MINI PROJECT: COMPUTER NETWORK DESIGN FOR THE BUILDING OF A COMPANY

INTRODUCTION

CCC (Computer & Construction Concept) was asked to design a computer network used in the headquarters and two branches of a BB Company under construction. The key characteristics of IT usage in this Company are as follows.

- The building consists of 7 floors, the first floor is equipped with one IT room and Cabling Central Local (for the gathering of wires and patch panels)
- Small-scale: 200 workstations, 5 servers, 12 (or maybe more with security-specific devices) networking devices
- Using **new technologies** for network infrastructure including wired and wireless connections, and fiber cabling (GPON). The network is organized according to the VLAN structure and GigaEthernet 1GbE/10GbE
- The network connects to outside by **2 leased lines for WAN connection** (possibly applying SD-WAN) and 2 xDSL (for Internet access) with a load-balancing mechanism
- Using a combination of licensed and open-source software, office applications, client-server applications, multimedia, and database
- Requirements for high security (e.g., firewall, IPS/IDS, phishing detection), high availability (HA), robustness when problems occur, ease to upgrade the system

The Head Office connects to 2 branches in 2 big cities like Nha Trang and Danang. Each branch is also designed similarly to the headquarters but on a smaller scale.

- The building is about 2 floors high, the first floor is equipped with 1 IT room and 1 Cabling Central Local.
- BB Branch scale: 30 workstations, 3 servers, 5 or more networking devices

Implementing the connection between the headquarters and the branch through the WAN links, we can choose one of the technologies used for this link according to the cost of the solution.

- Suggest options with cost
- Analyze the advantages and disadvantages of the selected solution.

The dataflows and workload of the system (about 80% at peak hours 9g-11g and 15g-16g) can be shared for Head Office and Branch as follows:

- Servers for software updates, web access, and database access, ... The total upload and download estimate is about 1000 MB/day.
- Each workstation is used for Web browsing, document downloads, and customer transactions, ... The total upload and download estimate is about 500 MB/day.
- WiFi-connected devices from customers' access are about 1000 MB/day.
- VPN configuration for site-to-site and for a teleworker to connect to LAN

BB Company's Computer Network is estimated for a growth rate of 20% in 5 years (in terms of the number of users, network load, branch extensions, ..).

REQUIREMENTS

Step 1 (1 point): Find out suitable network structures for buildings

- Analyze the network system requirements of Headquarters and Branches
- **Make a checklist to be surveyed at the installation locations**
- Define areas with high load (network load) to specially select the appropriate device configuration (load balancers are placed in necessary locations)
- Choose a network structure that matches the building's architecture with convenience and aesthetics
- Design the network usage in a wireless environment, applying network security standards and setting up partitions for network servers and devices (e.g., DMZ, Firewall, ...)

Step 2 (1 point): List of minimum equipment, IP diagram, and wiring diagram (cabling)

- List of recommended equipment and typical specifications
- Schematic physical setup of the system
- WAN connection diagram between Headquarters and Branches (using OSPF protocol)

Step 3 (2 points): Calculate the necessary bandwidth and suggest the configuration for computer networks

Step 4 (2 points): Design the network map using Packet Tracer or GNS3 simulation software

Step 5 (2 points): Test the system with popular tools such as ping, and traceroute, etc. on the simulated system.

Step 6 (2 points): Re-evaluate the designed network system through the following features: reliability, ease to upgrade, diverse support software, safety, network security, etc.

- The remaining problems for the project
- Development orientation in the future

Step 7: Upload the simulation file (using Packet Tracer or GNS-3) and the project report to BKeL before the deadline.

In the report and results demo of Assignment 2, students are asked to test connectivity:

- Connect between PCs in the same VLAN
- Connect PCs between VLANs
- Connect PCs between Headquarters and branches
- Connect to servers in the DMZ
- No connections from Customers' devices to PCs on the LAN
- Connect to the Internet to a Web server.

For the **talented engineer program**, you are required to implement and test a security solution for the Company: add firewalls and configure ACLs.

REFERENCES

- Information selectively comes from the Internet
- The references for the subject of Computer Networking

TIMING

Deadline for reporting: **23:00, 30/04/2023**.

Softcopy (to be submitted to BKeL before the deadline) and ***hard copy*** (needed for presentation and demo time).

NUMBER OF STUDENTS

Get into group of 2 or 3 students as indicated by the Instructor.