 12.1.8 Touch Response Time: No more than 1.67 ms; Touch Resolution: 32768 x 32768
  - 12.1.9 Writing Functions: Finger and pen input, dual-color writing, multi-touch, palm erasing and palm rejection; Protective Glass: 3.2 mm anti-glare tempered glass with surface hardness of at least 9H
  - 12.1.10 Whiteboard Functions: Electronic whiteboard, text and drawing recognition, and pen-lift activation of annotation and whiteboard functions
  - 12.1.11 Applications: Preinstalled Google Suite, installation of Android applications through the Play Store, Office document support and multimedia playback
  - 12.1.12 Wireless Screen Sharing: One-tap casting from smartphones, computers and tablets, with multi-screen display
  - 12.1.13 NFC: Supports quick unlocking
  - 12.1.14 Built-in Speakers: 4 speakers with 2.2-channel audio; Speaker Power: 2 x 10 W + 2 x 20 W
  - 12.1.15 Microphone Array: 16 elements; Pickup Distance: 0-12 m; Audio Processing: Automatic gain control, echo cancellation and intelligent noise filtering
  - 12.1.16 Front Ports

12.1.16.1 USB Type-A: 2 x USB 3.2 Gen1 ports

12.1.16.2 HDMI Input: 1 port

12.1.16.3 USB Type-C Input: 1 port with 100 W charging, data transfer, LAN and BYOD

12.1.16.4 Touch USB: 1 x USB 2.0 Type-B port

#### 12.1.17 Rear Ports

12.1.17.1 HDMI Input: 3 ports supporting 4K at 60 Hz

12.1.17.2 HDMI Output: 1 port supporting 4K at 60 Hz

12.1.17.3 DisplayPort Input: 1 port supporting 4K at 60 Hz

12.1.17.4 USB Type-A: 1 x USB 2.0 Android port and 2 x USB 3.2 Gen1 Follow ports

12.1.17.5 USB Type-C Input: 1 port with 15 W charging and data transfer

12.1.17.6 USB Type-C Output: 1 port supporting 4K at 60 Hz

12.1.17.7 Touch USB: 3 x USB 2.0 Type-B ports

12.1.17.8 VGA Input: 1 port; VGA Audio Input: 1 x 3.5 mm port

12.1.17.9 Analog Audio: 1 x 3.5 mm line input and 1 x 3.5 mm line output; Digital Audio Output: 1 x SPDIF

12.1.17.10 Control: 1 x RS-232; Memory Card: 1 x microSD slot

12.1.17.11 Ethernet: 1 x RJ45 input and 1 x RJ45 output, each supporting 10/100/1000 Mbps

12.1.18 Wi-Fi: Wi-Fi 6 with one station and one access point, supporting 2.4 GHz and 5 GHz; Bluetooth: Version 5.4

12.1.19 Input Voltage Range: 100-240 VAC; Power Frequency: 50/60 Hz; Power Consumption: 110 W (basic), 330 W (maximum); Standby Power Consumption: No more than 0.5 W

12.1.20 Operating Temperature: 0 °C to +40 °C; Operating Humidity: 10%-90% RH, non-condensing

12.1.21 Installation: Wall mount or mobile bracket; Mounting-hole Distance: 600 x 400 mm

12.1.22 Product Dimensions: 1660-1680 x 110-120 x 1030-1050 mm (L x W x H); Net Weight: 44-45 kg

12.1.23 Mobile Stand

12.1.23.1 Design: Modular mobile stand for interactive whiteboards

12.1.23.2 Applicable subject to mounting-interface compatibility

12.1.23.3 Maximum Load: 125 kg

12.1.23.4 Assembled Dimensions: 1150-1170 x 680-700 x 1550-1570 mm (L x W x H)

12.1.23.5 Net Weight: 14-16 kg

12.1.23.6 Operating Temperature: -5 °C to +45 °C

#### 12.1.24 Wireless Screen Sharing Dongle

12.1.24.1 Output Resolution: 720 x 480, 720 x 576, 1280 x 720, 1920 x 1080 or 3840 x 2160 pixels

12.1.24.2 Input Video Formats: 480p, 576p, 720p, 1080p and 4K; Supported PC Timings: 640 x 480, 800 x 600, 1024 x 768, 1280 x 720, 1920 x 1080 and 3840 x 2160

12.1.24.3 Source Interface: Full-feature USB Type-C with DisplayPort Alt Mode

12.1.24.4 Operating System Support: Windows 7/8.1/10/11, macOS, Chrome OS, Linux and Android, with a full-feature USB Type-C interface

12.1.24.5 Screen Sharing: Push-button projection after pairing; Software and Drivers: No installation required on the source device

12.1.24.6 Wireless Protocol: IEEE 802.11a/g/n; Wireless Data Rate: 54 Mbps

12.1.24.7 Frequency Bands: 2.4 GHz and 5 GHz; Preferred Band: 5 GHz

12.1.24.8 Transmission Distance: Up to 15 m between transmitter and receiver

12.1.24.9 Frame Rate: Up to 60 fps at Full HD, depending on the operating environment

12.1.24.10 Touch Control Back: Supports 10 touch points

12.1.24.11 Encryption: CCMP; Authentication: WPA2-PSK and WPA2-Enterprise

12.1.24.12 Input Voltage: 5 VDC through USB Type-C; Power Consumption: 2.5 W (average); Current Consumption: 0.9 A (maximum)

12.1.24.13 Operating Temperature: 0 °C to +40 °C; Operating Humidity: 0%-80% RH, non-condensing

12.1.24.14 Product Dimensions: 170-180 x 55-60 x 15-20 mm

12.1.24.15 Net Weight: 75-85 g

**12.2** Must include 1-unit Dual-Sensor Network PTZ Camera with the specifications below.

12.2.1 Image Sensors: 1/2.8-inch CMOS overview sensor and 1/1.8-inch CMOS detail sensor; Effective Pixels: 4 MP per sensor

12.2.2 Maximum Resolution: Overview 2560 x 1440 pixels; detail 2688 x 1520 pixels

12.2.3 Minimum Color Illumination: Overview 0.005 lux at F2.2; detail 0.001 lux at F1.7; Test Condition: 30 IRE

12.2.4 Focal Length: Overview 2.2 mm; detail 8-32 mm; Optical Zoom: 4x

12.2.5 Horizontal Field of View: Overview 122°; detail 15°-42°

12.2.6 Pan Range: 0°-180°, non-continuous; Tilt Range: -10° to +90°; Presets: 300

12.2.7 Auto Tracking: Supported; Standing-Up Detection: Detects a person standing up and zooms in

12.2.8 Classroom Behavior Analysis: 7 activities covering reading and writing, standing up, hand raising, active listening, leaning on the desk, phone use and turning around; Attendance Management: Supported

12.2.9 Examination Behavior Analysis: 8 activities covering writing, hand raising, picking up objects, turning around or looking back, standing up, placing hands under the desk while lowering the head, passing objects and phone use

12.2.10 Face Recognition: Face capture, 6 attributes, 8 expressions and face comparison; Face Databases: Up to 5; Face Comparison Capacity: 10,000 faces

12.2.11 Video Compression: H.265 and H.264; Streaming Capability: 3 streams; Maximum Frame Rate: 25/30 fps at 4 MP on both channels

12.2.12 Audio Input: 1 line-level channel; Audio Output: 1 line-level channel; Alarm Inputs: 2; Alarm Output: 1

12.2.13 Network Port: 1 x RJ-45 10/100 Mbps; Interoperability: ONVIF Profile S, ONVIF Profile G and CGI

12.2.14 Storage: MicroSD card up to 512 GB; FTP, SFTP and NAS supported

12.2.15 Power Supply: 12 VDC, 3 A; PoE: IEEE 802.3at; Power Adapter: Included

12.2.16 Power Consumption: Basic 15 W; maximum 19 W during PTZ movement

12.2.17 Operating Temperature: -10 °C to +50 °C; Operating Humidity: ≤95%

12.2.18 Ingress Protection: IP66; Transient Protection: TVS 6000 V with lightning, surge and voltage-transient resistance

12.2.19 Must be managed by Video Management System

**12.3** Must include 1-unit Recording and Broadcasting Server with the specifications below.

12.3.1 IP Camera Inputs: 6 channels; Maximum Input Bandwidth: 128 Mbps

12.3.2 Director Modes: Auto, Semi-Auto and Manual; Automatic View Switching: Teacher, student and presentation views with compatible cameras

12.3.3 Recording Modes: Film, PIP, Film + Source and PIP + Source

12.3.4 Course Scheduling: Automatic lesson recording according to the curriculum; Platform Integration: Schedule synchronization and automatic lesson-video upload

12.3.5 Recording Layouts: Multi-window layout and custom picture-in-picture

12.3.6 Video Overlays: Custom logo, time and course name

12.3.7 Audio Processing: Noise reduction and volume-gain adjustment

12.3.8 Interactive Meetings: Multi-party remote interaction; MCU Capacity: Up to 3 recording and broadcasting servers connected to one server

12.3.9 Real-Time Decoding: 2 MP, 3 MP, 5 MP, 8 MP and 12 MP video

12.3.10 Video Inputs: 4 x BNC with SDI adaptive access, 1 x HDMI and 1 x VGA

12.3.11 Encoding Capacity: 1080p at 25 fps for director, HDMI input and VGA input

12.3.12 Video Outputs: 2 x HDMI and 2 x VGA; HDMI Output 1 Maximum Resolution: 3840 x 2160 at 30 fps; Loop Outputs: 1 x HDMI and 1 x VGA

12.3.13 Audio Inputs: 2 stereo channels and 4 mono channels; Audio Outputs: 3 stereo channels

12.3.14 Video Compression: H.265 and H.264; Audio Compression: OPUS

12.3.15 Storage Interfaces: 2 x SATA 3.0; Maximum Disk Capacity: 16 TB per disk

12.3.16 Network Ports: 2 x RJ-45 10/100/1000 Mbps; Interoperability: ONVIF Profile S, CGI and SDK

12.3.17 PoE Ports: 4 supporting IEEE 802.3af/at; Total PoE Power: 130 W; Maximum Port Power: 60 W each on ports 1-2 and 30 W each on ports

12.3.18 Playback Modes: HD and fluent; Backup Methods: Web and local;  
USB Ports: 1 x USB 2.0 and 1 x USB 3.0

12.3.19 Input Voltage Range: 100-240 VAC; Power Consumption: ≤15 W  
excluding disks and PoE loads

12.3.20 Operating Temperature: -10 °C to +55 °C; Operating Humidity: 10%-  
90% RH

12.3.21 Enterprise-grade hard drives must be included, with sufficient capacity  
to support 90 days of classroom video recording storage

**12.4** Must include 1-unit 10-Port Gigabit PoE Switch with the specifications below.

12.4.1 Switching Layer: Layer 2; Switching Capacity: 20 Gbps; Packet  
Forwarding Rate: 14.88 Mpps

12.4.2 PoE Ports: 8 x RJ-45 10/100/1000 Mbps; Uplink Ports: 2 x RJ-45  
10/100/1000 Mbps

12.4.3 Packet Buffer: 4 Mbit; MAC Address Table: 8K entries; Jumbo Frame  
Size: 15,360 bytes

12.4.4 PoE Protocols: IEEE 802.3af and IEEE 802.3at on all PoE ports;  
Additional Power Mode: Hi-PoE on port 1

12.4.5 Total PoE Budget: 60 W; Maximum PoE Output: 60 W on port 1 and  
30 W per port on ports 2-8

12.4.6 PoE Power Management: Consumption monitoring, PoE on/off control  
and overload shutdown

12.4.7 VLAN: IEEE 802.1Q; Supported VLANs: 32

12.4.8 Link Aggregation: Static aggregation supported

**12.5** Must include 1-unit Wireless Access Point with the specifications below.

12.5.1 The AP should support IEEE 802.11a/b/g/n/ac/ax/be

12.5.2 The AP should support triple radios, 2.4GHz (2x2 MU-MIMO and 2  
spatial streams) + 5GHz (2x2 MU-MIMO and 2 spatial streams) +  
6GHz (2x2 MU-MIMO and 2 spatial streams).

12.5.3 The AP should support 1x 1/2.5/5GE Base-T + 1x GE Base-T

12.5.4 The AP should support 1x 10/100/100Mbps Base-T port with POE out.

12.5.5 The AP should support Bluetooth 5.1 and support Bluetooth serial port  
for remote maintenance.

12.5.6 The AP should support minimum 16 SSIDs for each radio.

12.5.7 The AP should support minimum 1000 users.

12.5.8 The AP should support built-in smart antennas.

12.5.9 The AP should support smart roaming.

12.5.10 The AP should support Transmit Power Control and Automatic Channel Scanning.

**12.6** Must include 1-unit Digital Intelligent Audio Box with the specifications below.

12.6.1 4.3 inch TFT screen, support touch operation

12.6.2 Support knob for convenient volume adjustment

12.6.3 Dual channel true diversity UHF wireless microphone operating frequency band, equipped with 2 microphones

12.6.4 Supports storing 2 wireless handheld microphones, with built-in charging and one click frequency matching function

12.6.5 Support password verification to use the microphones

12.6.6 Support adjusting microphone and speaker treble, midrange, and bass parameters

12.6.7 Support insert USB disk to play mp3 audio and record microphone voice

12.6.8 Support connecting smart whiteboard through USB Type-C interface to achieve audio input, audio output, and page flipping control functions

12.6.9 Audio input: 1\*Kanon port, 4\*RCA port

12.6.10 Audio output: 2\*6.35 balanced port, 2\*RCA port

12.6.11 Support 1\*USB type-C port, 1\*USB Disk port and 1\*RS232 port

12.6.12 Support displaying the status of whether the microphone is placed in the audio box on the 4.3 inch screen

**12.7** Must include 2-unit Smart Microphone with the specifications below.

12.7.1 Screen: TFT color screen

12.7.2 Condenser microphone

12.7.3 PPT Function: Page up and Page down

12.7.4 Support 3.5mm audio input for external microphone

12.7.5 Support insert audio box and lock it

12.7.6 Charge type: Audio box auto charge or USB Type-C

12.7.7 Battery operating time: 6Hour

12.7.8 Power:3.7V 700mAh

**12.8** Must include 2-unit Wireless Ceiling Speaker with the specifications below.

12.8.1 Support 2.4G wireless receive audio and audio in port;

12.8.2 Speaker unit: 3\*3-inch full frequency unit;

12.8.3 Frequency range:100Hz~15 kHz/-10 dB;

12.8.4 Frequency response:105Hz~13kHz/+3 dB;

12.8.5 Sensitivity:93dB/1w/m;

12.8.6 Sound pressure level:110dB(Max 116dB);

12.8.7 Coverage angle:360° x 180°(H x V);

12.8.8 Rated power:40W RMS;

12.8.9 Hole dimension: Φ 255mm

12.8.10 Simply connect AC220V , no need to connect any audio cable to

**12.9** 31 units of tables with chairs

**12.10** 2 units 2.5HP Split type Air-conditioning unit

### **13 Computer Laboratory**

The winning bidder shall develop 3 computer laboratories for MPSU Bontoc. Each computer laboratory should include quantities based on the specifications below:

**13.1** Must include 1-unit Interactive Display of at least 75” with the specifications below.

13.1.1 CPU: 8 cores; CPU Frequency: 2.4 GHz

13.1.2 Operating System: Android 15

13.1.3 RAM: 8 GB; Internal Storage: 128 GB

13.1.4 Screen Size: 75 inches; Aspect Ratio: 16:9; Resolution: 3840 x 2160 pixels

13.1.5 Brightness: 400 cd/m<sup>2</sup> (typical); Color Gamut: 90% NTSC; Color

Accuracy:  $\Delta E \leq 1.5$

13.1.6 Refresh Rate: 60 Hz; Panel Response Time: 8 ms; Display Lifespan: At least 50,000 hours

13.1.7 Touch Technology: Infrared; Touch Points: 64 under Android and 64 under Windows

13.1.8 Touch Response Time: No more than 1.67 ms; Touch Resolution: 32768 x 32768

13.1.9 Writing Functions: Finger and pen input, dual-color writing, multi-touch, palm erasing and palm rejection; Protective Glass: 3.2 mm anti-glare tempered glass with surface hardness of at least 9H

13.1.10 Whiteboard Functions: Electronic whiteboard, text and drawing recognition, and pen-lift activation of annotation and whiteboard functions

13.1.11 Applications: Preinstalled Google Suite, installation of Android applications through the Play Store, Office document support and multimedia playback

13.1.12 Wireless Screen Sharing: One-tap casting from smartphones, computers and tablets, with multi-screen display

13.1.13 NFC: Supports quick unlocking

13.1.14 Built-in Speakers: 4 speakers with 2.2-channel audio; Speaker Power: 2 x 10 W + 2 x 20 W

13.1.15 Microphone Array: 16 elements; Pickup Distance: 0-12 m; Audio Processing: Automatic gain control, echo cancellation and intelligent noise filtering

13.1.16 Front Ports

13.1.16.1 USB Type-A: 2 x USB 3.2 Gen1 ports

13.1.16.2 HDMI Input: 1 port

13.1.16.3 USB Type-C Input: 1 port with 100 W charging, data transfer, LAN and BYOD

13.1.16.4 Touch USB: 1 x USB 2.0 Type-B port

13.1.17 Rear Ports

13.1.17.1 HDMI Input: 3 ports supporting 4K at 60 Hz

13.1.17.2 HDMI Output: 1 port supporting 4K at 60 Hz

13.1.17.3 DisplayPort Input: 1 port supporting 4K at 60 Hz

13.1.17.4 USB Type-A: 1 x USB 2.0 Android port and 2 x USB 3.2

## Gen1 Follow ports

- 13.1.17.5 USB Type-C Input: 1 port with 15 W charging and data transfer
- 13.1.17.6 USB Type-C Output: 1 port supporting 4K at 60 Hz
- 13.1.17.7 Touch USB: 3 x USB 2.0 Type-B ports
- 13.1.17.8 VGA Input: 1 port; VGA Audio Input: 1 x 3.5 mm port
- 13.1.17.9 Analog Audio: 1 x 3.5 mm line input and 1 x 3.5 mm line output; Digital Audio Output: 1 x SPDIF
- 13.1.17.10 Control: 1 x RS-232; Memory Card: 1 x microSD slot
- 13.1.17.11 Ethernet: 1 x RJ45 input and 1 x RJ45 output, each supporting 10/100/1000 Mbps
- 13.1.18 Wi-Fi: Wi-Fi 6 with one station and one access point, supporting 2.4 GHz and 5 GHz; Bluetooth: Version 5.4
- 13.1.19 Input Voltage Range: 100-240 VAC; Power Frequency: 50/60 Hz; Power Consumption: 110 W (basic), 330 W (maximum); Standby Power Consumption: No more than 0.5 W
- 13.1.20 Operating Temperature: 0 °C to +40 °C; Operating Humidity: 10%-90% RH, non-condensing
- 13.1.21 Installation: Wall mount or mobile bracket; Mounting-hole Distance: 600 x 400 mm
- 13.1.22 Product Dimensions: 1660-1680 x 110-120 x 1030-1050 mm (L x W x H); Net Weight: 44-45 kg
- 13.1.23 Mobile Stand
  - 13.1.23.1 Design: Modular mobile stand for interactive whiteboards
  - 13.1.23.2 Applicable subject to mounting-interface compatibility
  - 13.1.23.3 Maximum Load: 125 kg
  - 13.1.23.4 Assembled Dimensions: 1150-1170 x 680-700 x 1550-1570 mm (L x W x H)
  - 13.1.23.5 Net Weight: 14-16 kg
  - 13.1.23.6 Operating Temperature: -5 °C to +45 °C
- 13.1.24 Wireless Screen Sharing Dongle
  - 13.1.24.1 Output Resolution: 720 x 480, 720 x 576, 1280 x 720, 1920 x 1080 or 3840 x 2160 pixels
  - 13.1.24.2 Input Video Formats: 480p, 576p, 720p, 1080p and 4K;

Supported PC Timings: 640 x 480, 800 x 600, 1024 x 768, 1280 x 720, 1920 x 1080 and 3840 x 2160

13.1.24.3 Source Interface: Full-feature USB Type-C with DisplayPort Alt Mode

13.1.24.4 Operating System Support: Windows 7/8.1/10/11, macOS, Chrome OS, Linux and Android, with a full-feature USB Type-C interface

13.1.24.5 Screen Sharing: Push-button projection after pairing; Software and Drivers: No installation required on the source device

13.1.24.6 Wireless Protocol: IEEE 802.11a/g/n; Wireless Data Rate: 54 Mbps

13.1.24.7 Frequency Bands: 2.4 GHz and 5 GHz; Preferred Band: 5 GHz

13.1.24.8 Transmission Distance: Up to 15 m between transmitter and receiver

13.1.24.9 Frame Rate: Up to 60 fps at Full HD, depending on the operating environment

13.1.24.10 Touch Control Back: Supports 10 touch points

13.1.24.11 Encryption: CCMP; Authentication: WPA2-PSK and WPA2-Enterprise

13.1.24.12 Input Voltage: 5 VDC through USB Type-C; Power Consumption: 2.5 W (average); Current Consumption: 0.9 A (maximum)

13.1.24.13 Operating Temperature: 0 °C to +40 °C; Operating Humidity: 0%-80% RH, non-condensing

13.1.24.14 Product Dimensions: 170-180 x 55-60 x 15-20 mm

13.1.24.15 Net Weight: 75-85 g

**13.2** Must include 1-unit Dual-Sensor Network PTZ Camera with the specifications below.

13.2.1 Image Sensors: 1/2.8-inch CMOS overview sensor and 1/1.8-inch CMOS detail sensor; Effective Pixels: 4 MP per sensor

13.2.2 Maximum Resolution: Overview 2560 x 1440 pixels; detail 2688 x 1520 pixels

13.2.3 Minimum Color Illumination: Overview 0.005 lux at F2.2; detail 0.001 lux at F1.7; Test Condition: 30 IRE

13.2.4 Focal Length: Overview 2.2 mm; detail 8-32 mm; Optical Zoom: 4x

- 13.2.5 Horizontal Field of View: Overview 122°; detail 15°-42°
- 13.2.6 Pan Range: 0°-180°, non-continuous; Tilt Range: -10° to +90°; Presets: 300
- 13.2.7 Auto Tracking: Supported; Standing-Up Detection: Detects a person standing up and zooms in
- 13.2.8 Classroom Behavior Analysis: 7 activities covering reading and writing, standing up, hand raising, active listening, leaning on the desk, phone use and turning around; Attendance Management: Supported
- 13.2.9 Examination Behavior Analysis: 8 activities covering writing, hand raising, picking up objects, turning around or looking back, standing up, placing hands under the desk while lowering the head, passing objects and phone use
- 13.2.10 Face Recognition: Face capture, 6 attributes, 8 expressions and face comparison; Face Databases: Up to 5; Face Comparison Capacity: 10,000 faces
- 13.2.11 Video Compression: H.265 and H.264; Streaming Capability: 3 streams; Maximum Frame Rate: 25/30 fps at 4 MP on both channels
- 13.2.12 Audio Input: 1 line-level channel; Audio Output: 1 line-level channel; Alarm Inputs: 2; Alarm Output: 1
- 13.2.13 Network Port: 1 x RJ-45 10/100 Mbps; Interoperability: ONVIF Profile S, ONVIF Profile G and CGI
- 13.2.14 Storage: MicroSD card up to 512 GB; FTP, SFTP and NAS supported
- 13.2.15 Power Supply: 12 VDC, 3 A; PoE: IEEE 802.3at; Power Adapter: Included
- 13.2.16 Power Consumption: Basic 15 W; maximum 19 W during PTZ movement
- 13.2.17 Operating Temperature: -10 °C to +50 °C; Operating Humidity: ≤95%
- 13.2.18 Ingress Protection: IP66; Transient Protection: TVS 6000 V with lightning, surge and voltage-transient resistance
- 13.2.19 Must be managed by Video Management System

**13.3** Must include 1-unit Recording and Broadcasting Server with the specifications below.

- 13.3.1 IP Camera Inputs: 6 channels; Maximum Input Bandwidth: 128 Mbps
- 13.3.2 Director Modes: Auto, Semi-Auto and Manual; Automatic View Switching: Teacher, student and presentation views with compatible cameras
- 13.3.3 Recording Modes: Film, PIP, Film + Source and PIP + Source

- 13.3.4 Course Scheduling: Automatic lesson recording according to the curriculum; Platform Integration: Schedule synchronization and automatic lesson-video upload
- 13.3.5 Recording Layouts: Multi-window layout and custom picture-in-picture
- 13.3.6 Video Overlays: Custom logo, time and course name
- 13.3.7 Audio Processing: Noise reduction and volume-gain adjustment
- 13.3.8 Interactive Meetings: Multi-party remote interaction; MCU Capacity: Up to 3 recording and broadcasting servers connected to one server
- 13.3.9 Real-Time Decoding: 2 MP, 3 MP, 5 MP, 8 MP and 12 MP video
- 13.3.10 Video Inputs: 4 x BNC with SDI adaptive access, 1 x HDMI and 1 x VGA
- 13.3.11 Encoding Capacity: 1080p at 25 fps for director, HDMI input and VGA input
- 13.3.12 Video Outputs: 2 x HDMI and 2 x VGA; HDMI Output 1 Maximum Resolution: 3840 x 2160 at 30 fps; Loop Outputs: 1 x HDMI and 1 x VGA
- 13.3.13 Audio Inputs: 2 stereo channels and 4 mono channels; Audio Outputs: 3 stereo channels
- 13.3.14 Video Compression: H.265 and H.264; Audio Compression: OPUS
- 13.3.15 Storage Interfaces: 2 x SATA 3.0; Maximum Disk Capacity: 16 TB per disk
- 13.3.16 Network Ports: 2 x RJ-45 10/100/1000 Mbps; Interoperability: ONVIF Profile S, CGI and SDK
- 13.3.17 PoE Ports: 4 supporting IEEE 802.3af/at; Total PoE Power: 130 W; Maximum Port Power: 60 W each on ports 1-2 and 30 W each on ports 3-4
- 13.3.18 Playback Modes: HD and fluent; Backup Methods: Web and local; USB Ports: 1 x USB 2.0 and 1 x USB 3.0
- 13.3.19 Input Voltage Range: 100-240 VAC; Power Consumption:  $\leq 15$  W excluding disks and PoE loads
- 13.3.20 Operating Temperature: -10 °C to +55 °C; Operating Humidity: 10%-90% RH
- 13.3.21 Enterprise-grade hard drives must be included, with sufficient capacity to support 90 days of classroom video recording storage

**13.4** Must include 1-unit 10-Port Gigabit PoE Switch with the specifications below.

- 13.4.1 Switching Layer: Layer 2; Switching Capacity: 20 Gbps; Packet

Forwarding Rate: 14.88 Mpps

- 13.4.2 PoE Ports: 8 x RJ-45 10/100/1000 Mbps; Uplink Ports: 2 x RJ-45 10/100/1000 Mbps
- 13.4.3 Packet Buffer: 4 Mbit; MAC Address Table: 8K entries; Jumbo Frame Size: 15,360 bytes
- 13.4.4 PoE Protocols: IEEE 802.3af and IEEE 802.3at on all PoE ports; Additional Power Mode: Hi-PoE on port 1
- 13.4.5 Total PoE Budget: 60 W; Maximum PoE Output: 60 W on port 1 and 30 W per port on ports 2-8
- 13.4.6 PoE Power Management: Consumption monitoring, PoE on/off control and overload shutdown
- 13.4.7 VLAN: IEEE 802.1Q; Supported VLANs: 32
- 13.4.8 Link Aggregation: Static aggregation supported

**13.5** Must include 1-unit Wireless Access Point with the specifications below.

- 13.5.1 The AP should support IEEE 802.11a/b/g/n/ac/ax/be
- 13.5.2 The AP should support triple radios, 2.4GHz (2x2 MU-MIMO and 2 spatial streams) + 5GHz (2x2 MU-MIMO and 2 spatial streams) + 6GHz (2x2 MU-MIMO and 2 spatial streams).
- 13.5.3 The AP should support 1x 1/2.5/5GE Base-T + 1x GE Base-T
- 13.5.4 The AP should support 1x 10/100/100Mbps Base-T port with POE out.
- 13.5.5 The AP should support Bluetooth 5.1 and support Bluetooth serial port for remote maintenance.
- 13.5.6 The AP should support minimum 16 SSIDs for each radio.
- 13.5.7 The AP should support minimum 1000 users.
- 13.5.8 The AP should support built-in smart antennas.
- 13.5.9 The AP should support smart roaming.
- 13.5.10 The AP should support Transmit Power Control and Automatic Channel Scanning.

**13.6** Must include 1-unit Digital Intelligent Audio Box with the specifications below.

- 13.6.1 4.3 inch TFT screen, support touch operation
- 13.6.2 Support knob for convenient volume adjustment
- 13.6.3 Dual channel true diversity UHF wireless microphone operating frequency band, equipped with 2 microphones

- 13.6.4 Supports storing 2 wireless handheld microphones, with built-in charging and one click frequency matching function
- 13.6.5 Support password verification to use the microphones
- 13.6.6 Support adjusting microphone and speaker treble, midrange, and bass parameters
- 13.6.7 Support insert USB disk to play mp3 audio and record microphone voice
- 13.6.8 Support connecting smart whiteboard through USB Type-C interface to achieve audio input, audio output, and page flipping control functions
- 13.6.9 Audio input: 1\*Kanon port, 4\*RCA port
- 13.6.10 Audio output: 2\*6.35 balanced port, 2\*RCA port
- 13.6.11 Support 1\*USB type-C port, 1\*USB Disk port and 1\*RS232 port
- 13.6.12 Support displaying the status of whether the microphone is placed in the audio box on the 4.3 inch screen

**13.7** Must include 2-unit Smart Microphone with the specifications below.

- 13.7.1 Screen: TFT color screen
- 13.7.2 Condenser microphone
- 13.7.3 PPT Function: Page up and Page down
- 13.7.4 Support 3.5mm audio input for external microphone
- 13.7.5 Support insert audio box and lock it
- 13.7.6 Charge type: Audio box auto charge or USB Type-C
- 13.7.7 Battery operating time: 6Hour
- 13.7.8 Power:3.7V 700mAh

**13.8** Must include 2-unit Wireless Ceiling Speaker with the specifications below.

- 13.8.1 Support 2.4G wireless receive audio and audio in port;
- 13.8.2 Speaker unit: 3\*3-inch full frequency unit;
- 13.8.3 Frequency range:100Hz~15 kHz/-10 dB;
- 13.8.4 Frequency response:105Hz~13kHz/+3 dB;
- 13.8.5 Sensitivity:93dB/1w/m;
- 13.8.6 Sound pressure level:110dB(Max 116dB);

13.8.7 Coverage angle:360° x 180°(H x V);

13.8.8 Rated power:40W RMS;

13.8.9 Hole dimension: Φ 255mm

13.8.10 Simply connect AC220V , no need to connect any audio cable to use.

**13.9** Must include 30 sets of desktop computers with minimum specifications below.

13.9.1 CPU should be at least Intel Core Ultra 5 or equivalent

13.9.2 Minimum of 16 GB RAM

13.9.3 At least 512 GB SSD Storage

13.9.4 At least 23” Monitor size

13.9.5 With Keyboard, Mouse and built-in camera

13.9.6 Equipped with UPS

13.9.7 Windows Operating System

13.9.8 Office Productivity Software

13.9.9 Endpoint protection

**13.10** Must include 31 units of tables with chairs.

**13.11** Must include 2 units split type air-conditioning with 2.5 HP.

## **14 Auditorium**

The winning bidder shall develop 1auditorium for MPSU Bontoc. Each auditorium should include quantities based on the specifications below:

### **14.1 Video LED Wall**

The winning bidder shall supply 1-set indoor LED video wall measuring 3.6 x 2.7 m, with control equipment, spares and supporting items based on the specifications below:

14.1.1 Must include 1-set Indoor Fine Pixel Pitch LED Display with the specifications below.

14.1.1.1 Pixel Pitch: 1.6 mm or finer ( $\leq 1.6$  mm)

14.1.1.2 LED Technology: Flip COB; Pixel Configuration: 1R1G1B

14.1.1.3 Installed Display Dimensions: 3.6 x 2.7 m (W x H); Display Area: 9.72 m<sup>2</sup>

14.1.1.4 Native Display Resolution: The bidder shall state the horizontal and vertical native pixel counts resulting from the specified

overall display dimensions and pixel pitch.

14.1.1.5 Maximum Brightness: 600 nit

14.1.1.6 Viewing Angle: 160° horizontal and 160° vertical

14.1.1.7 Contrast Ratio: 10000:1; Refresh Rate: 3840 Hz

14.1.1.8 Gray Scale: 13 bits

14.1.1.9 Input Voltage Range: 110-220 VAC

14.1.1.10 Input Power Density: 350 W/m<sup>2</sup> maximum and 120 W/m<sup>2</sup> average

14.1.1.11 Installation: Wall-mounted; Maintenance: Front access

14.1.1.12 Operating Temperature: -10 to +40 °C; Operating Humidity: 10%-80% RH; Protection Rating: IP65 front and IP43 rear

14.1.2 Must include 1-unit LED Controller with the specifications below.

14.1.2.1 Loading Capacity: Up to 13 million pixels in scaling mode or 8.8 million pixels in pixel-to-pixel mode.

14.1.2.2 Video Inputs: 2 HDMI 2.0 ports and 1 HDMI 1.3 port.

14.1.2.3 LED Data Outputs: 20 Gigabit Ethernet ports and 2 optical ports at 10 Gb/s.

14.1.2.4 Control Interfaces: 1 LAN control port and 2 sensor ports.

14.1.2.5 Power Supply: 100–240 VAC, 50/60 Hz.

14.1.2.6 Power Consumption: 53.9 W.

14.1.2.7 Operating Temperature: -20°C to +50°C.

14.1.2.8 Display Compatibility: The supplied LED controller shall support the full native resolution of the proposed LED display.

14.1.3 Must include 1-unit Ambient Light Sensor with the specifications below.

14.1.3.1 Function: Ambient light sensing for automatic LED display brightness adjustment.

14.1.3.2 Illuminance Range: 0–65,535 lux.

14.1.3.3 Cable Length: 5 m.

14.1.3.4 Power Supply: 5 VDC, supplied through the sensor port.

14.1.3.5 Power Consumption: 0.45 W.

14.1.3.6 Ingress Protection: IP65.

14.1.3.7 Operating Temperature: -20°C to +70°C.

14.1.4 Must include spare parts with the specifications below.

14.1.4.1 19 x LED module

14.1.4.2 2 x Power Supply for LED display

14.1.4.3 2 x Received Card

14.1.4.4 1 x Cables and accessories

14.1.4.5 1 x General wooden box package

## **14.2 LCD Video Wall and Accessories**

The winning bidder shall supply 6-unit 55-inch LCD video wall display in a 3 x 2 arrangement, with a network video decoder and mounting and connection accessories based on the specifications below:

14.2.1 Must include 6-unit 55-inch LCD Video Wall Display with the specifications below.

14.2.1.1 Screen Size: 55 inch; Aspect Ratio: 16:9; Backlight: Direct LED

14.2.1.2 Native Resolution: 1920 x 1080 pixels

14.2.1.3 Video Wall Arrangement: 3 columns x 2 rows; 6 displays in total.

14.2.1.4 Brightness: 500 cd/m<sup>2</sup>

14.2.1.5 Static Contrast Ratio: 1200:1

14.2.1.6 Bezel-to-Bezel Width: 0.88 mm; Individual Bezel Width: 0.48 mm top/left and 0.4 mm right/bottom

14.2.1.7 Refresh Rate: 60 Hz; Response Time: 8 ms

14.2.1.8 Viewing Angle: 178° horizontal and 178° vertical

14.2.1.9 Input Ports: 2 x HDMI 2.0, 1 x DisplayPort 1.4, 1 x VGA, 1 x DVI, 1 x RS-232, 1 x IR and 1 x audio; Maximum Input Resolution: 3840 x 2160 at 60 Hz through HDMI 1 or DisplayPort

14.2.1.10 Output Ports: 1 x DisplayPort supporting 3840 x 2160 at 30 Hz, 1 x RS-232 and 1 x audio

14.2.1.11 Continuous Operation: 24 hours per day, 7 days per week; Control: RS-232 and infrared remote control

14.2.1.12 Power Supply: 100-240 VAC, 50/60 Hz

14.2.1.13 Power Consumption: 160.1 W typical, 160.5 W maximum and less than 0.5 W in standby

14.2.1.14 Operating Temperature: 0 to +50 °C; Operating Humidity: 10%-80% RH

14.2.1.15 VESA Mounting Pattern: 600 x 400 mm

14.2.1.16 Product Dimensions: 1210-1220 x 680-690 x 115-120 mm (W x H x D); Net Weight: 23-24 kg

14.2.2 Must include 1-unit Video Wall Decoder with the specifications below.

14.2.2.1 Main Processor: Embedded processor; Operating System: Embedded Linux

14.2.2.2 Video Decoding Formats: H.265, H.264, MJPEG, MPEG4, SVAC and MPEG2

14.2.2.3 Audio Decoding Formats: PCM, G711 and AAC

14.2.2.4 Decoding Capacity: 2 channels at 32 MP using H.265, 7 at 12 MP, 10 at 8 MP, 14 at 6 MP, 18 at 5 MP, 21 at 4 MP, 28 at 3 MP, 43 at 1080p or 108 at D1, each at 25 fps

14.2.2.5 Video Inputs: 2 x HDMI; Simultaneous Input Capability: One 3840 x 2160 input at 60 Hz and one at 30 Hz

14.2.2.6 Video Outputs: 6 x HDMI

14.2.2.7 Output Resolution: 1920 x 1080 at 60 Hz fixed output; Custom Output Width and Height: 524-3840 pixels per dimension

14.2.2.8 Screen Splicing: Up to 6 displays

14.2.2.9 Multi-screen Display: 1, 4, 6, 8, 9, 16, 25 or 36 windows; Custom Split: M x N up to 36 windows; Window Roaming: Supported

14.2.2.10 Interoperability Protocols: ONVIF and RTSP

14.2.2.11 Network Interface: 1 x RJ-45 10/100/1000 Mbps Ethernet

14.2.2.12 Control and Peripheral Ports: 3 x RS-232 (1 x DB9 and 2 x RJ-45), 1 x RS-485, 2 x USB 3.0 and 1 x USB 2.0; Audio Intercom: 1 x 3.5 mm input and 1 x 3.5 mm output; Alarm I/O: 1 input and 1 output

14.2.2.13 Power Supply: 100-240 VAC, 50-60 Hz; Power Consumption: No more than 50 W

14.2.2.14 Operating Temperature: -10 to +55 °C; Operating Humidity: 10%-95% RH, non-condensing

14.2.2.15 Product Dimensions: 480-485 x 315-320 x 44-45 mm (L x W x H); Net Weight: 4.5-4.8 kg

14.2.3 Must include Video Wall Mounting and Delivery Accessories with the component quantities specified below.

14.2.3.1 Mounting Bracket: 6 units

14.2.3.2 HDMI 15m male-male/1080P with buckle: 8 units.

14.2.3.3 Project accessory kit: 1 set.

14.2.3.4 IR Extended Cable: 1 unit.

14.2.3.5 Wooden case for 55" display unit (2 in 1): 3 units

**14.3** Must include 1-unit 20-channel Digital Mixer with the specifications below.

14.3.1 20 input channels, 2 main outputs, 4 subgroup outputs, and 1 headphone output.

14.3.2 Built-in DCA groups, Auto Mixer, and Talkback with signal override.

14.3.3 Digital inputs and outputs, each independently switchable; user-definable names for all input and output channels.

14.3.4 Built-in digital effects processors that can be stacked.

14.3.5 Gain control and individually switchable +48 V phantom power on every input.

14.3.6 31-band graphic EQ on every output.

14.3.7 7-inch color LCD touchscreen; remote control via PC or tablet (e.g. iPad), compatible with iOS, Android, and Windows.

14.3.8 Built-in RTA (real-time analyzer) on the main outputs for clear, band-by-band frequency display.

14.3.9 Built-in 2-channel I/O audio interface with support for optional expansion cards.

14.3.10 Built-in module slot for optional multitrack recording and Dante networking modules, enabling remote audio transport over Dante.

14.3.11 75 function keys and 2 multi-function encoders with gradient-color ambient lighting.

14.3.12 6 x 100 mm motorized faders with user-adjustable motor speed.

14.3.13 48 kHz sample rate; DSP processing including 4-band parametric EQ, polarity invert, and delay; 24 scene memories.

14.3.14 Self-test mode for diagnosing system faults before use; one-touch

password lock.

**14.4** Must include 2-unit 15-inch Full Range Speaker with the specifications below.

- 14.4.1 Type: Passive 2-way speaker;
- 14.4.2 Continuous Power: 300 W (RMS);
- 14.4.3 Peak Power: 600 W (Peak);
- 14.4.4 LF Driver: 12" woofer / 2" high-temperature voice coil;
- 14.4.5 HF Driver: 1" internal-magnet driver / 1" voice coil;
- 14.4.6 Max SPL (1 m): 120 dB (calculated);
- 14.4.7 Nominal Impedance: 8  $\Omega$ ;
- 14.4.8 Sensitivity (1 W / 1 m): 96 dB;
- 14.4.9 Frequency Response: 55 Hz – 20 kHz (-10 dB);
- 14.4.10 Crossover Frequency: 2.8 kHz (12 dB/octave);
- 14.4.11 Speaker Protection: Dual protection bulbs + PTC dynamic protection;
- 14.4.12 Coverage Angle: 90° (H)  $\times$  60° (V), elliptical horn;
- 14.4.13 Connectors: 2 x Speakon, wired in parallel;
- 14.4.14 Circuit Protection: HF protection;
- 14.4.15 Enclosure: Trapezoidal plywood cabinet, black paint finish / M8 rigging points, black steel grille, integrated handles, rubber feet;

**14.5** Must include 1-unit Two Channel Amplifier (2 x 800W) with the specifications below.

- 14.5.1 RMS Power (EIAJ): 2 x 800 W @ 8  $\Omega$ , 2 x 1600 W @ 4  $\Omega$ , Bridged: 1 x 1600 W @ 8  $\Omega$ ;
- 14.5.2 Frequency Response: 20 Hz – 20 kHz, +0 / -1 dB;
- 14.5.3 Distortion: THD 0.01% (20 Hz – 20 kHz), IMD 0.0035%;
- 14.5.4 Signal-to-Noise Ratio (20 Hz – 20 kHz): > 100 dB;
- 14.5.5 Damping Factor (1 kHz): > 500;
- 14.5.6 Slew Rate: > 10 V/ $\mu$ s;
- 14.5.7 Voltage Gain: 36 dB; Input Sensitivity: 0.775 Vrms or 1.4 Vrms (switchable);
- 14.5.8 Input Impedance: 10 k $\Omega$  unbalanced, 20 k $\Omega$  balanced;

- 14.5.9 Connectors: Balanced XLR and unbalanced RCA inputs per channel, XLR parallel link outputs; 2 x Speakon and 2 pairs of binding posts for speaker output;
- 14.5.10 Controls: Front panel AC power switch and CH1/CH2 gain knobs; rear panel Stereo / Parallel / Bridge mode switch and input sensitivity switch;
- 14.5.11 Indicators: Power (blue) / Protect (green) / Limit (yellow) / Clip (red) / Parallel (yellow);
- 14.5.12 Intelligent Protection: DC, overheat, clip, overload, short circuit, open load, power on/off thump, and RF interference protection;
- 14.5.13 Cooling: Variable-speed fan with forced internal airflow and thermal protection;
- 14.5.14 Power Supply: High-power toroidal transformer, 220–240 V (110–120 V) AC, 50–60 Hz;

**14.6** Must include 2-unit 18-inch Subwoofer Speaker with the specifications below.

- 14.6.1 Type: Passive subwoofer;
- 14.6.2 Continuous Power: 600 W (RMS);
- 14.6.3 Peak Power: 1200 W (Peak);
- 14.6.4 LF Driver: 18" woofer / 3" high-temperature voice coil;
- 14.6.5 Max SPL (1 m): 128 dB (calculated);
- 14.6.6 Nominal Impedance: 8  $\Omega$ ;
- 14.6.7 Frequency Response: 40 Hz – 200 Hz (-6 dB);
- 14.6.8 Crossover Frequency: 500 Hz (12 dB/octave);
- 14.6.9 Sensitivity (1 W / 1 m): 105 dB;
- 14.6.10 Speaker Protection: Dual protection bulbs + PTC dynamic protection;

**14.7** Must include 1-unit Two Channel Amplifier (2 x 1500W) with the specifications below.

- 14.7.1 RMS Power (EIAJ): 2 x 1500W@8 $\Omega$ , 2 x 2800W@4 $\Omega$ , bridged: 1 x 2800W@8 $\Omega$ ;
- 14.7.2 Frequency Response: 20 Hz – 20 kHz, +0 / -1 dB;
- 14.7.3 Distortion: THD 0.01% (20 Hz – 20 kHz), IMD 0.0035%;
- 14.7.4 Signal-to-Noise Ratio (20 Hz – 20 kHz): > 100 dB;
- 14.7.5 Damping Factor (1 kHz): > 500;

- 14.7.6 Slew Rate:  $> 10 \text{ V}/\mu\text{s}$ ;
- 14.7.7 Voltage Gain: 36 dB; Input Sensitivity: 0.775 V<sub>rms</sub> or 1.4 V<sub>rms</sub> (switchable);
- 14.7.8 Input Impedance: 10 k $\Omega$  unbalanced, 20 k $\Omega$  balanced;
- 14.7.9 Connectors: Balanced XLR and unbalanced RCA inputs per channel, XLR parallel link outputs; 2 x Speakon and 2 pairs of binding posts for speaker output;
- 14.7.10 Controls: Front panel AC power switch and CH1/CH2 gain knobs; rear panel Stereo / Parallel / Bridge mode switch and input sensitivity switch;
- 14.7.11 Indicators: Power (blue) / Protect (green) / Limit (yellow) / Clip (red) / Parallel (yellow);
- 14.7.12 Intelligent Protection: DC, overheat, clip, overload, short circuit, open load, power on/off thump, and RF interference protection;
- 14.7.13 Cooling: Variable-speed fan with forced internal airflow and thermal protection;
- 14.7.14 Power Supply: High-power toroidal transformer, 220–240 V (110–120 V) AC, 50–60 Hz;

**14.8** Must include 6-unit 12-inch Full Range Speaker with the specifications below.

- 14.8.1 Type: Passive 2-way loudspeaker;
- 14.8.2 Continuous Power: 300 W (RMS);
- 14.8.3 Peak Power: 600 W (Peak);
- 14.8.4 LF Driver: 12" woofer / 2" high-temperature voice coil;
- 14.8.5 HF Driver: 1" internal-magnet driver / 1" voice coil;
- 14.8.6 Max SPL (1 m): 120 dB (calculated);
- 14.8.7 Nominal Impedance: 8  $\Omega$ ;
- 14.8.8 Sensitivity (1 W / 1 m): 96 dB;
- 14.8.9 Frequency Response: 55 Hz – 20 kHz (-10 dB);
- 14.8.10 Crossover Frequency: 2.8 kHz (12 dB/octave);
- 14.8.11 Speaker Protection: Dual protection bulbs + PTC dynamic protection;
- 14.8.12 Coverage Angle: 90° (H)  $\times$  60° (V), elliptical horn;
- 14.8.13 Connectors: 2 x Speakon, wired in parallel;
- 14.8.14 Circuit Protection: HF protection;

14.8.15 Enclosure: Trapezoidal plywood cabinet, black paint finish / M8 rigging points, black steel grille, integrated handles, rubber feet;

**14.9** Must include 3-unit Two Channel Amplifier (2 x 600W) with the specifications below.

14.9.1 RMS Power (EIAJ): 2 x 600W@8Ω, 2 x 1200W@4Ω, bridged: 1 x 1200W@8Ω;

14.9.2 Frequency Response: 20 Hz – 20 kHz, +0 / -1 dB;

14.9.3 Distortion: THD 0.01% (20 Hz – 20 kHz), IMD 0.0035%;

14.9.4 Signal-to-Noise Ratio (20 Hz – 20 kHz): > 100 dB;

14.9.5 Damping Factor (1 kHz): > 500;

14.9.6 Slew Rate: > 10 V/μs;

14.9.7 Voltage Gain: 36 dB; Input Sensitivity: 0.775 Vrms or 1.4 Vrms (switchable);

14.9.8 Input Impedance: 10 kΩ unbalanced, 20 kΩ balanced;

14.9.9 Connectors: Balanced XLR and unbalanced RCA inputs per channel, XLR parallel link outputs; 2 x Speakon and 2 pairs of binding posts for speaker output;

14.9.10 Controls: Front panel AC power switch and CH1/CH2 gain knobs; rear panel Stereo / Parallel / Bridge mode switch and input sensitivity switch;

14.9.11 Indicators: Power (blue) / Protect (green) / Limit (yellow) / Clip (red) / Parallel (yellow);

14.9.12 Intelligent Protection: DC, overheat, clip, overload, short circuit, open load, power on/off thump, and RF interference protection;

14.9.13 Cooling: Variable-speed fan with forced internal airflow and thermal protection;

14.9.14 Power Supply: High-power toroidal transformer, 220–240 V (110–120 V) AC, 50–60 Hz;

**14.10** Must include 1-unit Four-channel Wireless Handheld Microphone with the specifications below.

14.10.1 UHF band with PLL frequency synthesis and one-touch infrared (IR) sync;

14.10.2 Built-in intelligent wireless microphone management system;

14.10.3 4-channel receiver with 100 selectable frequencies per channel;

14.10.4 Frequency Range: 620 MHz – 710 MHz;

- 14.10.5 Built-in digital DSP noise reduction module for feedback suppression;
- 14.10.6 Built-in multi-frequency coexistence technology to effectively avoid interference;
- 14.10.7 RF interference shielding to prevent mobile phone interference;
- 14.10.8 LCD display shows operating channel, frequency, mic on/off status, battery level, and other receiver information;
- 14.10.9 PLL digital synthesis and integrated circuitry for stable performance;
- 14.10.10 Balanced XLR and unbalanced 6.35 mm (1/4") outputs for connection to a wide range of external equipment;
- 14.10.11 4 built-in receiving antennas for stronger signal reception;
- 14.10.12 Operating Range: Up to 100 m;
- 14.10.13 Battery: 2 x AA batteries per microphone; current consumption 118 mA (typical); up to 12 hours of continuous use;
- 14.10.14 System includes 1 receiver and 4 wireless handheld microphones.

**14.11** Must include 1-unit Four-channel Wireless Lavalier Microphone with the specifications below.

- 14.11.1 UHF band with PLL frequency synthesis and one-touch infrared (IR) sync;
- 14.11.2 Built-in intelligent wireless microphone management system;
- 14.11.3 4-channel receiver with 100 selectable frequencies per channel;
- 14.11.4 Frequency Range: 620 MHz – 710 MHz;
- 14.11.5 Built-in digital DSP noise reduction module for feedback suppression;
- 14.11.6 Built-in multi-frequency coexistence technology to effectively avoid interference;
- 14.11.7 RF interference shielding to prevent mobile phone interference;
- 14.11.8 LCD display shows operating channel, frequency, mic on/off status, battery level, and other receiver information;
- 14.11.9 PLL digital synthesis and integrated circuitry for stable performance;
- 14.11.10 Balanced XLR and unbalanced 6.35 mm (1/4") outputs for connection to a wide range of external equipment;
- 14.11.11 4 built-in receiving antennas for stronger signal reception;
- 14.11.12 Operating Range: Up to 100 m (line of sight);
- 14.11.13 Battery: 2 x AA batteries per bodypack transmitter; current

consumption 118 mA (typical); up to 12 hours of continuous use;

14.11.14 System includes 1 receiver and 4 bodypack transmitters with lavalier microphones.

**14.12** Must include 1-unit 8CH Antenna Distribution Amplifier with the specifications below.

14.12.1 Wideband UHF diversity antenna distributor covering 500 MHz – 1 GHz;

14.12.2 Amplifies and distributes antenna signals to up to 8 wireless receiver channels;

14.12.3 Allows multiple wireless systems operating on different frequency bands to be combined and used together;

14.12.4 One distributor supports up to 4 receivers;

14.12.5 Wideband design compatible with a wide range of wireless systems;

14.12.6 Works with directional antennas to improve reception stability;

14.12.7 Rack-mountable design.

**14.13** Must include 1-unit 16CH Professional Audio Processor with the specifications below.

14.13.1 Industrial-grade embedded Linux architecture, well-engineered design, 1U rack-mount;

14.13.2 16 balanced audio inputs with +48 V phantom power;

14.13.3 16 balanced line-level audio outputs on 3.81 mm Euroblock (Phoenix) connectors;

14.13.4 Sample Rate: 48 kHz; Frequency Response: 20 Hz – 20 kHz ( $\pm 0.5$  dB);

14.13.5 Adjustable channel level range with configurable fader maximum and minimum limits;

14.13.6 Scene save and recall at any time;

14.13.7 Built-in web server provides easy access to control software, control protocols, user manuals, and other documentation from any web browser over the network;

14.13.8 Input channel processing: preamp gain, 7-band parametric EQ, expander, compressor, AGC (automatic gain control), and delay;

14.13.9 Output channel processing: 10-band parametric EQ, limiter, delay, and filters (all-pass, high-pass, low-pass);

14.13.10 Supports AEC (acoustic echo cancellation), AFC (acoustic feedback control), and AM (automatic mixing);

- 14.13.11 Automatic mixing (AM) with microphone grouping; the algorithm automatically limits the number of open microphones (NOM) based on the preset maximum;
- 14.13.12 Digital processing provides feedback suppression, automatic gain control, noise reduction, and echo cancellation;
- 14.13.13 Group control, with channel copy, paste, and linking;
- 14.13.14 USB interface for audio recording;
- 14.13.15 Voice tracking that works with video matrix switchers and cameras for automatic camera tracking and switching.

**14.14** Must include 1-unit 8CH Power Sequencer with the specifications below.

- 14.14.1 8 switched output channels, each with freely adjustable power-on and power-off;
- 14.14.2 Each channel can be independently switched on or off for flexible equipment management;
- 14.14.3 1 front-panel auxiliary outlet, unswitched and independent of sequencing control;
- 14.14.4 Built-in real-time clock for scheduled automatic on/off of each channel by date and time;
- 14.14.5 RS-232 and RS-485 control interfaces, supporting cascading and integration with central control systems;
- 14.14.6 Rated Total Output Current: 30 A; Maximum Current per Channel: 13 A.
- 14.14.7 AC220–240V 60HZ.

## **15 University Productivity**

The winning bidder shall supply computing devices for university personnels that will be used aligned with the nature of their function.

### **15.1 Video Management System and Video Surveillance**

Must include 1-set Video Management System with the specifications below.

- 15.1.1 Video Capacity: A single-server system shall support at least 1,000 video devices and 2,000 video channels.
- 15.1.2 Device Integration: The platform shall support device access through ONVIF and RTSP.
- 15.1.3 Video Bandwidth: Incoming and outgoing video bandwidth shall each be at least 600 Mbps on a single server.

- 15.1.4 Live View: The platform shall support customizable layouts and window sizes, with manual recording available during live view.
- 15.1.5 Video Operations: The platform shall support device talk, fisheye dewarping, and cross-camera target tracking. Each channel shall support at least 8 linked tracking channels.
- 15.1.6 Playback: The platform shall support multi-window playback at speeds from 1/64× to 64×.
- 15.1.7 Recording Search and Protection: Users shall be able to filter recordings by video or target type, add tags, and lock recordings. Each user shall be able to maintain at least 10,000 tags and 10,000 locked recordings.
- 15.1.8 Video Downloads: Each client shall support at least 5 simultaneous video downloads.
- 15.1.9 Recording Plans: The platform shall support at least 3,000 general recording plans and 3,000 motion-detection recording plans.
- 15.1.10 Video Wall: The platform shall support live video, recorded video, scheduled display tasks, and continuous tours on at least 32 video walls.
- 15.1.11 Map: The platform shall support at least 8 map hierarchy levels and indicate alarm locations through device icons.
- 15.1.12 Alarm Management: The platform shall support more than 200 alarm types, custom alarms, alarm statistics, and alarm handling.
- 15.1.13 Intelligent Search: Users shall be able to search historical person and vehicle records and generate movement tracks and related reports.
- 15.1.14 Users and Permissions: The platform shall support at least 2,500 users, 500 permission roles, and 200 concurrent online users.
- 15.1.15 Mobile Monitoring: The mobile client shall support simultaneous live view of at least 16 channels, selection among 3 stream types, and PTZ control.
- 15.1.16 Education Module: The education module shall be deployable and enabled as a platform plug-in, with a web login using a username and password.
- 15.1.17 Attendance Groups: The system shall support at least 1,000 attendance groups.
- 15.1.18 Attendance Group Capacity: The system shall support at least 50,000 people across all attendance groups and at least 2,000 people in one group.
- 15.1.19 Classrooms: The system shall support at least 1,000 classrooms.
- 15.1.20 Classroom Video Links: Each classroom shall support links to at least 5 face-recognition channels.

- 15.1.21 Courses: The system shall support at least 5,000 courses.
- 15.1.22 Class Scheduling Selection: Users shall be able to select at least 2,000 people in one class-scheduling operation.
- 15.1.23 Classroom Scheduling Capacity: Each classroom shall support at least 10,000 people scheduled for classes.
- 15.1.24 Concurrent Classes: A single-server system shall support at least 4,000 people having classes at the same time.
- 15.1.25 Campus Attendance: The system shall support at least 64 campus attendance points and 50 campus attendance rules. It shall store at least 20 million class attendance records and 20 million school attendance records, respectively.
- 15.1.26 Licensing: All licenses necessary to enable the specified video management and education functions and connect the supplied devices shall be included. Coverage shall include at least 64 additional video channels and 30 classrooms.

**15.2** Must include 4-unit 8 MP Dual-Light PTRZ Dome Network Camera with the specifications below.

- 15.2.1 Image Sensor: 1/1.8-inch CMOS; Maximum Resolution: 3840 x 2160 pixels (8 MP).
- 15.2.2 Frame Rate: Up to 25/30 fps at 3840 x 2160 in default mode; up to 50/60 fps at 3840 x 2160 or 100/120 fps at 1920 x 1080 in high-frame-rate mode.
- 15.2.3 Lens: Motorized vari-focal, 8–32 mm; Maximum Aperture: F1.6; Iris Control: Automatic P-Iris.
- 15.2.4 PTRZ Adjustment: Motorized installation adjustment; Pan: 0°–355°; Tilt: 0°–80°; Rotation: 0°–355°.
- 15.2.5 Minimum Illumination: 0.0007 lux in color and 0.0003 lux in monochrome at F1.6 and 30 IRE; 0 lux with illumination enabled.
- 15.2.6 Illumination Distance: Up to 80 m with infrared light and 60 m with warm light.
- 15.2.7 Video Compression: H.265, H.264, H.264H, H.264B and sub-stream MJPEG; Streaming Capability: 5 streams, subject to the total encoding capacity.
- 15.2.8 Wide Dynamic Range: 140 dB; Noise Reduction: 3D; Image Stabilization: Gyroscope-based stabilization.
- 15.2.9 Intelligent Functions: Perimeter detection, face detection and recognition, people counting, video metadata, protective-equipment detection and number-plate recognition; Concurrent Analytics: Supports specified pairs of intelligent functions.

- 15.2.10 Privacy Protection: Automatic mosaic or frosted-glass masking of faces, human bodies and vehicle bodies, with adjustable mosaic size.
- 15.2.11 Built-in Audio: Dual microphones and a speaker; Alarm Warning: Sound and light warning supported.
- 15.2.12 Storage: MicroSD card support up to 1 TB, NAS, FTP and SFTP.
- 15.2.13 Network Interface: 1 x RJ45 10/100/1000 Mbps; Interoperability: ONVIF Profiles S, G, T and M; Alarm I/O: 3 inputs and 2 outputs; Audio I/O: 1 input and 1 output; Auxiliary Interfaces: RS-485 and BNC composite video.
- 15.2.14 Power Supply: 12 VDC, 24 VAC or IEEE 802.3at PoE+; Dual Power Backup: Supported when external power and PoE are connected simultaneously.
- 15.2.15 Protection: IP67 and IK10; Operating Temperature: -40 °C to +65 °C; Operating Humidity: Up to 95% RH, non-condensing.
- 15.2.16 Must be managed by Video Management System

**15.3** Must include 1-unit 128-Channel Intelligent Video Surveillance Server with the specifications below.

- 15.3.1 Processor: 64-bit multi-core; Operating System: Embedded Linux; AI Processing: 4 AI cards with switchable operating modes.
- 15.3.2 IP Video Inputs: Up to 128 channels.
- 15.3.3 Network Bandwidth: Up to 512 Mbps each for incoming, recording and outgoing traffic; with 8K output enabled, up to 256 Mbps each.
- 15.3.4 Recorder-side Analytics: Up to 64 channels at 2 MP or 4 MP for face recognition, perimeter analytics or video metadata, with 16 channels per allocated AI card.
- 15.3.5 Camera-assisted Face Recognition: Up to 80 channels at 2 MP or 60 channels at 4 MP when used with compatible face-detection cameras.
- 15.3.6 Natural-Language Video Search: Up to 80 channels at 2 MP, 60 channels at 4 MP or 30 channels at 8 MP with compatible camera-side target-search analytics; at least 1 AI card must be allocated to search modeling.
- 15.3.7 Face Database Capacity: Up to 100 face databases and 500,000 face images in total; 5 passerby databases share the same overall image capacity.
- 15.3.8 Video Outputs: 4 HDMI and 1 VGA; the first HDMI and VGA outputs share the same source; in 8K mode, 1 output supports 8K and 1 supports 1080p.

- 15.3.9 Video Compression: H.265 and H.264; Decoding Capacity: Up to 7 channels of 8 MP at 30 fps or 28 channels of 1080p at 30 fps when 8K output is disabled.
- 15.3.10 Local Storage: 8 SATA drive bays, up to 20 TB per drive; RAID: 0, 1, 5, 6, 10, 50 and 60; Network Storage: iSCSI supported.
- 15.3.11 Simultaneous Playback: Up to 16 channels; Backup: Internal hard disk and external USB storage.
- 15.3.12 Network Ports: 4 x RJ45 10/100/1000 Mbps; Network Modes: Multiple address, load balancing, fault tolerance and link aggregation; Interoperability: ONVIF Profiles S, G, T and M.
- 15.3.13 Input Voltage Range: 100–240 VAC; Power Frequency: 50–60 Hz; Power Consumption Limits: 38 W without HDDs, 105 W with all HDDs connected and 200 W rated maximum.
- 15.3.14 Form Factor: 2U; Installation: Desktop or rack; Operating Temperature: 0 °C to +45 °C; Operating Humidity: 10%–90% RH, non-condensing.
- 15.3.15 Supplied Storage: 1 x 16 TB enterprise hard disk, included in the hard-disk quantity specified below.
- 15.3.16 Must be managed by Video Management System

**15.4** Must include 1-unit 16-Bay Embedded Video Storage with the specifications below.

- 15.4.1 Processor: 64-bit multi-core; Operating System: Embedded Linux; Controller: Single; Cache: 8 GB, expandable to 32 GB.
- 15.4.2 IP Camera Inputs: Up to 320 channels.
- 15.4.3 Video Direct-Storage Bandwidth: Up to 800 Mbps each for incoming, recording and outgoing traffic.
- 15.4.4 Drive Bays: 16 hot-swappable SATA bays; Drive Capacity: Up to 20 TB per drive; Drive Type: Enterprise-grade CMR HDD.
- 15.4.5 RAID: 0, 1, 5, 6, 10, 50 and 60 with enterprise-grade HDDs; Hot Spare: Supported.
- 15.4.6 Storage Modes: Direct video-stream storage, direct picture storage and IP SAN; iSCSI: Client and server support.
- 15.4.7 Network Replenishment: Supports retrieval of camera SD-card recordings after network recovery when used with compatible cameras.
- 15.4.8 Video Compression: H.265, H.264 and MJPEG; Audio Compression: G.711A, G.711U, PCM and G.726.
- 15.4.9 Simultaneous Playback: Up to 16 channels; Recording Control: Continuous, event-based, scheduled, or scheduled and event-based.

15.4.10 Network Ports: 2 x RJ45 10/100/1000 Mbps; Network Modes: Multiple address, load balancing and fault tolerance; Interoperability: ONVIF Profile S.

15.4.11 External Interfaces: 2 x USB 3.0, 1 x eSATA and 1 x RS-232; Service Video Interfaces: 1 HDMI and 1 VGA, both for debugging only.

15.4.12 Power Redundancy: 1+1 redundant, hot-swappable power supplies.

15.4.13 Input Voltage Range: 100–240 VAC; Power Frequency: 50–60 Hz; Power Consumption: Less than 60 W while idling without HDDs and less than 220 W with all HDDs connected.

15.4.14 Installation: Standard 19-inch rack; Operating Temperature: 0 °C to +45 °C; Operating Humidity: 10%–80% RH, non-condensing.

15.4.15 Supplied Storage: 14 x 16 TB enterprise hard disks, included in the hard-disk quantity specified below.

15.4.16 Must be managed by Video Management System

**15.5** Must include 15-unit 16 TB Enterprise Hard Disk Drive with the specifications below.

15.5.1 Capacity: 16 TB.

15.5.2 Recording Technology: Conventional magnetic recording (CMR).

15.5.3 Interface: SATA 6 Gb/s.

15.5.4 Rotational Speed: 7,200 rpm.

15.5.5 Cache: 512 MB.

15.5.6 Sector Format: 512-byte emulation (512e).

15.5.7 Power Supply: +5 VDC and +12 VDC.

**15.6** 100 units of All-in-One (AiO) PC

15.6.1 CPU should be at least Intel Core Ultra 5 or equivalent

15.6.2 Minimum of 16 GB RAM

15.6.3 At least 512 GB SSD Storage

15.6.4 At least 21.5” Display

15.6.5 Windows Operating System

15.6.6 Office Productivity Software

15.6.7 Endpoint protection

15.6.8 Equiped with UPS

15.6.9 At least 1 year warranty

**15.7** 100 units of General-Purpose laptop

15.7.1 CPU should be at least Intel Core Ultra 5 or equivalent

15.7.2 Minimum of 16 GB RAM

15.7.3 At least 512 GB SSD Storage

15.7.4 At least 13" Display

15.7.5 Windows Operating System

15.7.6 Office Productivity Software

15.7.7 Endpoint protection

15.7.8 Power Adapter

15.7.9 Laptop Bag

15.7.10 At least 1 year warranty

**15.8** 80 units of High-Tier Laptop

15.8.1 CPU should be at least Ultra 5 CPU or the equivalent

15.8.2 GPU should be at least 2GB or higher

15.8.3 Minimum of 16 GB RAM

15.8.4 At least 500GB SSD Storage

15.8.5 At least 15" Display or higher

15.8.6 2560 x 1600 IPS Screen

15.8.7 Windows Operating System

15.8.8 Office Productivity Software

15.8.9 Endpoint protection

15.8.10 Power Adapter

15.8.11 Laptop Bag

15.8.12 At least 1 year warranty

## **16 Professional Services**

Bidder must ensure seamless interoperability, optimize performance, and enhance the overall efficiency of the agency's technology infrastructure. It relies on advanced technical knowledge, strategic planning, and adherence to best practices and industry standards.

### **16.1 Project Management**

The fulfillment of the project which involves overseeing the project team, creating project plans, tracking progress, identifying and managing risks, and communicating with stakeholders.

- 16.1.1 Develop a clear understanding of the project goals and objectives and ensure that all project team members have a shared understanding of these goals.
- 16.1.2 Create a detailed project plan that includes timelines, milestones, and deliverables.
- 16.1.3 Assign roles and responsibilities to the project team members and ensure that everyone understands their roles.
- 16.1.4 Monitor project progress regularly and adjust the project plan as necessary.
- 16.1.5 Identify potential risks and develop contingency plans to mitigate these risks.
- 16.1.6 Communicate regularly with stakeholders, including sponsors, customers, and team members, to ensure that everyone is aware of project progress and any issues that arise.
- 16.1.7 Ensure that project documentation is accurate and up to date, including project plans, progress reports, and risk assessments.
- 16.1.8 Foster a positive team environment by encouraging collaboration, providing support, and recognizing team members' contributions.
- 16.1.9 Continuously evaluate project performance and identify opportunities for improvement.

### **16.2 System and Hardware Installation**

- 16.2.1 Provision of essential services for installation of devices, software and systems supplied for this project.

#### **16.2.2 Operating System (OS) Hardening**

The OS hardening service shall include the patching and application of advanced system security procedures to secure the server's OS. The OS hardening procedures must include the following, at a minimum:

- 16.2.2.1 If available, install service packs, firmware and/or patches to keep the OS up to date.

16.2.2.2 Perform secure configuration by deleting unnecessary programs and/or drivers, apply restrictions to the network, files and applications, assign groups and set the policies and use templates to manage and enforce security configurations.

16.2.2.3 Install End-Point Protection

### **16.3 Support Services**

16.3.1 The winning bidder must ensure that appropriate support services are in place within the active warranty period of all supplied devices and software.

### **16.4 Knowledge Transfers**

16.4.1 Provide training for all users and IT Support for MPSU.

16.4.2 Prior to the project handover, the winning bidder must conduct a walk-through with university nominated personnel but limited to engineering and IT technical personnel. The intent primarily is to orient on the supplied equipment/devices, completed installations, equipment type, functionalities, basic operations & maintenance, and how these are integrated holistically.

16.4.3 Document handover:

Network Diagram

System Diagram

Network Topology and IP Vlan

Application and system documentation

### **16.5 Testing and Commissioning Services**

The winning bidder shall be required to perform testing and commissioning. Minimum Scope of Services are as follows:

16.5.1 The winning bidder shall submit the testing Methods of Procedures (MoP) to MPSU prior to actual testing.

16.5.2 Perform actual testing as per Manufacturer prescribed testing methodologies.

16.5.3 Testing results must be documented and submitted to MPSU PMT not later than 48 hours from completion of the testing activities.

16.5.4 Should there be failed testing, the winning bidder is given a maximum of 12 hours to troubleshoot or rectify the problem. Re-testing shall then be performed. After completion of the 2nd testing and such has failed anew, the winning bidder shall furnish MPU PMT with full report not more than 24 hours from the time failed testing has been declared and must replace the defective hardware and/or software not more than fourteen (14) days from the date of completion of the failed testing. In case of longer replacement period, the winning bidder must inform

MPSU PMT in writing, stating the reasons thereof and arrival date.

#### **16.6 As-Built Documents**

The winning bidder must develop and submit As-Built documents for all works covered in this project such as cabling works and system deployments. The As-Built documents must accurately reflect the actual installations, and other relevant works completed and duly signed off by the signing authority designated by MPSU, as well as the respective trade engineers from the winning bidder's side. Mechanical and Electrical Load Schedules must form part of the As-Built documents. Submittal should be in the following form:

- 16.6.1 3 Sets of Print Outs in A1 Sheet, (properly compiled and labeled accordingly)
- 16.6.2 Sets of Print Outs in A3 Sheets (properly compiled and labeled accordingly)
- 16.6.3 Soft Copies in pdf format, compiled and stored in a USB Drive

#### **17 Implementation Timeline**

- 17.1 Project implementation shall be completed within thirty (30) days from the date of the Notice to Proceed (NTP), or on/before December 23, 2026, whichever comes first. The winning bidder must complete and hand over the project within this prescribed timeline.
- 17.2 E-Learning\_MPSUParticipating bidders are required to include in its bid submission a high-level Gantt Chart that will illustrate the project implementation schedule per WBS.

#### **18 Bidder Competency Requirements and Submittals**

- 18.1 The bid submission shall be in sufficient detail to show compliance with the Specification and shall include the following:
  - 18.1.1 Statement of compliance, or otherwise, against the Specification for the System offered.
  - 18.1.2 A detailed technical description of the proposed System, including all the equipment and software offered.
  - 18.1.3 A working timeline including the periods of design and manufacture, delivery, installation, training, site acceptance testing, and commissioning.
  - 18.1.4 Conceptual Designs.
  - 18.1.5 Colored brochures of all equipment supplied including racks and consoles.

**18.2** The participating bidder must include the following certifications in its bid submission:

18.2.1 Manufacturers or Distributor's Certificate or Authorization from the manufacturer or authorized distributor of the AIO PC, Network equipment stating that the bidder is an authorized reseller, permitted to join the bid and has validated the full solution of the project. The certification must also state that the manufacturer of the desktop, network and server is capable of providing support for the proposed solution which will be implemented in this particular project.

**18.3** Manufacturers or Distributor's Certification for the Servers, Storage, Networking, and Workstations must:

18.3.1 Have local spare parts warehouse in Metro Manila

18.3.2 Have more than 10 years of business experience in the Philippines

18.3.3 The manufacturer and/or its authorized distributor must have certified engineers.

18.3.4 Certification from the Manufacturer or Authorized Distributor stating that the equipment supplied is not obsolete or shortly to be phased out of production.

18.3.5 Warranty Certificates of all supplied equipment and devices, stating the warranty coverage.

18.3.6 The bidder must have ISO 9001:2015 Quality Management Systems. In the case of a Joint Venture (JV), any of the parties forming the JV must possess the ISO Certification as stated herein.