

TERMS OF REFERENCE ICT Local Area Network (LAN), Wireless LAN (WLAN) and Data Centre for UNDP Office in BEIRA, Mozambique

1. Objectives

The present Terms of Reference aim to provide the minimum specifications the Contractor shall provide to UNDP as part of their proposal for installation, configuration, patching, testing, labelling and documentation of the Datacentre, Local Area Network and Electrical Power cabling for ICT Systems for UNDP Field office in Beira. The installation is expected to be **highly scalable and reliable**.

2. Background

UNDP BEIRA Office is currently located in Av. Mártires da Revolução, 2501 e 4493, Beira, Sofala, Mozambique. It currently has an estimate of 20 end-users; connected through an inter-office LAN and Data Connectivity System. The LAN connection is also used for DATA, Security Cameras, VoIP communications, videoconferences and building management systems. In this regards UNDP will require a unified Wired and Wireless Local Area Network (LAN) installed and configured at the office site using Fibre and CAT6 Specifications.

3. Technical Requirements

3.1 Local Area Network

Supply and Installation of structured IP Telephony ready LAN Cabling which should include:

- Industry standard Cat6 Cable, face plates, patch panels, fly leads, patch cords and any other appropriate accessories.
- LAN should include the copper cabling based on Unshielded Twisted Pair wires
- Supply of network ports/outlets,
- The LAN is to use Cat6 UTP copper wiring for horizontal cabling (Industry standards 1000Base-T, Power over Ethernet 802.3af or 802.3at).
- Supply of new CAT6 cables to be routed to the wiring closets/cabinets located at strategic locations on each floor.
- Fibre wiring through multimode fibre optic connections.
- All floor switches should be connected to Core Switch in the Datacentre by Fibre
- Each wiring must be properly protected and fixed to the walls and ceilings by using the technology standards to avoid electrical interference and maximum throughput.
- External wiring should be protected from environment.
- The solution must be aesthetically well presented.
- Point-to-point, port-by-port testing of the complete wiring solution.
- Labelling of ports on both ends as well as labelling of patch panels
- Service provider must indicate in detail how the new LAN will be installed without disrupting day-to-day operations.
- To follow the guidelines described in the rest of this document

3.2 Wireless Local Area Network

Implement a Full Wireless Environment as detailed below:

- Analysis of the radio frequency environment, optimize Access Points positioning.
- Coverage areas. Users will need access to the wireless network. They might not only need connectivity in their offices and conference rooms, but they may also need connectivity inside utilities rooms and the cafeteria.
- Ensure to identify whether users are mobile or stationary, which provides a basis for including enhanced roaming in the design.
- Client devices. Ensure the solution accommodates for wireless phones, laptops running Microsoft Windows with integrated 802.11b/g/n/ac radios.
- Identify locations for Access Points.
- Minimize WLAN Interference

3.3 Data Center/Server Room Standards

Component	Standards
Server room physical security	<ul style="list-style-type: none">a) Server room should be located in a flood-proof environment above ground and towards the back of the office building away from any roads.b) Server room must have separate set of keys from the rest of the doors/offices. Combination lock or card-key based locking mechanism preferred to simplify access controlc) Access should be limited to staff that require physical access to servers and other equipmentd) Vendors must be accompanied when working in Server roome) Access list must be reviewed at least on a bi-annual basisf) No flammable materials should be stored inside the Server roomg) Backup tapes should be stored at an off-site location and properly catalogued
Power	<ul style="list-style-type: none">a) Allow 5-7 kilowatts of power for each rack, 24-30 kilowatts if using blade serversb) Power must be conditionedc) Equipment should be on dedicated circuitsd) On-line UPS is recommended with backup power of at least 15 minutese) If power is expected to be interrupted for more than 15 minutes, equipment must be shut downf) If there is regular power interruption, stand-by generators must be provided. If so, ensure that there is fuel delivery for the generators for extended power interruptionsg) Ensure that equipment are properly protected from lightning strikes. Ensure that grounding is adequately implemented so that protection is effective for the antennas, lightning protection systems and for the electrical power distribution.

Component	Standards
Climate control	<ul style="list-style-type: none"> a) Server room must maintain ambient temperature of 68° to 75°F (20° to 24°C). Temperature should not exceed 85 degrees. Calculate the heat generated by your equipment, the size of the room, and your cooling load to be able to maintain ideal temperature. Approximately, every 3,000 Watts (approximately 25 amps at 120 volts) requires 10,200 BTU of cooling b) If you have a large data center with several aisles of racks, ensure that this temperature is maintained across all aisles. 'Hot aisle – Cold aisle' configuration must be implemented c) Relative humidity should be maintained at 45%-55% d) Ensure dust-free environment in Server rooms
Environment monitoring	<ul style="list-style-type: none"> a) Smoke, fire and water-condition alarms with paging capabilities should be installed in Server room
Fire suppression	<ul style="list-style-type: none"> b) Fire suppression system must be in place with preference given to electrically safe systems such as FM-200. c) If water sprinklers are used, automatic emergency power shut-off must be in place. d) In case there is no automatic fire suppression system, Class I fire extinguishers must be put inside and by the entrance outside of the room with count 1 gallon (4 liters) per cabinet.

4. Additional Notes

- The Contractor before submitting a proposal, shall conduct a site visit to the new premises with UNDP ICT unit to discuss the site lay out and plans to fully understand the nature and scope of the work. **UNDP will provide the following:**
 - ✓ Cisco Meraki Switches and Access Points
 - ✓ SFP Modules
 - ✓ Air Conditioners for Datacentre
 - ✓ UPS systems
 - ✓ Racks for the Server Room and Cabinets for the Floor Switches (additional cabinets will be provided by vendor if needed).
- Under the normal circumstances all problems should be resolved within maximum 24 hours after the notification from UNDP received.
- UNDP may wish to visit the Contractor's previous installations.
- The successful Contractor must have a physical presence, including availability of 7x24x365 coverage for technical support and/or helpdesk facilities, in the country.

5. Expected Key Results

Working in partnership with UNDP ICT Unit, the Contractor is expected to undertake the following activities:

- Install an integrated Local Area Network (LAN).
- Connect all Access/Floor Switches to Core Switch to be in the Datacentre via Fibre
- Test and Certificate each installed cable
- Label all cabling by using agreed format with the ICT Unit
- Provide documentation details for the new LAN
- Contractor shall also specify the warranty period associated with the supplied LAN products making up the structured cabling solution

6. Maintenance Services and Warranty

The Contractor shall provide technical support for period of 3 months after successful installation of LAN which includes: troubleshooting and replacement of Network Nodes; maintenance of cabling, ducting, nodes. The Contractor shall also specify the warranty for all LAN products

7. Documentation (Duplicate)

The documentation is a fundamental element for the operation and especially network maintenance. The Contractor shall also provide complete documentation of IT equipment, LAN architecture design with comprehensive diagram of LAN structure including the exact layout of cables in soft and printed form, after completion

8. Reporting Mechanisms

The ICT Contractor will have a dual reporting arrangement: to UNDP ICT unit.

9. Implementation Timeline

All installation works should be accomplished and commissioned within 15 days after the signing of the Contract.

10. Payment

Payment will be as per RFQ terms i.e. 95% upon satisfactory completion and 5% retention amount to cover 6 months' defects liability period.

11. Qualification Requirements

UNDP needs the following qualifications from the potential offeror:

- a. Solid experience in provision of services in nature, scale and complexity commensurate with the present terms of reference, with already provided services possessing features required by these terms of reference; The company must have at least three similar contracts (similar by scope, nature and amount), preferably with international / intergovernmental organizations. Evidences of contracts are required; references from other clients are highly welcomed.
- b. Qualified and experienced experts in structured Local Area Networks, Network Administration, good customer service and interpersonal skills working under the general supervision and guidance of the department and / or company manager and in cooperation and under the guidance of UNDP assigned focal point.

12. Applicable International Standards

13. The ANSI/TIA/EIA-492AAAA and 492AAAB standards, developed by the Telecommunications Industry Association
14. ANSI/TIA/EIA-568-B.2-1

15. Floor Plans

Annex 1

16. List of minimum cabling specs

Contractor should ensure to visit the locations to ensure the correct quantities based on the following minimum specifications:

Multimode Fibre 62.5/125micron core/cladding, enhanced grade, multimode, and graded index glass fibre
Underground PVC conduit for the fibre.
Cable internal 4 pairs 24AWG CAT6 UTP- 305mtr/Roll-Grey rolls of 305 Meters
Patch cord CAT6 UTP – 1meter Grey/Blue for connecting patch panels to switches, routers, etc.
Patch cord CAT6 UTP – 3 Meter Grey/Blue for connecting servers, workstations, printers and other peripherals
Patch cord CAT6 UTP – 5 Meter Grey/Blue for connecting switches to servers
Patch cord CAT6 UTP – 10 Meter Grey/Blue for conference rooms
Patch panel 1U 19" 48port CAT6 UTP -W/Manager -Fully loaded
Patch panel 1U 19" 24port CAT6 UTP -W/Manager -Fully loaded
Cable managers 1U 19" with 4 rings
CAT6 RJ45 Connectors 50MIC gold plated contact 100 pcs per Pack
<div>Twin Cat6 RJ 45 socket outlet<ul style="list-style-type: none">- TIA/EIA-568-B.2-1 specifications- Fully component compliant- Independently tested by Delta- 568B colour coding- 110/LSA compatible IDC connectors- Shuttered access to protect from dust ingress- Manufactured from V0 flame retardant PVC- Protective labelling lens- Mounts in flush or bevelled faceplate</div>
Faceplates for double socket modules
<div>Single Cat6 RJ 45 socket outlet<ul style="list-style-type: none">- TIA/EIA-568-B.2-1 specifications- Fully component compliant- Independently tested by Delta- 568B colour coding- 110/LSA compatible IDC connectors- Shuttered access to protect from dust ingress- Manufactured from V0 flame retardant PVC- Protective labelling lens- Mounts in flush or bevelled faceplate</div>
Faceplates for single socket modules
Trunking when needed

PVC cable trunking for wall surface mounting, Standard EN 500852-1, white self-extinguishing, cadmium, and lead free PVC. With all mounting accessories,
Trunking Body: 2 compartment of size 65x150, with 2x65mm cover and integrated division partition,
Trunking Body: 1 compartment of size 50x70
Trunking External bend 90 degree with 2 external front cover
Internal bend 90 degree with 2 external front cover
T-piece with 2 front cover
Perimeter End cap
Body joint
Cover joint (to be included in item #2.7)
Perimeter Trunking Coupler
Screw set for trunking. 100pc/pct. Ex.: 72S bolt M V BF and nut MIO
Cable ties self-locking polyamide of size 150 x 3.5, 100pc/pct.
Tower Cable Clip Grey 2.5mm Pack of 100

17. Configurations Specifications

17.1 General

- Cable shall be installed in accordance with manufacturer's recommendations and best industry practices. Cables shall be installed in continuous lengths from origin to destination (no splices).
- Cabling system brand shall be either AMP or Panduit or Krone; or technically equivalent.

17.2 Project planning

Contractor is highly recommended to undertake comprehensive site survey to determine complete overview of building setup, office distribution etc. to create an adequate plan of action

17.3 Data/Voice Cabling System

- Category 6 UTP Cable.
- Comply with TIA/EIA-568-B.2-1 and ISO/IEC 11801

- Comply with ANSI/TIA/EIA-492AAAA and 492AAAB standards
- All Jacks (RJ-45), Plugs, Outlets, Patch Panels, and Patch Cables must conform to Category 6 level.
- Fibre must be multimode

17.4 Multimode fibre

Installed cable shall be 62.5/125micron core/cladding, enhanced grade, multimode, and graded index glass fibre. All materials in the cable shall be dielectric.

17.5 Performance

Installed fibre must meet or exceed the following performance specifications.

Wavelength (nm)	Max. Attn.(dB/Km)	Min. Bandwidth (MHz*Km)
850	3.0	200
1,300	0.9	500

Cable Construction

Installed cable must be manufactured to meet or exceed the following specifications:

17.6 Plenum Cable (Inside Cable)

Plenum rated cable shall be used for all interior installations. Installed cable shall meet or exceed the following specifications:

- a) Tight buffered 900 ums, mechanical strippable Teflon (for plenum applications).
- b) EIA/TIA -598 colour coding for fibre optic cable.
- c) Aramid yarn strength member, capable of supporting a short-term tensile load of 400 lb. without stretching.
- d) Capable of bend radii as small as 20 x outside cable diameter (under installation load) and 10 x outside cable diameter (long term load).
- e) Capable of a minimum crush resistance of 850 lb./in.

17.7 Outside Plant Cable

Outside plant cable shall be used for all applications where cable is to be run in underground conduits.

Outside plant cable may not be used for interior applications and shall meet the following specifications:

- a) Gel filled buffer tube, 250 ums, acrylate.

- b) EIA/TIA-598 colour coding for fibre optic cable.
- c) Flooded core
- d) Capable of bend radii as small as 20 x outside cable diameter (under installation load) and 10 x outside cable diameter (long term load).
- e) Capable of a minimum crush resistance of 850 lb./in.

17.8 Recommended Suppliers

Corning and Berk-Tech fibre are currently recommended for installation; or any technically equivalent material. Cable from other manufacturers will be considered. All cable installed must be cleared by IST prior to installation.

17.9 Cabling System Configurations

Cables shall be terminated at patch panels in rack cabinet. Contractor must connect the cabling system to Cisco Managed Switches through patch panels so that all ports are active. All data ports should be connected to data switches.

17.10 Cabling System Testing

Contractor must propose Testing Methodology and the methodology must conform to the guideline provided in this document.

All cables and termination hardware shall be 100% tested for defects in installation and to verify cable performance under installed conditions. The contractor, prior to system acceptance, shall verify all conductors of each installed cable useable. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced to ensure 100% useable conductors in all cables installed. All cables shall be tested in accordance with this document, and best industry practices.

Performance Verification

Category 6 data cable shall be performance verified using an automated test set. Test results shall be automatically evaluated by the equipment, using the most up-to-date criteria from the TIA/EIA Standard currently ANSI/TIA/EIA568-B.2, and the result shown as pass/fail. Test results shall be printed directly from the test unit or from a download file using an application from the test equipment manufacturer. The printed test results shall include all tests performed, the expected test result and the actual test result achieved.

17.11 Fibre optic testing

Before Installation

It is suggested that individual fibre in a cable be tested with an OTDR for length and transmission anomalies while on the reel before installation.

After Installation and termination

- a) All single mode and multi-mode fibre strands shall be tested end-to-end for bi-directional attenuation, 850 nm/1300 nm for multimode and 1310 nm/1550 nm for single mode fibres. Tests should be conducted in compliance with EIA/TIA-526-14 or OFSTP 14, Method B, per the manufacturer's instructions for the test set being utilized.
- b) Tests must ensure that the measured link loss for each strand does not exceed the "worst case" allowable loss defined as the sum of the connector loss (based on the number of mated connector pairs at the EIA/TIA-568 B maximum allowable loss of 0.75 dB per mated pair) and the optical loss (based on the performance standard above, 2.1.1 and 2.2.1).
- c) After the cable is in place it shall be tested in the following manner:

After termination, each fibre shall be tested with an ODTR for length, transmission anomalies, and end-to-end attenuation. Results are to be recorded and supplied to CNS in the form of hard-copy printouts or photographs of screen traces.

After termination and bulkhead mounting, each terminated fibre is to be tested for end-to-end loss with a power meter/light source. As above, results are to be recorded and supplied to CNS. The maximum allowable attenuation for any splice or termination is 0.3 db.
- d) The contractor shall review all end faces of field terminated connectors with a fibre inspection scope following the final polish. Connector end faces with hackles, scratches, cracks chips and or surface pitting shall be rejected and repolished or replaced if repolishing will not remove the end face surface defects. The recommended minimum viewing magnifications for connector ends are 100X for multimode fibre and 200X for single mode fibre.

17.12 9.7. System Documentation

The following section describes the installation, administration, testing, and as-built documentation required to be produced and maintained by the contractor during the installation.

17.13 Cabling System Labelling

The contractor shall develop and submit for approval a labelling system for the cable installation. UNDP will negotiate an appropriate labelling scheme with the successful contractor. At a minimum,

the labelling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labelling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labelled to identify the location within the cabling system infrastructure. All labelling information shall be recorded on the as built drawings and all test documents shall reflect the appropriate labelling scheme. All label printing will be machine generated using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the cable, and placed within view at the termination point on each end. Outlet labels will be the manufacturer's labels provided with the outlet assembly.

Each cable and inner duct is to be permanently labelled at each end with a unique cable number. In addition, labels shall be affixed to the cable/inner duct at every transition of a vault, hand hole, riser closet, or major pull box. Labels will be in the form of "-Location one-IST Location two- sequence number". For example, cable number 123 from Evans Hall to Wurster Hall would be labelled as "CNS-Eva-Wur-123.

Each fibre optic strand shall be labelled with a unique identifier at the ST coupler in the FIC. Connectors shall be labelled on the identifying sheets on the front of the FIC.

Each fibre shall be labelled where it enters the back of the coupler panels. The identifier shall be in the format Cable # - tube- strand. For tight buffered cables the "tube identifier" shall be "xx".

17.14 As-built Drawings

The installation contractor will be provided with drawings at the start of the project. The contractor shall provide the As-built drawing to UNDP after the project. The marked up drawing set will accurately depict the as built status of the system including termination locations, cable routing, and all administration labelling for the cabling system. In addition, a narrative will be if describes any areas of difficulty encountered during the installation that could potentially cause problems to the telecommunications system.

17.15 Test Documentation

Test documentation shall be provided at the completion of the project. The test equipment by name, manufacturer, model number and last calibration date should be provided at the end of the document. Unless a more frequent calibration cycle is specified by the manufacturer, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test.

When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be collocated in the document.

18. Warranty and Services

18.1 Cabling System Warranty

The contractor shall facilitate the System Performance Warranty between the Cabling System manufacturer and UNDP. The extended component warranty shall be provided which warrants functionality of all components used in the system for at least 20 years from the date of acceptance. The performance warranty shall warrant the installed cabling system. Copper links shall be warranted against the link performance minimum expected results defined in TIA/EIA-568-B.2-1 (latest draft).

18.2 Post Installation Maintenance

The contractor shall furnish an hourly rate with the proposal submittal, which shall be valid for a period of one year from the date of acceptance. This rate will be used when cabling support is required to affect moves, adds, and changes to the system (MACs). MACs shall not void the Contractor's nor manufacturer's warranty.

18.3 Project Management

The contractor must propose Project Schedule and time required to finish the project. The contractor shall establish a point of contact with UNDP who will be responsible for reporting progress and updating UNDP's Technical Representatives, with issues that UNDP must address to facilitate the cabling system installation. Information critical to the completion of the task or project shall be communicated to UNDP's Technical Representatives, as the requirement becomes known. Casual information shall be passed during the scheduled progress report