Asia Pacific University of Technology & Innovation  
  
INTRODUCTION TO NETWORKING (CT043-3-1)  
  
Group Assignment  
  
Semester: 2024

Table of Contents

1.0 Objective and Assumptions

The purpose of this project is to design a robust and scalable network architecture for NeuroByte, a growing startup with branches in Malacca, Ipoh, Kedah, and Perlis. The aim is to ensure seamless connectivity and communication between the branches while incorporating modern networking standards such as VLSM subnetting and IoT device integration. Cisco Packet Tracer is used for designing and simulating the network setup. The network topology will emphasize high reliability, efficient IP addressing, and effective device configuration.

2.0 Malacca Branch (Student Name & TP)

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2.1 Logical Topology Design

The Malacca branch adopts a star topology where the central switch connects various office and server devices. This layout includes a separate switch for the IoT and server room, which connects to another switch handling workstations and client PCs. These two switches are then connected to a main switch which links to the local router. This router establishes WAN connectivity to the other branches via serial interfaces.

2.2 Justification of Topology

The star topology used in the Malacca branch provides simplicity, easy troubleshooting, and scalability. Dedicated switches for servers and client PCs help segregate traffic and improve performance. With this layout, failure of a single workstation link does not impact the rest of the network. This also simplifies the addition of new devices, making it ideal for the growing needs of NeuroByte.

2.3 IP Addressing Scheme

The Malacca branch uses the 192.168.10.0/24 IP block. A subnet 192.168.10.0/27 is allocated to support 30 hosts. This includes PCs, servers, and IoT devices.  
  
Network ID: 192.168.10.0  
Subnet Mask: 255.255.255.224  
First Valid IP: 192.168.10.1  
Last Valid IP: 192.168.10.30  
Broadcast Address: 192.168.10.31  
Gateway: 192.168.10.1 (assigned to Router’s Fast Ethernet port)

3.0 Ipoh Branch (Student Name & TP)

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3.1 Logical Topology Design

The Ipoh branch follows a similar star topology design. A central switch connects the internal devices, including two dedicated switches—one for client PCs and IoT devices, and the other for server equipment like DNS and Email servers. These switches are further connected to the main router that links to other branches through serial interfaces.

3.2 Justification of Topology

The star topology in the Ipoh branch provides a straightforward structure that enhances reliability and manageability. Each switch isolates different device types, which limits the chances of data collision and simplifies troubleshooting. This configuration also supports future scalability and efficient traffic management within the branch.

3.3 IP Addressing Scheme

The Ipoh branch is assigned the subnet 192.168.10.32/27, capable of supporting up to 30 hosts, including PCs, servers, and IoT devices.  
  
Network ID: 192.168.10.32  
Subnet Mask: 255.255.255.224  
First Valid IP: 192.168.10.33  
Last Valid IP: 192.168.10.62  
Broadcast Address: 192.168.10.63  
Gateway: 192.168.10.33 (Router Fast Ethernet port)

4.0 Kedah Branch (Student Name & TP)

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4.1 Logical Topology Design

The Kedah branch uses a centralized star topology, with one switch connecting all servers and another for user devices and IoT hardware. Both switches connect to a central switch, which links to the router. The router connects to the wide area network via serial interfaces, maintaining communication with the other three branches.

4.2 Justification of Topology

This topology enhances performance, improves device management, and allows for easier expansion. Segmenting the servers and user devices through separate switches ensures reduced congestion and simplified maintenance.

4.3 IP Addressing Scheme

The Kedah branch uses the IP block 192.168.10.64/27, suitable for 30 hosts.  
  
Network ID: 192.168.10.64  
Subnet Mask: 255.255.255.224  
First Valid IP: 192.168.10.65  
Last Valid IP: 192.168.10.94  
Broadcast Address: 192.168.10.95  
Gateway: 192.168.10.65

5.0 Perlis Branch (Student Name & TP)

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5.1 Logical Topology Design

The Perlis branch maintains a star topology structure with dedicated switches for different device categories. The layout enables a reliable and scalable setup, supporting all internal communication and IoT functions. A central switch aggregates connections and links them to the branch router for WAN access.

5.2 Justification of Topology

This structure helps in isolating data traffic, enhances fault tolerance, and simplifies device management. The modularity supports network upgrades and makes troubleshooting easier. This topology ensures consistent performance across all services.

5.3 IP Addressing Scheme

The Perlis branch utilizes the 192.168.10.96/27 subnet, supporting up to 30 hosts.  
  
Network ID: 192.168.10.96  
Subnet Mask: 255.255.255.224  
First Valid IP: 192.168.10.97  
Last Valid IP: 192.168.10.126  
Broadcast Address: 192.168.10.127  
Gateway: 192.168.10.97

6.0 WAN Topology Design and Justification

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7.0 Justification of Configuration Techniques

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8.0 Conclusion

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9.0 References (APA Format)

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10.0 Work Breakdown Structure

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