

Terms of Reference

Extension and Revamping of LAN

1. Objective

The main objective is to revamp the existing LAN and extend to residential zone for efficient, secured and well managed LAN and Internet services to meet the needs of students and staff residing in it.

2. Existing Network

The current network design is star topology being built based on international best practices and standards.

The infrastructure consists of network, storage and server equipment which are scalable with good capacity.

It is partially deployed on virtualization technology called Ganeti, which fulfills the requirement of realizing effective utilization and efficient management of server and storage resources. And network with several subnets in a LAN.

As of now all the critical services like websites, Virtual Learning Environment(VLE) and Library Management System are hosted in the campus and provide services accordingly.



Following are the technical details:

A. Design Ganeti Cluster S Node1 Node2 Node3 Border Router FTP Lab 2 Switch Serv 24 Core Fibre Optic Cable Lab1 6 Core Fibre Optic Cable DHCP, DNS, N-Computing **Core Router** Core Fibre Optic Cable Guest House Admin Block1 Network Extension Starts Here Academic Block Admin Block2 Admin Block3 **Residential Area** (Hostels and Staff Quater) Library Block1 Culture Block Store Block Library Block2

This is current architecture of network except the Residential Area which is expected to extend with this tender.

- B. Equipment/Software
 - a. Network and Servers
 - b. Ganeti Clustering
 - c. N-Computing



3. Proposed Solution

With ever increasing users in the network every year, college plans to improve the current network to withstand the users traffic. Monitor the activities and traffic of users with proper network management system, extending the LAN to give Internet services to students and staff residing in the residential area. And to implement new technology such that IP dual stack mechanism.

The vendor should strictly adhere to following scope of works. Any deviation from the scope of work shall be considered unacceptable, leading to delay and shall be liable for liquidated damages as per RGoB procurement rules and regulations.

4. General Scope of Work

- i. Deliver hardware as defined in the attached specification details to the respective site.
- ii. Validate the design and include additional cabling, power supply and any other hardware/software that may be required to operationalize during installation.
- iii. Successful implementation and testing of connectivity and hardware-software functioning.
- iv. The VENDOR should provide a full documentation of the project

5. Detailed Scope of Work (Functional and Technical Requirement)

- a. Deployment of PacketFence & OpenNMS
- b. Implementation of IPv6/IPv4 Dual-Stack
- c. Segregating VLANs
- d. Network Extension



Deployment of PacketFence & OpenNMS

This is very important priority to college with 1000+ users will be using the Internet service, so to monitor the traffic or abnormalities, secure the networks, usage of captive-portal for registration and remediation, centralized wired and wireless management and layer-2 isolation of problematic devices has been mandatory. So the firm should be able to deploy PacketFence with all the features in it without fail.

Implementation of IPv6/IPv4 Dual-Stack

The era of freely available IPv4 addresses has come to an end as Regional Internet registries are now assigning their last few remaining IPv4 addresses. Many of the largest mobile and broadband networks in the world are actively rolling out IPv6 connectivity to their end-users, with legacy IPv4 on a path to be increasingly funneled through resource-constrained Carrier-Grade NATs (CGNATs). Making web content, sites, and applications available dual-stacked over both IPv6 and IPv4 will become increasingly critical. The firm should be cautious when deploying IPv6 transition technologies to reach the audiences across a hybrid IPv4/IPv6 Internet while retaining performance, reliability, and security.

Segregating VLANs

College Academic Zone has been connected with fiber optic cable internally. It has been connected with 12 cores fiber optic cable but only 2 cores are used. The current network has lots of VLAN being tagged and all are used via 2 cores single fiber optic cable. So while designing or restructuring, all the 12 cores has to be used for different VLANs. Each managed switch should carry separate VLAN. There are 7 managed switches in the campus that needs to have separate VLANs. At the same time configuration should be done in all the affected switches, core router and border router too.

The cabling in the campus has not been labeled or marked with port numbers or room number. And proper cabling should be done in server room as well as to all the switches across the campus.



Network Extension

The Internal network extension shall be carried out in the residential area. The network layout will begin from Guest House and ends at staff quarter as shown in the diagram. There is Internet connection till guest house.

The diagram is part of extension of network in residential campus. S1-S5 is managed switches to be placed in the building.



The firm shall strictly follow the **cabling system specification** attached with the tender when extension or revamping is carried out.

6. Trainings and Knowledge Transfer

The contractor should provide all necessary trainings and engage in knowledge transfer activities. Prepare a training material and provide hands on training to CLCS officials.



7. Reporting and Documentation

Following documents and reports should be submitted. The document should be submitted in both soft and hard copy. Well documented IP Addressing Scheme (IPv4 and IPv6) with provision to scale in future. Detailed description on routing/switching configurations and implementation of PacketFence and OpenNMS.

8. Other Services

Install, configure and implement all the necessary, but not limited to following services upon consultation with CLCS. However, the successful bidder should be in a position to implement any additional services as per CLCS's instruction.

- i. DNS
- ii. NTP
- iii. DHCP
- iv. SNMPv3
- v. FTP

9. Successful bidder should strictly adhere to following work schedule:

Key Activities	Estimated Timeline
Contract Signing and Awarding (Supply	Within X time (date of awarding work)
Order/Work Order)	
Site Preparation and Delivery of Equipment	Within X time + 30 days
Implementation	Within X time + 45 days
Testing	Within X time + 60 days
Training	Within X time + 75 days
Commissioning and Sign Off	Within X time + 90 days



Terms and Conditions

- Bidder should have a registered office with legal presence and have valid Sales Tax No.
 & VAT No. as applicable.
- 2) Bidder should be a licensed Bhutanese firm.
- 3) The bidder must submit BoQ/BoM with make and model and brochure, along with the bid document, for each and every item they are supplying without which the item will be rejected.
- 4) The bidder is required to submit Curriculum Vitae (CV) of every team member along with the certificate of past work experiences in the similar field. Preference shall be given to OEM certified engineer/professional.
- 5) The bidder should provide detail structure of overall project team and their profile (qualification, experience, individual role in the project).
- 6) Professional engineer with expertise in FTTx project working full-time with the company
- At least 2 professional engineers with expertise in configuration and installation of switches and routers
- 8) Company's experience in carrying out physical cabling and networking of mid-size to large enterprise. Enclose list of clients for proof of work carried out. The claim must be supported by documentary evidence such as proof of work and completion certificate.
- 9) All the licensing requirements/warranty/support of supplied hardware and software should be of minimum 3 years from the date of purchase.



- All accessories being supplied should be configurable and compatible with each other. Hence, it is the responsibility of bidder to sort out compatibility issues and supply the compatible accessories wherever required.
- 11) Successful bidder operate/maintain/support for a period of 1 year from the date of commissioning of services. An agreement shall be signed after the completion of the project, and before operationalizing the services.
- 12) The bidder should submit project proposal entailing detailed technical approach and methodology.
- 13) The equipment/accessories specified are tentative list only. Eligible bidders are advised to carry out survey prior to submission of bid in order to ensure complete solution. In case there are need of any additional equipment or accessories, after the award of contract, it is the responsibility of bidder to ensure that all the required equipment/accessories are provided without incurring any additional cost to the Purchaser. The bidder is expected to provide complete end-to-end solution and support.

(*** Note: Bidders failing to fulfil above terms and conditions will be rejected)