Technical Specifications and Terms of Reference

UPGRADING OF IT NETWORK (PHASE II)

BID NO : PBM 2021-018

DATE :

REQUIRED SPECIFICATIONS	**Statement of Compliance and Offered Specifications** (please write down detailed offered specifications, brand and model) Note: Specify **"COMPLY"** for each technical specifications offer, TOR provisions and scopes of work	**REFERENCES (include supporting documents)** (attached brochure / technical data/ website, etc.)
Term of Reference **Upgrading of IT Network (Phase II)** **I. BACKGROUND** The project shall cover the upgrading of ICT network including network designs, supply, installation, configuration and testing of various ICT equipment and structured cabling for UP Mindanao, but shall not be limited to the following: 1. Design and configuration of the University Network for Two (2) Tier Collapsed Core Architecture (Phase 1) and Three (3) Tier Architecture (Phase 2) (configurations file will be saved and backup) 2. Supply, installation, and configuration of multi-wan load balancer, fiber core switches, POE edge switches, WIFI controller, WIFI access points, network cabinets, uninterruptible power supply (UPS); and 3. Installation, configuration and integration of existing		

ICT Equipments: firewalls(Palo Alto PA 820 and PA 500),Wifi controller and access points (Aruba 7205 and it's access points), VOIP Server (YEASTAR S300 and it's IP Phones), CCTV Server (Bosch Server and CCTVS) and existing switches and servers; and

Existing ICT Equipments	Quantity
Palo Alto PA 820	1
Palo Alto PA 500	1
HP A5500	1
Aruba 7205 Controller	1
Aruba AP-205	90
Yeastar S300 IP-PBX	1
Borderless Hub BH80P3/HTEK UC803P IP Phones	60
Bosch DIVAR IP 7000 3U	1
BOSCH Autodome IP Dynamic 7000 HD	5
BOSCH DINION IP Bullet 5000 HD	15
BOSCH Flexidome IP indoor 5000 HD	44
HPE OfficeConnect 1920 24G POE	4
HPE OfficeConnect 1920 8G POE	2
3COM 2920	2
CATALYST 2960	4

CISCO SF 300	19
CISCO SF 302	3
HP 2620-24 (J9625A) PoE	2
HP 2520-24 (J9623A)	2
3Com Baseline Switch 2226 SFP Plus 1	8
Servers	
Dell Power Edge R300	1
Dell Power Edge R210	2
Dell Power Edge R410	2
Dell Power Edge R430	1
Dell Power Edge R630	1
Fujitsu Primergy RX2540	1
Lenovo System X 3650 M5	1

4. Design, supply, installation and testing of structured cable system and renovations of the data/server rooms at the College of Humanities and Social Sciences building(CHSS), College of Science and Mathematics building (CSM), CARIM buildings Phase1 and 2, CHSS Cultural Center Building, CSM Dormitory, CSM Annex 2, EBL Dorm /ILC/LRC Building, Faculty and Staff Housing,Football Stadium Phase 1, Former HKC Building, Infirmary, Kalimudan, Library, SOM Building, Student Dormitory, Training Gym, and other new

buildings

Buildings	New Cabinet	Old Cabinet
Admin Building (CHSS)	1	1
CSM Existing	1	1
CARIM Phase 1 & 2	1	
Admin Building (Admin)		
CHSS Cultural Center Building	1	1
CSM Dormitory	1	1
CSM Annex 2	1	
EBL Dormitory	1	1
Faculty and Staff Housing	1	
Football Stadium Phase 1	1	
Former HKC Building	1	1
Infirmary	1	1
Kalimudan	1	1
Library	1	1
SOM Building	1	1

Student Dormitory	1	
Training Gym	1	

5. Design, supply, installation and testing of Structured Cable System for the Access Points for the entire university

6. Supply, installation, setup and configuration of Hypervisor for Virtualization for 6 servers(Dell Power Edge R430, Dell Power Edge R630, Fujitsu Primergy RX2540, Lenovo System X 3650 M5 and 2 future servers).The servers are provided by the end user.

7. Installation, Setup and Configuration of the new local and public DNS (opensource) for the entire network is included in the scope of work. The DNS should be configured with the firewall (PALO ALTO) and the new Fiber core switches and POE Switches. The servers or hardware equipment for the DNS shall be provided by the end user

8. **Supply, Renewal, updating and upgrading of the existing Aruba Controller (7205) firmware, software, licenses and OS to support the new 90 units of WIFI 6 access points and existing 90 units of access points is included in the scope of work.** Setup and configuration of a third party wifi captive portal server(opensource) for the integration and configuration to the existing Aruba Controller (7205).The servers or hardware equipment for the third party wifi captive

portal server shall be provided by the end user. 9. Renewal of warranty or extended warranty of the existing Aruba Controller (7205) must be included. **10.3 year warranty and 3 Year Foundation Care Next Business Day Onsite (H3CX5E) for existing Wireless Access Controller** 11.3 year warranty and 3X(3 Years Period) Aruba 1 Year Renewal Foundation Care Next business day Exchange (H3PT8PE) for existing 90 Access Points (AP 215 JW170A) 12.Mounting and Relocating of existing access points 13.Setup and configuration of the Multi-WAN load balancer with the Firewall(PA820 and PA500) is included in the scope of work 14.Setup and configuration of the Firewall(PA820 and PA500) for firewall redundancy and failover in the network is included in the scope of work. 15.Setup and configuration of the Two WIFI Access Controller and firewall for controller and firewall redundancy and failover in the network is included in the scope of work. 16.Supply and installation of power outlets MDF / IDF Cabinets. Includes electrical wiring, outlets, CB, tapping point, conduiting, grounding Assessment and Installation of Electrical Provisions for all the mentioned equipment in this Term of Reference that should		

meet the Industry Standards.		
II. OBJECTIVE In line with the government's focus on "advancing science, technology, and innovation" and the UP mandate to become a "research university" and "regional and global university," UP Mindanao aims to provide world-class facilities for the conduct and dissemination of research in order to increase research productivity of scientists in Mindanao and encourage collaboration with international scholars. The implementation of the Upgrading of IT Networks (Phase 2) will support the University in delivering research, instruction and extension to its stakeholders. **III. APPROVED BUDGET FOR THE CONTRACT**		

The Approved Budget for the Contract (ABC) is Fifty Million Pesos (P 50,000,000.00) through the General Appropriations Act of 2019 Capital Outlay inclusive of all government taxes and charges. **IV. BIDDER'S QUALIFICATIONS** 1. **The Bidder must have an employed Certified Project Management Professional (PMP) or its equivalent. Must attach valid certification certified true copy by the issuing entity or notarized copy. Submission of certification is during the bid opening. Must attach certificate of employment or contract of services during the bid opening.** 2. **The bidder must have at least one Licensed Electrical Engineer, at least one Licensed Electronic Communication Engineer and at least One Certified Data Center Professional (CDCP) during the project and warranty duration that are trained and certified in the design and installation of cabling systems. Submission of certifications or licenses are during the bid opening. Must attach certificate of employment or contract of services during the bid opening.** 3. **The bidder must have at least:** • **one (1) Palo Alto Networks Certified Network Security Engineer to handle the implementation, support and training and** • **one (1) Palo Alto Networks Certified Network Security Consultant for the design and security posture assessment.** • **-one (1) Aruba Certified Switching Professional and** • **one (1) Certified Mobility Professional for the**		

design, implementation and training ● **Submission of certifications or licenses are during the bid opening. Must attach certificate of employment or contract of services during the bid opening.** 4. Additional post qualification requirements: ● Letter from the Cabling System Manufacturer that it manufactures end-to-end structured cabling system copper and fiber optic cables and their associated connecting hardware to be submitted during the bid opening. ● Certification from Manufacturer's main/regional office stating that the contractor is an Authorized Business Partner and Certified Installer of the Brand being offered (Switches and cabling) to be submitted during the bid opening.		

V. SCOPE OF WORK AND DELIVERABLES OTHER REQUIREMENTS The bidder may conduct an actual site visit, they should submit a time-line (Gantt chart) of activities as part of technical proposal and submit original/clear copy of the brochure for items in the Technical Specifications deliverables during the bid opening.		

VI. DELIVERABLE AND THEIR TECHNICAL SPECIFICATIONS

NETWORK EQUIPMENT

1. Fiber Core Switch (2 units)
Location: 1 for Admin Building Data Center and 1 for the Proposed New Data Center

The core switch should have the minimum or better specifications at listed below

a. Performance:
   - High-speed fully distributed architecture
   - At least Provides 6.4Tbps for switching and 2,000 Mpps for forwarding. All switching and routing are wire-speed to meet the demands of bandwidth-intensive applications today and in the future.

b. Physical Interfaces:
   - Compact 1U switch
   - At least Model with 48 ports of 1GbE/10GbE/25GbE (SFP/SFP+/SFP28) and 8 ports of 40GbE/100GbE (QSFP+/QSFP28)
   - SFP+ ports support an optional 10GBASE-T Transceiver.
   - At least 48p 25G SFP/+/28 and 8p 100G QSFP+/28
   - At least 6 Front-to-Back Fans
   - **At least 2 Power Supply Units included and installed (650W 100-240VAC Front-to-Back Power Supply)**

c. Management:

- SNMP
- RJ45 for Serial Console or USB - C Console Port
- USB-Type A for file management only
- RJ45 Ethernet for OOBM

d. Three (3) Years Warranty(unit replacement , labor and parts)

e. INCLUDED: Jumper Cable – ROW for the Fiber Core Switch

f. 3 year warranty and 3 Year Foundation Care/3 Year Extended Service - Service - 8 x 5 Next Business Day - Service Depot – Exchange for the Fiber Core Switch

g. 3 year warranty and 3 Year Foundation Care Next Business Day Onsite (HC7B0E) for Fiber Core Switch

h. Fiber Core Switch 4-post Rack Kit (mounting kit)

i. Globally known brand distributed in the Philippines via a locally declared company with global standard certifications like ISO, ITIL and D&B and engineers certified of the said brand

j. INCLUSIONS

i. At least 24 units of compatible SFP Transceivers (support 1GbE) for Single Mode Fiber (SMF)

ii. At least 48 units of compatible SFP28 Transceivers (support 25GbE) for Single Mode Fiber (SMF).

iii. **At least 20 units of compatible 10GBASE-T Transceivers for the 2 units of fiber core switch**

iv. **Includes compatible 4 units 100G QSFP+/QSFP28 Transceivers for Single Mode Fiber and must be compatible with the new Fiber Core Switches specified in this Term of Reference. This transceivers will be used to connect and stack the 2 new Fiber Core Switches specified in this Term of Reference which are installed two separate buildings)**

v. **At least 24 units of 6m SC-LC Fiber Patch cord compatible with the 1Gbe SFP Transceivers for Single Mode Fiber (SMF),**

vi. **At least 48 units of 6m SC-LC Fiber Patch cord compatible with the 25Gbe SFP28 Transceivers for Single Mode Fiber (SMF).**

vii. **At least 12 units of LC-LC 6m Fiber Patch cord compatible with the 1Gbe SFP Transceivers for Single Mode Fiber (SMF)**

viii. **At least 12 units of 6m LC-LC Fiber Patch cord compatible with the 25Gbe SFP28 Transceivers for Single Mode Fiber (SMF).**

ix. **The Fiber patch cord should be compatible with the EDGE Switches POE and core switches for the 2 units of fiber core switch**

x. **At least 4 units 6m SC-LC Fiber Patch cord compatible with the 100G QSFP+/QSFP28 Transceivers, EDGE Switches POE and core switches for the 2 units of fiber core switch**

xi. **Includes 2 units of JD362B HPE X361 150W AC Power Supply for the existing defective HP A5500 switch and supplier shall install and troubleshoot the parts in order for the**

device to work.

xii. The Transceivers and fiber patch patch cord must be compatible with the new EDGE Switch POE specified in this Term of Reference for the 2 units of fiber core switch. Also must be compatible with the existing equipment. Note: The current University's equipments: firewall - Palo Alto PA 820, Palo Alto PA 500, Yeastar S300, Aruba Controller (7205,)HP A5500 Switch and existing switches and servers

xiii. power plugs must be compatible with the PDUs in this Term of Reference

k. CONFIGURATION AND TESTING

i. supplier must able to configure the the two fiber core switches (in two separate building) in a two (2) tier collapsed core architecture (Phase 1) and three (3) tier architecture (Phase 2) network with the new POE Edge Switches and existing switches

ii. Supplier shall propose, create, configure and deploy a new university network design and topology that maximize the capabilities of the new core switches, the EDGE Switches POE, Multi-WAN Internet Load Balancer with the existing firewalls (Palo Alto PA820,Palo Alto PA500) and switches and the existing centralized controller (Aruba 7205). This is also subject to the approval of the end users.

iii. Supplier shall configure the existing existing centralized controller (Aruba 7205), switches and firewalls (Palo Alto PA820,Palo Alto PA500) and the new EDGE Switches POE, Core Switches and the new Multi-WAN Internet Load Balancer specified in this Term of Reference

with the approval of the end users			

2. Edge Switch POE 24 ports (at least 10 units)

The edge switch POE should have the minimum or better specifications at listed below

a. Performance:
- At least System Switching Capacity: 880 Gbps
- At least System Throughput Capacity: 660 Mpps
- At least Stack Size: 10 member
- At least t Max. Stacking Distance: Up to 10 kms with long range transceivers
- At least Stacking Bandwidth: 200 Gbps

b. Physical Interfaces:
- At least 24x ports Smart Rate 100M/1G/2.5G/5GBaseT Class 6 PoE ports supporting up to 60W per port
- At least 4x 1/10/25/50G SFP ports **At least 2 field-replaceable, hot-swappable power supply slots. 2 power supply must be installed and included**
- At least Delivers up to 1440W of Class 6 PoE Power
- At least Two field-replaceable, hot-swappable fan trays (included)

c. Management:
- SNMP
- RJ45 for Serial Console or USB - C Console Port
- USB-Type A for file management only

- RJ45 Ethernet for OOBM

d. **Three (3)) Years Warranty (unit replacement , labor and parts)**
e. **3 year warranty/3 Year Foundation Care/3 Year Extended Service - Service - 8 x 5 Next Business Day - Service Depot – Exchange for Edge Switch POE 24 ports**
f. **3 year warranty and 3 Year Foundation Care Next Business Day Onsite (HL5Y5E) for Edge Switch POE 24 ports**
g. **INCLUDED: Additional Jumper Cable – ROW for Edge Switch POE 24 ports**
h. Globally known brand distributed in the Philippines via a locally declared company with global standard certifications like ISO, ITIL and D&B and engineers certified of the said brand
i. power plugs must be compatible with the PDUs in this Term of Reference

3. Edge Switch POE 48 ports (at least 14 units)

The edge switch POE should have the minimum or better specifications at listed below

a. Performance:
- At least System Switching Capacity: 880 Gbps
- At least System Throughput Capacity: 660 Mpps
- At least Stack Size: 10 member
- At least Max. Stacking Distance: Up to 10 kms with long range transceivers
- At least Stacking Bandwidth: 200 Gbps

b. Physical Interfaces:
- At least 48x ports Smart Rate 100M/1G/2.5G/5GBaseT Class 6 PoE ports supporting up to 60W per port
- At least 4x 1/10/25/50G SFP ports
- **At least 2 field-replaceable, hot-swappable power supply slots. 2 power supply must be installed and included**
- At least Delivers up to 2880W of Class 6 PoE Power
- At least Two field-replaceable, hot-swappable fan trays (included)

3. Management:
- SNMP
- RJ45 for Serial Console or USB - C Console Port
- USB-Type A for file management only
- RJ45 Ethernet for OOBM

d. Three (3) Years Warranty (unit replacement , labor and parts) **e. 3 year warranty/3 Year Foundation Care/3 Year Extended Service - Service - 8 x 5 Next Business Day - Service Depot – Exchange for Edge Switch POE 48 ports** **f. 3 year warranty and 3 Year Foundation Care Next Business Day Onsite (HR4Q8E) for Edge Switch POE 48 ports** **g. INCLUDED: Additional Jumper Cable – ROW for Edge Switch POE 48 ports** h. Globally known brand distributed in the Philippines via a locally declared company with global standard certifications like ISO, ITIL and D&B and engineers certified of the said brand i. power plugs must be compatible with the PDUs in this Term of Reference			

4. 42RU Network Cabinet (at least 3 units)

The 42RU Network Cabinet should have the minimum or better specifications at listed below

- **42 RU**
  - **42 RU, 800mm W x 1200mm D cabinet with top panel**
  - **The top of cabinet includes molded edge protection and snap-in covers and pre-installed in cable entry openings to prevent air leakage**
  - **Welded and assembled steel frame construction**
  - **Easy maintenance powder coat finish**
  - **Adjustable rear equipment rails with continuous positioning, fixed front rails**
  - **Large cable entry/cable access**
  - **Doors include keyed swing handles**
  - **Side panels**
  - **It includes two solid side panels, two sets of #12-24 threaded equipment mounting rails**
  - **Dual hinge door for maximum accessibility between adjacent cabinets**
  - **The dual hinge perforated front door opens to the left or right and the rear door is split perforated.**
  - **Cabinet supplied with 2 sets of high density cable management fingers**
  - **Cabinets shall include front and rear cable management fingers, the entire cabinet shall be fully electrically bonded, including equipment rails, door and side panels**
  - **Cable entry holes are equipped with plastic**

sealing plugs

- **UL 2416 standard compliant and have been static load tested to at least 1,000kg**
- **Support Optical distribution frame or tray**
- **EIA-310-E, TIA/EIA-942, UL Listed 2416, RoHS Compliant**
- **Rolling Load of at least 1,000kg**
- **Cabinet ships assembled, one per pallet**
- **Cabinets include hardware kit: #12-24 screws, or M6 screws and cage nuts**
- **Casters**
- **At least 2 units of PDUs for each rack are included. Installation and configuration of PDUs to the different power sources are included.**

- at least VERTICAL PDU at least (28) C13, (4) C19, 220-250v, 30amp, (METERED), 2-meter long wire with input plug C309

- Each PDU should have a at least 32 number of outlets(**(28)C13, (4)C19**) and should be the same brand with a 24ru cabinet and 42ru cabinet in this Term of Reference. Input Plug of the PDU should be compatible with the new and existing UPS.
- Support Angled Patch Panel
- Clip nuts included
- Inclusion of 35 units PDU Power Cord (C14 to C13) rated for core switches, switches, **servers**
- **Mounting and Positioning of Cabinets and PDU**

5. 24RU Network Cabinet (at least 13 units)

The 24RU Network Cabinet should have the minimum or better specifications at listed below

a. Enterprise cabinet, 24 RU, single hinge perforated front and rear doors with keyed swing handles, (2) solid single piece side panels with ┳ turn locks, and casters. Fully assembled.
   Dimensions: 46.7H x 23.5W x 42.0D (1187mm x 600mm x 1070mm).
   Color: Black
b. Rear Door Type: Single Hinge Perforated
c. Material: Steel
d. Front Door Type: Single Hinge Perforated
e. Number of Rack Units: 24
f. Casters: Yes

g. Static Load Capacity (kg): at least 567 h. Rolling Load Capacity (kg): at least 227 i. Finish/Coating: Powder-Coated j. Standards Meet: EIA-310-D, TIA/EIA-942, RoHS Compliant, UL 2416 k. Cooling Architecture: Containment l. Support Angled Patch Panel m. Support Optical distribution frame or tray **n. at least 1 Units PDU for each 24RU rack. For the total of 14 units of PDUs for at least 14 units of 24RU Network Cabinet. Installation and configuration of PDUs to the different power sources are included**			

p. at least Basic PDU, 16A 220V, (12) C13 and (4) C19 receptacles, 2-meter long wire with input plug IEC C20

q. Each PDU should have a at least 16 number of outlets (**(12)C13, (4)C19**) (the same brand with 24ru cabinet and 42ru cabinet in this Term of Reference). Input Plug of the PDU should be compatible with the new and existing UPS.

r. Mounting and Positioning of Cabinets and PDU

6. Uninterruptible Power Supply (UPS) 2000VA (at least 19 units)

The Uninterruptible Power Supply (UPS) 2000VA should have the minimum or better specifications at listed below

a. Backup time of at least 3 minutes at full load Load capacity of 2000 VA/2000 W

b. Auto self testing system

c. Communication: USB/SNMP

d. Double-conversion On-Line UPS System

- Input and Output Voltage at 230 VAC with 60Hz
- No Load Shutdown (all outlets should have battery backup)
- Related cables and accessories
- Comes complete with sealed free-maintenance batteries
- **UPS and battery must have at least Three (3)years warranty**

e. User Interface: LCD with audible alarm

f. Outlet Receptacle: 8 IEC C13 Outlets

g. power plugs must be compatible with the PDUs in this Term of Reference

h. Mounting and Positioning of UPS

i. **RDU101 Web/SNMP management card for On-Line Uninterruptible Power Supply (UPS) 2000VA** j. **EXTENDED BATTERY CABINET 48VDC for On-Line Uninterruptible Power Supply (UPS) 2000VA, Rail Kit Bundled**			

7. Multi-WAN Internet Load Balancer

The Multi-WAN Internet Load Balancer should have the minimum or better specifications at listed below

Minimum specifications:

- Ethernet WAN Ports: 13 (GE)
- LAN Ports: 3 (GE)
- USB WAN Modem Port: 1
- Recommended Users :1000-5000
- Stateful Firewall Throughput: 5Gbps
- 802.1q VLANs Supported: 1024
- Port-Based VLAN
- Load Balancing & Failover
- Load Balancing Algorithms: atleast 8
- Drop-In Mode
- Inbound Load Balancing
- Cloud Management
- VPN
- Hot Failover
- WAN Smoothing
- Bandwidth Bonding
- VPN Throughput (256-bit AES)/(No Encryption) : atleast 800Mbps
- IPsec VPN (Network-to-Network)
- Number of IPsec Tunnels: atleast 400
- Remote User Access
- L2TP VPN Server
- OpenVPN Server
- PPTP VPN Server
- Recommended PPTP/L2TP/OpenVPN Users: atleast 500
- GRE (Network-to-Network): atleast 5
- Bandwidth Usage Monitor
- QoS for VoIP and E-Commerce

- User Groups Bandwidth Control
- Web Blocking
- Full Web Filtering Blacklist
- LACP (802.3ad) NIC Bonding
- High Availability
- LAN Bypass
- FCC, CE, RoHS
- **Warranty: Three (3) Years(unit replacement , labor and parts)**
- **EssentialCare/Extended Warranty (3-Years) for the Multi-WAN Internet Load Balancer**

power plugs must be compatible with the PDUs in this Term of Reference

8. Wireless Access Controller

- WLAN controller must be the same brand and at least the same model or better with existing Wireless Access controller which is the Aruba 7205 Mobility Controller
- WLAN controller should be an enterprise-class switch and scalable which will connects, controls, manage and intelligently integrates wireless Access Points (WAPs) and RF Monitors into the wired LAN.

- Can be configured for redundancy, in any combination of HA Deployment Models can be used:
    - ➔ Master / Standby Master with HA Active-Active Local Controllers — Full redundancy
    - ➔ Master with HA Active-Standby Locals — N+1 Redundancy with Over-subscription
    - ➔ Master-Local HA Active-Active or Standby-Active — Master Active or acting as backup LMS
    - ➔ Independent Masters HA Active-Active — No local controllers, each master acting as backup for the other

- WLAN controllers must support 802.11n with backward compatibility to a/b/g
- WLAN controllers must support 802.11n WAP with backward compatibility to a/b/g
- Uplink port that supports; at least 10/100/1000Mbps (10/100/1000Base-T) copper port

● All ports automatically sense and negotiate speed, duplex, and MDI/MDX Settings ● High-speed Layer-2/Layer-3 packet forwarding ● The WLAN controllers must support seamless roaming across the University of the Philippines in Mindanao subnets ● To maintain the health of WLAN, controller must capable of monitoring Switch and control the wireless network to reconfigure access point parameters as needed to maintain high service levels ● WLAN controllers must perform tasks such as client authentication, policy enforcement, configuration control, fault tolerance and network expansion. ● High-performance packet processing provides value-added wireless services such as load balancing, rate limiting, self-healing, calibration, authentication, mobility, security, firewalls, encryption, intrusion detection and mitigation, centralized monitoring and configuration ● WLAN controller must work seamlessly with all the wired LAN equipment ● WLAN controllers must support multiple APs per UP Mindanao buildings and offices and multiple users and sessions. ● The controller firmware can be easily upgraded, as future software releases are made available ● The controller must support 802.11e and Quality of Service (QoS) ● The controller must support redundancy ● Can be mounted in a standard 42U (19-inch) network equipment rack ● Mounting kits and railings must included ● **Three (3) Years Warranty(unit replacement , labor**			

and parts)

- **3 year warranty and 3 Year Foundation Care Next Business Day Onsite (H3CX5E) for Wireless Access Controller**

9. Wireless Access Point (at least 90 units)

The Wireless Access Point should have the minimum or better specifications at listed below

Technical Specifications:

- AP type: Indoor, dual/tri-radio, 5GHz and 2.4GHz 802.11ax 4x4 MIMO
- 5GHz radio (dual-radio operation): Eight spatial stream Single User (SU) MIMO for up to 4.8Gbps wireless data rate with individual 8SS HE80 (or 4SS HE160) 802.11ax client devices, or with eight 1SS or four 2SS HE80 802.11ax MU-MIMO capable client devices simultaneously
- 5GHz radio (tri-radio operation*): Four spatial stream Single User (SU) MIMO for up to 2.4Gbps wireless data rate with individual 4SS HE80 (or 2SS HE160) 802.11ax client devices, or with four 1SS or two 2SS HE80 802.11ax MU-MIMO capable client devices simultaneously
- 2.4GHz radio: Four spatial stream Single User (SU) MIMO for up to 1,150Mbps wireless data rate with individual 4SS HE40 802.11ax client devices or with two 2SS HE40
- 802.11ax MU-MIMO capable client devices simultaneously
- Support for up to 1,024 associated client devices

per radio* (typical recommended limit for active clients is 200), and up to 16 BSSIDs per radio

- Supported frequency bands (country-specific restrictions apply):

  2.400 to 2.4835GHz (radio 1)
  5.150 to 5.250GHz (radio 0 and 0L)
  5.250 to 5.350GHz (radio 0 and 0L)
  5.470 to 5.725GHz (radio 0 and 0U)
  5.725 to 5.850GHz (radio 0 and 0U)

- Available channels: Dependent on configured regulatory domain
- Dynamic frequency selection (DFS) optimizes the use of available RF spectrum
- Supported radio technologies:

  802.11b: Direct-sequence spread-spectrum (DSSS)
  802.11a/g/n/ac: Orthogonal frequency-division multiplexing (OFDM)
  802.11ax: Orthogonal frequency-division multiple access (OFDMA) with up to 37 resource units (for an 80MHz channel)*

- Supported modulation types:

  802.11b: BPSK, QPSK, CCK
  802.11a/g/n: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM (proprietary extension)

802.11ac: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM (proprietary extension)
802.11ax: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM

- 802.11n high-throughput (HT) support: HT20/40
- 802.11ac very high throughput (VHT) support: VHT20/40/80/160
- 802.11ax high efficiency (HE) support: HE20/40/80/160
- Supported data rates (Mbps)

802.11b: 1, 2, 5.5, 11
802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54
802.11n: 6.5 to 600 (MCS0 to MCS31, HT20 to HT40), 800 with 256-QAM
802.11ac: 6.5 to 1,733 (MCS0 to MCS9, NSS = 1 to 4, VHT20 to VHT160), 2,166 with 1024-QAM
802.11ax (2.4GHz): 3.6 to 1,147 (MCS0 to MCS11, NSS = 1 to 4, HE20 to HE40)
802.11ax (5GHz): 3.6 to 4,804 (MCS0 to MCS11, NSS = 1 to 8, HE20 to HE160)

- 802.11n/ac packet aggregation: A-MPDU, A-MSDU
- Transmit power: Configurable in increments of 0.5dBm
- Maximum (aggregate, conducted total) transmit power (limited by local regulatory requirements):

2.4GHz band: +24dBm (18dBm per chain)

5GHz band: +27dBm in dual-radio mode, +24dBm in tri- radio mode (18dBm per chain)

Note: conducted transmit power levels exclude antenna gain. For total (EIRP) transmit power, add

antenna gain.

- Advanced Cellular Coexistence (ACC) minimizes the impact of interference from cellular networks
- Maximum ratio combining (MRC) for improved receiver performance
- Cyclic delay/shift diversity (CDD/CSD) for improved downlink RF performance
- Space-time block coding (STBC) for increased range and improved reception
- Low-density parity check (LDPC) for high-efficiency error correction and increased throughput
- Transmit beam-forming (TxBF) for increased signal reliability and range*

802.11ax Target Wait Time (TWT) to support low-power client devices*

a. Locations of Wireless Access Points (WAPs) in all buildings and offices must be optimal to achieve total performance desired throughput.

b. WAPs have to be small, lightweight and can be securely deployed in a variety of locations such as on walls, cubicles, desktops, and in the ceiling.

c. The WAP antenna diversity should allow for the best possible signal processing using dual, Omni-directional antennas and directional antennas and other type of antennas that will assure signal strength in all areas.

d. WAPs should work with the existing centralized wireless controllers(ARUBA Controller 7205) to provide a high performance, centrally managed, wireless mobility solution for the UP Mindanao network. WAPs should have an extended lifespan and can be configured manually or automatically across any L2/L3 network, allowing easy upgrades when new features, capabilities, or standards emerge.

e. WAPs should function as “thin” WAPs which would provide 802.11n with backward compatibility to a/b/g user access. Functions should also include but not limited to wireless user authentication, link layer encryption, VPN termination. Support roaming and low-latency handoffs between APs, ideal for handling delay-sensitive applications such as voice over wireless.

f. WAP 802.11 services must be controllable

g. WAPs must supports operation in the radio frequency bands that will take advantage of higher density AP deployment, better overlapping coverage and reduced interference from other technologies (medical equipment,

microwave ovens, cordless phones, Bluetooth devices) h. WAPs activity must be coordinated by an existing wireless centralized controller (Aruba 7205). Supplier shall propose, create, configure and deploy a new university network design and topology that maximize the capabilities of the core switches, the EDGE Switches POE, Multi-WAN Internet Load Balancer with the existing firewalls (Palo Alto PA820,Palo Alto PA500) and switches and the existing centralized controller (Aruba 7205). This is also subject to the approval of the end users. i. RF Management software must be available to automatically support channel selection, power levels, load balancing and failover j. WAPs must support Power-over-Ethernet standard beyond 802.3af k. WAPs may supports 802.11e and Quality of Service (QoS)			

l. WAPs must support access via Ethernet m. Necessary licenses of each WAPS must be included and installed by the supplier in the centralized controller (Aruba 7205) n. Globally known brand distributed in the Philippines via a locally declared company with global standard certifications like ISO, ITIL and D&B and engineers certified of the said brand **o. Warranty: Three (3) Years(unit replacement , labor and parts)** **p. 3 year warranty and 3 Year Foundation Care Next Business Day Exchange (HG6M3E) for Access Points** **q. AP-MNT-MP10-D AP mount bracket 10-pack D for Wireless Access Point (9 units)** **r. Aruba LIC-AP Controller per AP Capacity License E-LTU per AP (90 units)** **s. Aruba LIC-PEF Controller Policy Enforcement Firewall Per AP License E-LTU per AP (90 units)** **t. Aruba 3Y FC 24x7 License PEF Cn SVC [for JW473AAE] per AP (90 units)** **u. Aruba 3Y FC 24x7 Ctrl perAP Cap ELTU SVC per AP (90 units)**			

10. Virtualization Platform Hypervisor license should be able to provide license for at least 12 Processors and at least 6 servers. Must be brand agnostic in terms of supported hardware, guest OS and applications. Hypervisor vendors must be able to provide a roadmap to support disaster recovery automation for DR purposes. Must provide a virtualization management console that can deliver the different features and functionalities. Must be able to live-migrate virtual machine workloads from one host to another. Must be able to discover and provide inventory of the whole virtualized environment through a single window. Must be able to convert, create and deploy VMs. Must be able clone VMs and create templates. Must be able to provide health monitoring, performance analytics, capacity management through a single operations dashboard. Must be able to increase capacity by adding CPU, memory or devices to VMs when needed without disruption or downtime. Must support snapshots. Must be able to create virtual switches that have VLANs for network segregation. Must be able to leverage agent-less anti-virus solution to offload AV processing from the virtual machines. Supply, installation, setup and configuration of Hypervisor for Virtualization for 6 servers.This kit includes 12 CPU licenses of vSphere Essentials Plus (for 6 servers with up to 2 processors each) and 2 licenses for vCenter Server Essentials. Six servers are provided by the end user. Warranty: Three (3) Years			
11. Structured Cable System (at least 650 nodes)			

GENERAL SPECIFICATIONS

a. Cat 6a Unshielded Twisted Pair (UTP) Cable shall be primarily used for distribution that will run through from IDF to Switches and Routers.
b. All cable trays for horizontal home runs shall be sized accordingly based on the number of nodes per floor with at least thirty percent (30%) provision for expansion. Minimum size of cable tray should be at least 300mm width and 100mm depth (W x D);
c. All cable trays/ladder shall be powder coated or hot dip galvanized and all conduits for horizontal home runs shall be PVC with connector coupling;
d. Deployment and installation of network racks are related to structure cabling technical implementation.
e. The length of each individual run of horizontal cable from the TR to the TO shall not exceed 90m
f. The Contractor shall observe the bending radius and pulling strength requirements of the horizontal cable during handling and installation
g. Each run of cable between the TR and the TO shall be continuous without any joints or splices, except where consolidation points are required
h. Installation practice shall comply to manufacture best practices
i. The cable manufacturer shall be ISO 9001 and 12001 registered
j. The contractor shall install/mount the new access points and the existing access points provided by the end user
k. The Locations of at least 650 nodes will be finalized once the project is awarded to the winning bidder since new buildings may be finished during the duration of the bidding. The end-user has the right to re-allocate the

nodes depending on the availability of the new building.			

ELECTRICAL WORKS

a. Electrical works shall comprise the supply and installation of power outlets and electrical provisions for the cabinets if no existing electrical provisions.
b. The installation of all electrical works shall be done in accordance with the provisions of the latest edition of the Philippine Electrical Code, the laws and ordinances of the local code enforcing authorities
c. The wiring to be used shall be 3.5mm sq. or better THWN or THHN concealed on modular panel base plate and use of aluminum threshold for connection to other workstations. Use of Mica Tubing shall be limited to a length of six inches (6") on outlet termination and there shall be no open wiring, no exposed or dangling wires seen at the work stations.

PASSIVE COMPONENT

1. Category 6a Cables (150 box roll(305 meters per box roll))

The Category 6a Cables should have the minimum or better specifications at listed below

a. Category 6A/Class EA cable shall be constructed of 23 AWG copper conductors with PVC (CM) insulation. The copper conductors shall be twisted in pairs and separated by a cross-divider. All four pairs shall be surrounded by MaTriX tape(or its equivalent or better) and a flame retardant jacket. The advanced MaTriX tape shall suppress the effect of alien crosstalk allowing

10Gb/s transmission, while minimizing cable diameter. The innovative cable design shall provide installation flexibility as cables can be routed in tight bundles through pathways and spaces

b. Horizontal cabling shall be 23 AWG, 100-Ohm, 4-pair UTP; UL/NEC CM rated, round design, round solid filler, non-bonded pairs, in PVC jacket.
c. Cable jacketing shall be lead-free.
d. Cable performance characterized up to 600MHz.
e. Cables must not exceed 100 meter distance from the IDF/MDF
f. All cables must have fluke test result
g. Cable shall meet or exceed the performance requirements of ANSI/TIA/EIA-568B.2-1. Must be confirmed by an independent testing laboratory.
h. Must be Gigabit Ethernet Zero-bit Error Rate tested and confirmed by an independent testing facility.
i. Cable shall be UL listed.

2. Category 6a Patch Panels

The Category 6a Patch Panels should have the minimum or better specifications at listed below

a. Loaded 24 ports CAT-6a Angled All Metal Shielded Modular Patch Panels loaded with Shielded Jack Modules that support 10GBASE-T certified performance with the needed accessories
b. Category 6A/Class EA, 8-position, UTP jack module shall terminate 4-pair, 22 – 26 AWG, 100 ohm unshielded twisted pair cable and shall not require use of a punchdown tool. The termination cap shall be color-coded blue to designate Category 6A performance and shall include a universal label coded for T568A and T568B wiring schemes. The Mini- Com® TX6A™ 10Gig UTP Jack Module must be installed as part of the TX6A™ 10Gig UTP Copper Cabling System to achieve IEEE 10GBASE-T certified performance.
c. Patch panels shall be 1RU and provide 24 modular jack ports, with universal wiring that may be terminated to T568A or T568B.
d. Patch panel modular jacks shall be configured as 6-port, replaceable modules.
e. The front of each module shall be capable of accepting 9mm to 12mm labels. Each port shall be capable of accepting an icon to indicate its function.
f. Patch panel shall terminate the building cabling on 110-style insulation displacement connectors.
g. Patch panel shall meet or exceed the performance requirements of ANSI/TIA/EIA-568B.2-1.
h. Patch panel must be UL Listed.
i. High density 1RU 48-port or 2RU 72-port configuration might be used if rack space is limited

3. Category 6a Data Outlet/Modular Jacks

The Category 6a Data Outlet/Modular Jacks should have the minimum or better specifications at listed below

a. Category 6A/Class EA, 8-position, UTP jack module shall terminate 4-pair, 22 – 26 AWG, 100 ohm unshielded twisted pair cable and shall not require use of a punch down tool. The termination cap shall be color-coded blue to designate Category 6A performance and shall include a universal label coded for T568A and T568B wiring schemes. The Mini-Com® TX6A™ 10Gig UTP Jack Module must be installed as part of the TX6A™ 10Gig UTP Copper Cabling System to achieve IEEE 10GBASE-T certified performance.
b. Modular jacks shall be terminated using an 110-style pc board connector, color-coded for both T568A and T568B wiring.
c. Category 6a modular jacks shall meet the performance requirements listed in ANSI/TIA/EIA-568B.2-1.
d. Flexibility to support 180º or 90º cable termination with bend-limiting strain relief.
e. Modular jack shall be UL Listed

4. Faceplates

The Faceplates should have the minimum or better specifications at listed below

a. Must be surface-mounted, 2-port single-gang.
b. Each port shall be provided with an icon to indicate its

function.

c. Faceplates shall accommodate two labels and provide a clear polycarbonate cover for each. Faceplates shall be **PVC Faceplate**.
d. Should be compatible with the Category 6a Data Outlet/Modular Jacks in this Term of reference
e. Should be the same brand with cat6a cable, Category 6a Patch Panels,
Category 6a Data Outlet/Modular Jacks

5. Category 6a Patch Cords

The Category 6a Patch Cords should have the minimum or better specifications at listed below

a. Category 6A/Class EA, UTP patch cords shall be constructed of 24 AWG stranded copper cable with an enhanced performance modular plug on each end. Copper conductors in patch cable shall be twisted in pairs and separated by a quadrant separator. All four pairs shall be surrounded by **matrix tape** and a flame retardant jacket. The patent pending matrix tape shall suppress alien crosstalk and allow 10 Gb/s transmission. Patch cord cable shall be offered in multiple colors and lengths for design flexibility with a strain relief boot on each modular plug. All patch cords shall be compatible with both T568A and T568B wiring schemes.
b. Patch cable assemblies must be factory-manufactured with stranded **CM UTP cable** and color-matched snag

less rubber boots.

c. Work area at least patch cords (**650 units**) shall be at least 10 meters while equipment patch cords at least (**650 units**) shall be 3 meters in length.
d. One patch cord per user outlet and equipment connectivity must be provided.
e. All Cat6a patch cords shall be factory terminated
f. All patch cord shall have Labels on it to provide identification of performance level, length and quality control number
g. All patch cord shall be compatible with optional RJ45 plug lock-in device to prevent unauthorized removal of cable, IP phone, other networking equipment, or critical connection

6. Cable Organizer

The Cable Organizer should have the minimum or better specifications at listed below

a. Vertical cable management hardware must be compatible and the same brand with the cabinet in the Term of Reference. 22 RU, 5 inches wide x 12 inches deep, includes dual-hinging covers, finger material is ABS and is black and Manager, cover, hardware kit for 24 RU Cabinet. Dual-sided, Steel, 42RU, finger material is ABS, Black, 1pc, Includes two full-length metal, dual-hinging, push-to-close doors and With manager, two doors, hardware kit for the 42 RU Cabinet.
b. Must have black-coated finish.

Labeling

All jacks, panels and frames shall be clearly labeled. Labels should be tamper resistant and made with a label maker at the station end. Data frames should be created with a label maker. Label color shall be black on white and a CD/DVD copy of the labeling software including label sheets/package shall be provided to UP Mindanao. Label sheets shall be both laser and inkjet compatible.

CAT 6a UTP Cable Installations

Tester: Shall pass the following end-to-end Testing Parameters using Level III Cable ● Attenuation ● Attenuation to Crosstalk Ratio (ACR) ● PowerSum Attenuation to Crosstalk Ratio (PSACR) ● Near End Crosstalk (NEXT) ● PowerSum Near-End Crosstalk (PSNEXT) ● Equal Level Far-End Crosstalk (ELFEXT) ● PowerSum Equal Level Far-End Crosstalk (PSELFEXT) ● Return Loss ● Propagation Delay ● Delay Skew ● Transfer Impedance ● Fluke test			

Distribution of Nodes

Location	Nodes
CHSS BUILDING 1ST FLOOR	82
CHSS BUILDING 2ND FLOOR	90
CHSS BUILDING 3RD FLOOR	8
CSM BUILDING 1ST FLOOR	90
CSM BUILDING 2ND FLOOR	90
Aruba Access Points	140
CARIM / OR, Staff Housing and other new Buildings Structured Cabling	150

VII. DELIVERY AND IMPLEMENTATION

1. The winning bidder shall submit Project Management Plan Fifteen (15) calendar days upon receipt of Notice to Proceed for the implementation of the proposed solution that is subject for review and approval of the UP Mindanao. The project Management Plan Shall include but not be limited to the following:
   - Scope of Work
   - Project Organization
   - Implementation Methodology
   - Project Timeline
   - Communication and Deployment Strategy
   - Capacity Building Program Strategy

   The Project Management Plan should also include the

deployment of project personnel to be assigned in UP Mindanao in the duration of the project. 2. Supply, Delivery, Installation, Testing and Commissioning shall be within two hundred seventy (270) calendar days from the approval of the Project Management Plan. 3. The winning bidder shall submit manufacturer's certification as the distributor or dealer/reseller of the offered product as a requirement for issuance of Certificate of Acceptance.			

VIII. OTHER REQUIREMENTS

A. MAINTENANCE, SUPPORT AND WARRANTY

1. Provide Three (3) years maintenance support and services to include
   - 12 Hours per day (Monday-Friday) Technical Support (should be physically Davao Based)
   - Next Business Day Response Time
   - Provide Comprehensive Disaster Recovery Procedure
   - Project focal person where the UP Mindanao ITO personnel can directly communicate with to address concerns
2. The Bidder shall provide technical support via telephone/fax, on-site assistance to resolve technical and other related problems. Resolution can be delivered in the form of telephone, electronic and/or on-site resolution. It shall refer to a condition wherein the reported problem is resolved by the proponent to the satisfaction of the end-user. However, the end-users have the right to insist for on-site resolution if the end-user wants it.
3. The proponent shall resolve a problem within twenty-four (24) hours after it was reported by UPMin in any available and fastest means of communications.
4. Established procedure on support and problem escalation
5. Provide on-call and on-site (if requested by the end user) support personnel for three years after the acceptance of the project.
6. Within the warranty period, equipment that cannot be repaired within twenty- four (24) hours shall be immediately replaced with a service unit of similar specifications or better.
7. The Contractor shall guarantee that the entire structured

cabling and networks are free from all defective workmanship and materials, and will remain so for the period of:

- 25 Years of Product Warranty from the Cabling Manufacturer of the Product Offered.
- Minimum Three (3) Years Warranty on Workmanship

9. Inspection and cleaning of data cabinets, switches, and routers shall be done by the bidder on a quarterly basis.
10. To provide monthly maintenance for the duration of the warranty period, adequate supply of parts must be readily available.

B. RISK MANAGEMENT PLAN

The winning bidder shall submit a Risk Management Plan prior to UPMin's acceptance. Risk Management Plan shall include the following among others:

- Step by step procedures to be undertaken during disaster must be clearly identified to avoid loss of data.
- Retrieval and restoration procedure that includes troubleshooting flowchart shall be incorporated in the plan.
- Personnel responsible to undertake the plan and procedures shall be identified and drawn up in the Risk Management Plan Organizational Chart.

C. PROVISION OF DOCUMENTATION

1. The solution provider shall provide complete documentation for every deliverable and at every end of each development stage and milestone which must be submitted to the Information Technology Office for approval. UPMin shall own any and all documents and shall reserve the right to reproduce at no additional cost.
2. The documentation must be written in English of durable construction with concise and high quality presentation to include but not limited to the following:

Technical Manuals

- As built documents
- Infrastructure Diagrams and Topology
- Troubleshooting and Installation Guides
- Single Line Diagram
- System/Operation Manual
- Documentation and Tagging Summary

Operational Manuals

• User Manuals (for Operations) • Disaster recovery Plan			

D. TRAINING AND TECHNOLOGY TRANSFER

1. The contractor must provide advance training for at least four (4) IT Personnel for the new and existing ICT Network Equipment, basic troubleshooting for the Structured Cabling and Management of the Data Center for at least five (5) days.
2. To ensure that proper maintenance and sustainability an appropriate training shall be conducted by the proponent as Essential part of Technology Transfer to prepare and equip UPMin and its personnel in the overall operations and maintenance of its new Network Infrastructure and architecture.
3. The proponent shall submit a Program of Instruction (POI) detailing all the training activities to be conducted for review, evaluation and approval of UPMin. Hands-on training shall form part of the training program.
4. Operation and Training manuals shall be provided to each participant.
5. The Training shall be conducted and completed prior to the formal turnover and acceptance.
6. All expenses related to training (e.g. venue, meals, equipment, certificate..) shall be borne by the proponent.
7. Venue of Training shall be determined by the proponents unless UPMin opted to conduct said training inside UPMin premises.
8. Certificate of Participations/ Attendance to Training/s shall be given to all participants.
9. All documents and manuals must be submitted before project acceptance.

E. REMOVAL OF DEFECTIVE UNAUTHORIZED

WORK

Any defective work and equipments(new and existing), whether the result of poor workmanship, defective materials, damaged through carelessness or any other cause, found to exist prior to acceptance, shall be removed immediately and replaced by work and material and equipments which shall conform to the approved specifications, or shall be otherwise remedied in an acceptable manner. This clause shall have full effect regardless of the fact that the work may have been done with the approval of UPMin or its representative.

IX. INSPECTION, TESTING, ACCEPTANCE AND PAYMENT

A. PRE-BID SITE INSPECTION

The providers may conduct a pre-bid site inspection so they could assess the needs of the end users

Actual Site Inspection Details: Date and Time: 9AM-4PM (Weekdays only) ***Contact Person:*** Prof. Vicente B. Calag, ITO Director 092-57596645 vbcalag@up.edu.ph Mr. Bob Navarrete 09---------- bsnavarrete@up.edu.ph ***Meet-up location:*** ITO, G/F Administration Building, UP Mindanao, Mintal, Davao City Safety Protocols: must wear face mask and face shield. Site Inspection Certificate will be issued by the ITO. ***Note:*** 1. Those who will conduct site inspection should inform the ITO via email ahead of time. **B.INSPECTION AND TESTING** 1. All ICT Equipment, cables and termination hardware shall be 100% inspected and tested for defects in installation and to verify ICT Equipments and cable performance under installed conditions. Any defect in the ICT Equipment and cabling system installation including but not limited to cable, connectors, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% usable conductors in all cables installed. 2. Submit the corresponding reports of the testing		

conducted. **C. ACCEPTANCE** A certificate of acceptance for any of the bid items shall be issued by UPMin only after completion of the scope of work and compliance to all the requirements. **C. PAYMENT** The source of funds for this project is the University of the Philippines System and payment shall be made after the completion and acceptance of the project.		

Prepared by:

Bob Mitzel S. Navarrete
UP Mindanao IT office

Signature of Representative

Name of Representative

Position

Company

Address

Telephone/Fax/Email

Distances of Various Buildings to the ITO Data Center

West of Data Center

#	NAME	Distance in Meters	
1	Proposed Student Center and Convergence Park	205	m
2	CARIM	205	m
3	Proposed CHSS Performing Arts Theater	322	m
4	AI and Data	324	m
5	Proposed RDE	410	m
6	CSM Dormitory	500	m
7	Proposed College of Med	512	m
8	Proposed CSM Acad Building	515	m

9	**CSM Existing**	**520**	**m**
10	**Proposed NICER**	**600**	**m**
11	**Proposed CHSS Academic Building**	**635**	**m**
12	**Proposed PGC**	**682**	**m**
13	**Proposed Hospital Expansion to Level 3**	**717**	**m**
14	**Proposed MCID**	**754**	**m**
15	**Proposed Hospital**	**838**	**m**
16	**Proposed College of Human Kinetics**	**851**	**m**
17	**Proposed Expansion Area**	**1040**	**m**
18	**Proposed Throwing Field**	**1047**	**m**
19	**Proposed Sewage Treatment Plant**	**1149**	**m**
20	**Football Stadium Phase 1-2**	**1178**	**m**
21	**Training Gym**	**1211**	**m**

22	**Proposed Floating Garden**	**1230**	**m**
23	**Aquatics Center**	**1238**	**m**
24	**Water Tank**	**1383**	**m**
25	**Proposed Athletes Dorm**	**1388**	**m**
26	**Proposed Arena**	**1401**	**m**
27	**Proposed Transport Hub**	**1478**	**m**
28	**Football Stadium Phase 456**	**1497**	**m**
	SUB TOTAL	**23830**	**m**
		23.83	**Km**

Distances of Various Buildings to the ITO Data Center

East of Data Center			
#	NAME	Distance in Meters	
29	Proposed Indigenous Mat Dev and Testing Lab	228	m
30	Proposed S&T Park	315	m
31	CHSS Cultural Complex	465	m
32	Proposed Carillon	480	m
33	Library	492	m
34	Proposed AIR	516	m
35	Student Dormitory	516	m
36	EBL Dormitory	592	m
37	Former HKC Building	644	m
38	SOM 1 and 2	711	m
39	Proposed SOM 3	803	m

40	**Faculty and Staff Housing**	**813**	**m**
41	**Kalimudan**	**856**	**m**
42	**Proposed DA Construction Lab**	**866**	**m**
43	**CTCL**	**870**	**m**
44	**Admin Building**	**871**	**m**
45	**Infirmary**	**880**	**m**
46	**Proposed Amphitheater**	**900**	**m**
47	**Proposed MRF**	**1081**	**m**
48	**H2O**	**1188**	**m**
	SUB TOTAL	**14087**	**m**
		14.087	**Km**

Two (2) Tier Collapsed Core Architecture