

PROJECT TITLE:

Structured Cabling for Caraga Regional Hospital

Objective

The project aims to rehabilitate the network infrastructure of **CARAGA REGIONAL HOSPITAL** compound with fiber backbone, fiber core switches and distribution switches including materials for distribution nodes.

Technical Specifications:

The following technical specification shall constitute the minimum requirement for this project.

FIBER OPTIC BACKBONE CABLING

The supplier shall carry out design, engineering, installation, cabling connections, testing and commissioning of the Fiber Optic Backbone System.

1. Fiber Optic Cable, 12-Core, Figure 8 CST Armored, Outdoor, Singlemode

Specifications:

- 12 Core, Single Mode Fiber cable
- Outdoor, Steel Armored
- Multitube
- With central FRP Strength member
- Sheath is polyethylene PE
- Operating Temperature @ -40 Degree Celsius to +70 Degree Celsius
- Installation Temperature @ -40 Degree Celsius to +70 Degree Celsius

Description:

The fibers, 250µm, are positioned in a loose tube made of a high modulus plastic. The tubes are filled with a water-resistant filling compound. A steel wire locates in the center of the core as a metallic strength member. The tubes (and fillers) are stranded around the strength member into a compact and circular cable core. After an Aluminum Polyethylene Laminate (APL) moisture barrier is applied around the cable core, this part of cable accompanied with the stranded wires as the supporting part is completed with a polyethylene (PE) sheath to be figure 8 Structure.

Features:

- High tensile strength of stranded wires meets the requirement of self-supporting and reduce the installation cost.
- Good mechanical and temperature performance
- High strength loose tube that is hydrolysis resistant
- Special tube filling compound ensure a critical protection of fiber
- The following measures are taken to ensure the cable watertight: Steel wire used as the central strength member Loose tube filling compound 100% cable core filling APL moisture barrier

Compliances:

- YD/T 1155-2001
- IEC 60794-1
- RoHS

Applications:

- Suitable for direct buried and duct installation
- Outside plant environments

2. Fiber Optic Cable, 4-Core, Figure 8 CST Armored, Outdoor, Singlemode

Specifications:

- 4 Core, Single Mode Fiber cable
- Outdoor, Steel Armored
- Multitube
- With central FRP Strength member
- Sheath is polyethylene PE
- Operating Temperature @ -40 Degree Celsius to +70 Degree Celsius

- Installation Temperature @ -40 Degree Celsius to +70 Degree Celsius

Description:

The fibers, 250µm, are positioned in a loose tube made of a high modulus plastic. The tubes are filled with a water-resistant filling compound. A steel wire locates in the center of the core as a metallic strength member. The tubes (and fillers) are stranded around the strength member into a compact and circular cable core. After an Aluminum Polyethylene Laminate (APL) moisture barrier is applied around the cable core, this part of cable accompanied with the stranded wires as the supporting part is completed with a polyethylene (PE) sheath to be figure 8 Structure.

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- The following measures are taken to ensure the cable watertight: Steel wire used as the central strength member Loose tube filling compound 100% cable core filling APL moisture barrier

Compliances:

- YD/T 1155-2001
- IEC 60794-1
- RoHS

Applications:

- Suitable for direct buried and duct installation
- Outside plant environments

3. Fiber Optic Cable, 12-Core, Glass Yarn Strength Member, Outdoor, Multimode

Specifications:

- 12 Core, Multimode Fiber cable, OM3
- Outdoor, Glass Yarn Strength
- Multitube
- Sheath is polyethylene PE/LSZH
- Operating Temperature @ -40 Degree Celsius to +60 Degree Celsius
- Installation Temperature @ -5 Degree Celsius to +50 Degree Celsius

Description:

The fibers, 250µm, are positioned in a loose tube made of high modulus plastics. The tube is filled with a filling compound. The tube is covered with a layer of glass yarn as a strength member. The cable is completed with a PE or LSZH jacket.

Features:

- Good mechanical and temperature performance
- High strength loose tube that is hydrolysis resistant
- Glass yarn strength member ensure tensile strength
- Crush resistance and flexibility

Compliances:

- ITU-T G651 / ITU-T G652D
- ANSI/TIA 568-B.3
- IEC-794
- RoHS

Applications:

- Backbone in LAN's
- Indoor/Outdoor in ducts
- Internal wiring/Fans-out

4. Fiber Optic Cable, 4-Core, Glass Yarn Strength Member, Outdoor, Multimode

Specifications:

- 4 Core, Multimode Fiber cable, OM3
- Outdoor, Glass Yarn Strength
- Multitube
- Sheath is polyethylene PE/LSZH
- Operating Temperature @ -40 Degree Celsius to +60 Degree Celsius
- Installation Temperature @ -5 Degree Celsius to +50 Degree Celsius

Description:

The fibers, 250µm, are positioned in a loose tube made of high modulus plastics. The tube is filled with a filling compound. The tube is covered with a layer of glass yarn as a strength member. The cable is completed with a PE or LSZH jacket.

Features:

- Good mechanical and temperature performance
- High strength loose tube that is hydrolysis resistant
- Glass yarn strength member ensure tensile strength
- Crush resistance and flexibility

Compliances:

- ITU-T G651 / ITU-T G652D
- ANSI/TIA 568-B.3
- IEC-794
- RoHS

Applications:

- Backbone in LAN's
- Indoor/Outdoor in ducts
- Internal wiring/Fans-out

5. Fiber Optic Patch Cord, Multimode

Features:

- Multimode Patch Cord
- LC to LC type Duplex patch cord
- LSOH
- Compliant with TIA/EIA-568B-3 standard
- Compliant with ITU G.651
- Connectors meet IEC60874 and IEC61754
- Environmental and mechanical tests based on IEC61300-3-1, 4, 11 & IEC 60322 & IEC60754-1,2
- Provide total immunity to electrical interference
- RoHS compliant
- Must be the same brand with the offered Fiber Optic Cable

6. Fiber Optic Patch Cord, Singlemode

Features:

- Singlemode Patch Cord
- LC to LC type Duplex patch cord
- LSOH
- Meets TIA/EIA 568-B.3 standard fiber meets ITU G652D & G655 and IEC60793-2 connectors
- Meet IEC60874 and IEC 61754 environmental and mechanical tests based on IEC 61300-2-1,2,4,5,6,17, IEC61300-3-1,4,11, IEC 60332, IEC60754-1,2
- RoHS compliant

7. Accessories for the Fiber Optic Cabling

- Fiber Optic Patch Panel, 48-Cores, with Splice Trays, No Adapter, Rackmount (2)
- Fiber Adapter, LC, Duplex, Multimode with Zirconia Ceramic Sleeve (24)

- Fiber Adapter, LC, Duplex, Singlemode with Zirconia Ceramic Sleeve (24)
- Splice Cassette (34)
- Fiber Optic Pigtail, LC, Singlemode (148)
- Fiber Optic Pigtail, LC, Multimode (72)
- Horizontal Cable Manager (28)
- Fiber Optic Patch Panel, Main Body (26)
- Fiber Optic Patch Panel, Blank Panel (48)
- Adapter Panel, 8-Port LC, Duplex, Singlemode (21)
- Adapter Panel, 8-Port LC, Duplex, Multimode (9)

ii. COPPER STRUCTURED CABLING SYSTEM

1. Category 6 UTP Cable

Comply with all category 6 requirement as:

- ❖ The UTP cable should be of Category 6 class.
- ❖ The electrical performance of the UTP cable should have undergone a certified performance in a 4-connector configuration up to 100 meters that meets the standards of ANSI/TIA-568-C.2, ISO 11801 2nd Edition Class E and IEC 61156-5 Category 6 channel and component requirements
- ❖ The UTP conductor should be 23 AWG solid copper and insulated with HPDE
- ❖ The UTP flame rating is at least PVC (CM).
- ❖ The UTP sheath thickness should be 0.5mm nominal.

2. Category 6 Patch Panel, 24-Ports, Loaded, Black

- ❖ The patch panel should mount to standard EIA 19" racks
- ❖ The capacity of the patch panel should be 24 ports
- ❖ The patch panel should be loaded with jack modules
- ❖ The patch panel style should be Flat

3. Category 6 Patch Cord

- ❖ The patch cords for endpoint should be 3 meters in length
- ❖ The patch cords for connection to patch panel should be 1 meter
- ❖ The color of the patch cords should be blue
- ❖ The UTP conductor should be 24 AWG solid copper and insulated with HPDE.
- ❖ The UTP flame rating is at least PVC (CM).
- ❖ The patch cord should be using RJ45 contacts 50μ inch gold plated
- ❖ The patch cord should be using Molded snag proof boot
- ❖ The patch cord should be compliant with Cat.6 standards as:
 - ANSI/TIA 568-C.2:2011
 - ISO/IEC 11801 Class E:2011 (Edition 2.2)
 - CENELEC EN 50173-1:2011
 - CENELEC EN 50288-6-2:2013
 - IEC 61935-2:2010 (Edition 3.0)
 - IEC 61156-6:2012
 - ETL Verified
- ❖ The patch cord should be Compliant with safety standards as:
 - IEC 60332-1-2:2004
- ❖ RoHS compliant (EU Directive 2011/65/EC)

4. Category 6 Unshielded Keystone Jack

- ❖ The UTP jack module should conform to TIA/EIA-568C.2, ISO/IEC 11801 and EN50173-1 specifications.
- ❖ The UTP jack module should accept 22-26 AWG solid cables.
- ❖ The UTP jack Dielectric Strength should 1000V RMS for 1min.
- ❖ The UTP jack module Current Rating should be 1.5Amp Max.
- ❖ The UTP jack module Contact Resistance should be 10MΩ Min.
- ❖ The UTP jack module Insulation Resistance should be 2mΩ per contact.
- ❖ The UTP jack module Material Flame Rating should be UL94 V-0.

5. Faceplate

- ❖ Fits to any surface, drywall, baseboard, and even modular furniture
- ❖ Dimensions: 70 x 115mm
- ❖ Keystone jacks can easily be snapped in and out
- ❖ Number of ports: 1, 2; shutter type
- ❖ Material: UL-94V-0 high-impact, fire-retardant ABS resin

6. **Fan Tray for Server Cabinet**
7. **Utility box, Ga.16 metal**
8. **Wire Duct, plastic**
9. **PVC pipe**
10. **PVC Clamp for 20mm, metal**
11. **Metal screw with tox (pack of 100)**
12. **Cable Tie**
13. **Label Cartridge for Epson LW-400**
14. **Cable tray support and installation for wireway**

iii. DATA RACK AND ACCESSORIES

1. IDF Data Cabinet

The wall mount data cabinet should be installed to the areas specified as IDF.

- ❖ Capacity: 12RU
- ❖ Dimension (WxDxH): 600mm, 450mm+100mm, 635mm
- ❖ Color: Black
- ❖ Should be of the same brand with the Fiber Cable & Accessories
- ❖ Compliant with ANSI/EIA RS-310-D, IEC297-2, DIN41491.Part1, part7, DIN 4144 standards
- ❖ Has Fan unit with three pins German type plug, 1wire/2 fans
- ❖ Includes 1U Power Distribution Unit, 6 Outlets, Voltage: 220V-240V

2. Uninterrupted Power Supply for IDFs

- ❖ Capacity: 1500 VA
- ❖ Rated power: 600W
- ❖ On-Line Input Voltage: 162-290VAC, single phase
- ❖ On-Battery Wave Form: Stepped sinewave

iv. ACTIVE NETWORK EQUIPMENT

The supplier shall supply, deliver, install, configure and conduct tests to Network switches.

1. Core Switch

Hardware Specifications:

- Layer 3
- 16-Ports 10G Base-X SFP+ (Fiber Ports)
- 1 x 8-Ports SFP+ with MACSec Interface Module
- 2 x 150W Asset Manageable AC Power Supply
- Box Switching Capacity : 2.56Tbps
- Port Switching Capacity : 480Gbps
- Packet forwarding rate : 357Mpps

Features

- Industry-leading high performance and scalable 10GE access switching solution with modular dual power, fixed or modular uplinks (10GbE/40GbE) and IRF for resiliency.
- Must offer OSPF/BGP and multicast, SDN enabled and flexible management.
- The switch offers high-density 10GE forwarding and can expand 10GE ports flexibly, working at wire-speed
- Virtualizes multiple core switches into one virtual switch and provides the following benefits:
 - ❖ Scalability—virtual switch allows you to add devices to the system easily. It provides a single point of management, enables switch plug-and-play, and supports software auto-update for software synchronization from the master

to the new member devices. Allowing new switches to be added to the fabric without network topology change

- ❖ High availability - Must have a routing hot backup technology ensures redundancy and backup of all information on the control and data planes and non-stop Layer 3 data forwarding in the fabric. It also eliminates single point of failure and ensures service continuity.
 - ❖ Redundancy and load balancing—The distributed link aggregation technology supports load sharing and mutual backup among multiple uplinks, which enhances the network redundancy and improves link resources usage.
 - ❖ Flexibility and resiliency—The switch uses standard GE ports instead of specialized ports for the virtual switch fabric links between fabric member devices. And must be able to assign bandwidth as needed between uplink, downlink, and virtual fabric system connections. Fabric can span a rack, multiple racks, or multiple campuses.
- Modular hardware and software design—The switch uses modular, hot swapping, and redundancy design for hardware, including power modules and fan trays. The switch also uses modular design for software, which enables feature installation and removal on an as-needed basis.
 - Software-defined networking (SDN)—A switch network architecture that separates the control plane from the forwarding plane, typically by using OpenFlow.
 - Supports Virtual eXtensible LAN (VXLAN)—A MAC-in-UDP technology that provides Layer 2 connectivity between distant network sites across an IP network. It will enable long-distance virtual machine and data mobility and is typically used in data centers and the access layer of campus networks for multitenant services.
 - Supports Ethernet Virtual Private Network (EVPN) is a Layer 2 VPN technology that provides both Layer 2 and Layer 3 connectivity between distant network sites across an IP network. EVPN uses MP-BGP in the control plane and VXLAN in the data plane.
 - Supports In-Service Software Upgrade (ISSU) and Operation, Administration, and Maintenance (OAM) Ensuring business continuity and improve Ethernet management and maintainability.
 - The switch supports AAA authentications (including RADIUS authentication) and dynamic or static binding of user identifiers such as user account, IP address, MAC address, VLAN, and port number.
 - For future expansion the switch supports integration to intelligent management center that will enable administrators to manage and monitor online users in real time and take prompt action on illegitimate behaviors.
 - ❖ The User Profile allows to define a set of policies based on user group in different application scenario.
 - The switch offers a large number of inbound and outbound ACLs and VLAN-based ACL assignment. This simplifies configurations and saves ACL resources.
 - The switch must have MACsec it is an ideal hop-by-hop link-layer security protocol for Ethernet networks, which are typically insecure. It must provide the following services:
 - ❖ Data encryption—Encrypts data over the Ethernet link to protect data against security issues such as eavesdropping.
 - ❖ Anti-replay—Prevents packets from being intercepted and modified enroute to protect the network against unauthorized access.
 - ❖ Tampering protection—prevents packet tampering to protect data integrity.
 - ❖ MACsec supports the following deployments:
 - ❖ Client-oriented—Protects data transmission over the link between the

client and its access device.

- ❖ Device-oriented mode—Protects data transmission over the link between two peering devices.
- The switch supports the following hardware high availability features:
 - ❖ 1+1 power module redundancy and 1+1 fan tray redundancy.
 - ❖ Hot-swappable interface modules.
 - ❖ Automatic power and fan tray status monitoring and alarming mechanisms.
 - ❖ Automatic fan speed adjustment based on the change in temperature.
 - ❖ Self-protection mechanisms that protect power modules against overcurrent, overvoltage, and over temperature conditions.
- The switch supports the following device management features:
 - ❖ Provides multiple management interfaces, including the console port, out-of-band management
 - ❖ Ethernet port, and USB port.
 - ❖ Supports configuration and management from CLI or a general-purpose Web-based manager, including Management Center.
 - ❖ Supports multiple access methods, including SNMPv1/v2c/v3, Telnet, and more secure SSH 2.0 and SSL.
 - ❖ Uses OAM to enhance system management capability.
 - ❖ Supports FTP for system upgrade.
- The switch support DRNI (Distributed Resilient Network Interconnect) cross-device interconnection aggregation technology and realize the cross-device interconnection by virtually expanding two physical devices into one Aggregate to keep controls independent of each other, provide device-level redundancy protection and traffic load sharing, and improve system reliability.
- The switch must support Telemetry technology, which can send the switch's real-time resource information and alarm information to the O&M platform through the GRPC protocol. The platform can realize network quality backtracking, troubleshooting, risk early warning, architecture optimization and other functions to accurately guarantee user experience by analyzing real-time data.

2. Access Switch

Hardware Specifications:

- Layer 2
- 24-Ports Gigabit Ethernet with 4 SFP+ Uplink
- Box Switching Capacity : 336Gbps
- Port Switching Capacity : 128Gbps
- Forwarding Capacity : 96Mpps
- A simple (fixed power design), cost-effective and easy to deploy access switching solution with POE+ that offers enhanced security, high-density GE and 10GbE uplinks, static route, RIP, OSPF, SDN and virtual fabric enabled and flexible management.
- Software Defined Network (SDN) it simplifies network management and reduces maintenance complexity by separating network control layer and network forwarding layer through OpenFlow. More importantly, it implements flexible network flow control and provides a well-defined network platform for core network application and innovation.
- The switch must be pre-built with Resilient Framework that provides the following benefit:
 - ❖ High scalability: With resilient framework, plug-n-play device aggregation can be achieved by adding one or more switches into the virtual fabric stack and enabling stacking on the new device.
 - ❖ High reliability: A backup technology allows each slave device in the framework stack to serve as the backup of the master, creating control and data link redundancy, as well as uninterrupted layer-3 forwarding. This improves the reliability, avoids unplanned downtime and serves to

improve overall performance. When the master device fails, traffic remains uninterrupted.

- ❖ Load balancing: the framework supports cross-device link aggregation, upstream and downstream can be connected to more than one physical link, which creates another layer of network redundancy and boosts the network resource utilization.
 - ❖ Availability: the switch implements framework through standard Forty Gigabit Ethernet (40GE) or Ten Gigabit Ethernet (10GE) ports which allocates bandwidth for business and application access and reasonably splits local traffic and upstream traffic. Framework rules not only able to obeyed within and across the rack, but also across the LAN.
- Management Center must be free of charge, easy to use web management tool. The management center must be embedded network management tool into the switch, it includes commander switches and other access switches.

Must have the following benefits:

- ❖ Intelligent operation: once the switch is powered on and management center function is enabled, topology will be created automatically and user can go enhanced web GUI to check the latest status.
 - ❖ Centralized management: all management can be achieved via commander switch such as centralized configuration backup, and software version management, increasing working efficiency.
 - ❖ One key device replacement: in case of one switch failure, the new added same type switch can download the same configuration and work as old switch immediately.
 - ❖ The switch supports innovative single-port multi-authentication function, the access authentication modes supported by different clients are different. For example, some clients can only perform MAC addresses Authentication (such as the printer terminal), and some user host for 802.1X authentication, and some user hosts only want to access through the Web portal authentication.
 - ❖ The switch supports SSH V2 (Secure Shell V2) to secure information security, and strong authentication protects the Ethernet network switch from attacks such as IP address spoofing and clear text interception.
 - ❖ ARP attack and ARP virus are major threats to LAN security, so the switch must have a diverse ARP protection function such as ARP Detection to challenge the legitimacy of client, validate the ARP packets, and set a speed limit for ARP to prevent ARP swarm attacks from targeting CPU.
 - ❖ The switch series supports EAD (End User Admission Domination) function. EAD integrates terminal security policies, such as anti-virus and patch update, network access control and access right control policies to form a cooperative security system. By checking, isolating, updating, managing, and monitoring access terminals, EAD changes to passive mode, single point network protection to active, comprehensive network protection, and changes separate management to centralized management, enhancing the network capability for preventing viruses, worms, and new threats.
- The switch features multiple redundancy measures at the device and link levels, support current and voltage surge control, overheat protection, power and fan troubleshooting and alert, as well as fan speed adjustment when the temperature changes.
 - Apart from device level redundancy, the switch also provides diverse link redundancy support such as LACP/STP/RSTP/MSTP/Smart Link protocols. It supports resilient framework and 1: N redundancy backup as well as cross-device link aggregation which substantially increases network reliability.

- Quality of Service - The switch supports packet filtering at Layer 2 through Layer 4, and traffic classification based on source MAC addresses, destination MAC addresses, source IP addresses, destination IP addresses, TCP/UDP port numbers, protocol types, and VLANs. It must support flexible queue scheduling algorithms based on ports and queues, including strict priority (SP), weighted round Robin (WRR) and SP+WRR. The switch enables committed access rate (CAR) with the minimum granularity of 8 kbps. It supports port mirroring in the outbound and inbound directions, to monitor the packets on the specific ports, and to mirror the packets to the monitor port for network detection and troubleshooting.
- The switch supports implementation of a variety of green energy saving features, including auto-powerdown (port automatic energy saving), if the interface status has been down for a period of time, the system automatically stops the interface power and the system enters power-saving mode. They also support EEE energy feature, by which if a port stays idle for a period of time, the system will set the port to energy saving mode.
- The switch must also compliant with material environmental protection and the EU RoHS safety standard.
- Professional Anti-lightning function
 - ❖ The switch must have a built-in lightning protection technology and supports industry leading switch port 10KV anti-lighting capability, which can greatly reduce the rate of lightning damage to the equipment.

3. SFP Transceiver Modules

- Type : Single Mode
- Speed : 10G
- Should be of the same brand with the switch

4. SFP Transceiver Modules

- Type : Multi Mode
- Speed : 10G
- Should be of the same brand with the switch

ENGINEERING SERVICES

- ❖ Engineering Services, Fiber Optic Backbone Cabling
- ❖ Engineering Services,
- ❖ Engineering Services, Active Equipment

ANNEXES

I. Installation and Training

Installation

- Should be implemented based on the design.
- Contractor should provide in-house basic training upon handover of the system to the end user. Contractor should provide documentation upon completion of the project. Contractor should turn-over all documentations (*i.e. Manuals, Designs, Keys, Passwords, etc.*) to the end-user before acceptance.

Training

- To ensure proper transfer of technology, technical training for the end user shall also be required. Training shall be conducted by a trainer equipped with the appropriate skills set. Training syllabus shall cover but not limited to the following:
 - ❖ System technology operational principles;
 - ❖ System and individual components functionalities/features;
 - ❖ Principle of design and installation of Fiber and Copper Cabling topology;
 - ❖ Principle of design and installation of Active Network Equipment;
 - ❖ Principle of Troubleshooting and repair;

- ❖ Technical training shall be conducted in an appropriate venue where lecturer can be performed.

II. Solution Provider Qualifications

- Bidder shall submit Letter of Authorization stating that the Solution Provider is an authorized business partner and certified installer and designer of that Cabling System Manufacturer.
- Bidder shall have at least 1 Certification relating to Network Routing and Switching in connection with active network involvement in the overall project or similar. Should be an organic employee of the prospective bidder's company for a minimum of one year.
- Bidder should have 1 Project Management Professional (PMP) personnel to check the standards and best practice of the Project Implementation and supervise the overall project management. Must attach a copy of the Certification. Failure to attached is a ground of disqualification.
- Bidder must have at least 1 License Professional Electronic Communication Engineer (PECE) who are trained and certified in Design and Installation / Integration of Network Cabling System. Must attach proof of PECE.
- Bidder must conduct actual site inspection and must submit along with the Technical Documents a Certificate of Site Inspection issued by the Project Leader of CRH. Failure to attach is a ground of disqualification.
- Bidder must submit PCAB License with principal classification at Communication Facilities.