Faculty of Computing
IE1030 – Data Communication Networks
Year 1 Semester 1 (2024)

Network Design Assignment

Learning Outcomes

LO4: Perform basic configuration of key networking equipment such as switches routers and wirless access points

LO5: Apply basic network security standards and best practice guidelines in protecting networking infrastructure and data in transit

LO6: Design and implement small computer networks

This is a group assignment. The students will be working in groups created by the Year 1 – Unit which is the same group used for other modules in the same semester. Use the group registration link provided in the module page in courseweb and register your group information.

Scenario:

Your team have been hired as a Network Consultants by **TechWorld Inc.**, a growing mid-sized company specializing in software development and IT services. The company is moving to a new office building and requires a new network infrastructure. The team task is to design a robust, scalable, and secure network that meets the company's current needs while allowing for future growth.

Company Overview:

- **Company Name:** TechWorld Inc.
- **Industry:** Software Development and IT Services
- **Number of Employees:** 80
- **Office Location:** 3-floor building with 10,000 square feet of office space per floor.

Business Requirements:

1. **Departments and Workstations:**
    - **Administration Department:** 15 computers, 2 printers, 1 scanner.
    - **Sales Department:** 25 computers, 3 printers, 1 copier.
    - **IT Department:** 10 computers, 1 server, 1 printer.

- o **Development Team:** 20 computers, 2 servers, 1 shared high-performance storage device.
- o **HR Department:** 5 computers, 1 printer.
- o **Meeting Rooms (3 rooms):** Each room requires a wireless access point and video conferencing equipment.

2. **Network Services:**
   - o **Internet Connectivity:** High-speed broadband connection.
   - o **Internal Communication:** Email server, file sharing, and internal chat service.
   - o **External Communication:** Web server hosting the company website and a secure VPN for remote workers.
3. **Security Requirements:**
   - o **Data Protection:** Secure sensitive company data with encryption.
   - o **Network Segmentation:** Implement VLANs to separate network traffic between different departments.
   - o **Access Control:** Use firewalls and access control lists (ACLs) to protect the network.
   - o **Wireless Security:** Implement secure wireless networks for employees and guests.
4. **Scalability and Flexibility:**
   - o The network should support the company's growth plans, including the addition of more employees and new departments.
   - o Provide solutions for adding more devices without major reconfigurations.
   - o Plan for future integration of IoT devices such as smart office equipment.
5. **Budget:**
   - o The company has allocated a budget for the entire network setup, including hardware, software, and installation.

IP Addressing Scheme for Each Group:

Each group is assigned a unique private IP addressing scheme based on their registration number of the group leader. The IP address will be generated by using the last two digits of the registration number to create a unique subnet.

Example:

- **Registration Number:** IT12345679
- **Unique Subnet:** 192.168.xx.0/24 (where xx is derived from the last two digits of the registration number)

For instance, if the group leader's registration number is **IT12345679**, their subnet will be **192.168.79.0/24**.

Assignment Instructions:

1. **Subnet Assignment:**
   - o Use the last two digits of your group leader's registration number to determine your unique subnet.

- o   Example: Registration Number IT12345679 -> Subnet 192.168.79.0/24.
2. **IP Address Allocation:**
    - o   Assign IP addresses to all devices in your designed network, ensuring no overlap with other groups' subnets.
    - o   Example: 192.168.79.1 for the router, 192.168.79.2 for the switch, etc.
3. **VLANs and Segmentation:**
    - o   Create VLANs for each department within your subnet to ensure network segmentation and security.
    - o   Use appropriate VLAN IDs for segmentation (e.g., VLAN 10 for Administration, VLAN 20 for Sales, etc.).

Deliverables:

1. Network Topology Design:

- Design a detailed network topology that includes all the departments, devices, and network infrastructure.
- Include a logical and physical layout of the network, showing how all devices are connected.
- Consider the placement of routers, switches, access points, servers, and workstations.
- Show how VLANs will be used to segment network traffic between departments.

2. IP Addressing Scheme:

- Provide a detailed IP addressing plan that includes the IP addresses assigned to all devices in your network.
- Ensure that the IP addressing scheme is unique to your group based on your registration number.

3. Budgeting:

- Create a detailed budget that includes all necessary hardware, software, and any other relevant costs.

4. Security Considerations:

- Outline the security measures you plan to implement, including VLANs, firewalls, and secure wireless networks.

5. Documentation:

- Document all configurations, IP assignments, and security policies implemented in your network design.

Submission Instructions:

- **Deadline : 30th September 2024**
- Use the coverpage as the first page of your document, and follow the document instrctios given below in creating the assingment report.
- Name your submission with the batch group number and the group identification number.

    E.g. if your group number is - P10 – 11 and batch group is - Y1.S1.WD.IT.10.02

    Y1.S1.WD.IT.10.02_P10-11.pdf

- Submit your network design assignment as a PDF, including the network topology diagram, IP addressing plan, budget breakdown, and security considerations.
- Ensure that all diagrams and tables are clear and well-labeled.

General Formatting

1. Paper size: A4
2. Contents font & size: Times New Roman, size 12
3. Chapter headings/sub headings font & size: Times New Roman Bold, size 12
4. Page numbering:
    - Cover page should not contain any number
    - Declaration page to table of figures page should be numbered using Roman numbers at bottom center of the page
    - Content pages, references page(s) and annexes (if any) should be numbered using Arabic numbers at the bottom center of the page
5. Margins: 1 inch margins on left, right, top and bottom
6. Line spacing: 1.5 line spacing

Figure Numbering

1. Each figure should be numbered at bottom center of the figure along with a figure name.
2. Figure number should start with word 'Figure' followed by the 'main chapter number' and 'figure number within the chapter' separated by a 'period sign (.)' and followed by a 'colon (:)'.

For example,

Figure 2.6: XYZ Connector