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**TITLE:**

***NEUROBYTE PROPOSED NETWORK DESIGN***

**Module Lecturer: Mr. DAVID TAN**

**TEAM 10**

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# CHAPTER 1: INTRODUCTION

NeuroByte, a rapidly expanding start-up with offices in Malacca, Ipoh, Kedah, and Perlis, seeks to establish seamless and reliable network connectivity across its four branches. The company envisions a robust network infrastructure that not only supports its current operational needs but also lays the foundation for future scalability and advanced technological integration. To achieve this goal, NeuroByte has turned to the Asia Pacific University (APU) for expert advice and assistance. In response, APU has leveraged its pool of talented students to propose a comprehensive networking solution. This initiative involves designing, implementing, and configuring a network tailored to NeuroByte's specific requirements while incorporating state-of-the-art technologies such as Internet of Things (IoT) devices and dedicated server rooms for critical services. Through this collaborative effort, the proposed solution will address connectivity challenges and empower NeuroByte to achieve its long-term business objectives.

# CHAPTER 2: OBJECTIVES

The objective of this assignment is to:

* Utilize the foundational principles of wired networking to create an efficient and reliable network design.
* Design and simulate both Local Area Network (LAN) and Wide Area Network (WAN) topologies using Cisco Packet Tracer.
* Develop a detailed IP addressing scheme that ensures optimal performance and scalability.
* Apply subnetting techniques to efficiently segment the network and manage traffic flows.
* Configure network devices, including routers and switches, to support seamless communication between branches.
* Integrate Internet of Things (IoT) devices into the network for enhanced automation and monitoring capabilities.
* Allocate dedicated server rooms for essential services such as web hosting, file storage, domain name resolution, and email communication.
* Employ static routing techniques to ensure packets are routed accurately and efficiently to their destinations.
* Provide a logical and physical topology design supported by justification and evidence of its suitability for NeuroByte’s business needs.

# CHAPTER 3: ASSUMPTIONS

3.1 PERLIS

We have assigned the Perlis branch to be our Headquarters to help connectivity and smooth data exchange in every branch

NeuroBytes headquarters, the Perlis Branch, will have five departments: IT, Finance Dep, CEO Room, and Server Room. The following is a breakdown of the entire workforce across the Four departments:

|  |  |
| --- | --- |
| ***DEPARTMENT/ROOM NAME*** | ***NO. OF HOSTS/SERVERS*** |
| ***IT DEPARTMENT*** | ***12 hosts*** |
| ***FINANCE DEPARTMENT*** | ***10 hosts*** |
| ***C.E.O ROOM*** | ***5 hosts*** |
| ***SERVER ROOM*** | ***5 Servers: web, mail, printer, database, file*** |

The Perlis Branch operates with thirty staff and three departments split across single PC installations. The three departments maintain one common printer while network connections use switches for central operation. Two servers including a database server and a file server work together to support operational needs at this location.

The office enables wireless connectivity by linking together a wireless LAN controller with an access point. Through serial DCE technology the branch links to headquarters for exchanging data. Both a dedicated PC and mobile devices including smartphones and tablets function for the CEO.

3.2 Malacca

.The Malacca Branch acts as a training centre for NeuroByte, providing staff development programs and fostering skill enhancement to support the company’s growth.

NeuroBytes' Malacca Branch has Four departments: IT, HR Dep, Branch Manager Room, and Server Room. The following is a breakdown of the entire workforce across the Four departments

|  |  |
| --- | --- |
| **DEPARTMENT/ROOM NAME** | **NO. OF HOSTS/SERVERS** |
| IT DEPARTMENT | **12 hosts** |
| HR DEPARTMENT | **10 hosts** |
| BRANCH MANAGER ROOM | **5 hosts** |
| SERVER ROOM | **5 Servers: web, mail, printer, database, file** |

The Malacca Branch functions as NeuroByte’s training centre, hosting 27 staff across four departments: IT, HR, the Branch Manager’s Room, and the Server Room. Each department is equipped with individual PCs, totalling 12 hosts in IT, 10 in HR, and 5 in the Branch Manager’s Room.

The Server Room operates five critical servers, including web, mail, printer, database, and file servers, ensuring seamless workflow and resource sharing. Wireless connectivity is provided by integrating a wireless LAN controller with access points.

A serial DCE connection links the branch to headquarters for efficient data exchange. The setup also supports mobile devices like smartphones and tablets, alongside a dedicated PC for the Branch Manager to oversee operations

3.3 IPOH

The Ipoh Branch serves as NeuroByte’s network operations hub, overseeing the monitoring and management of network performance to ensure seamless connectivity across all branches.

NeuroBytes' Ipoh Branch will have four departments: Network Operations Centre (NOC), IT Department, Branch Manager Room, and Server Room. The following is a breakdown of the entire workforce and their respective hosts/servers across these four departments:

|  |  |
| --- | --- |
| **DEPARTMENT/ROOM NAME** | **NO. OF HOSTS/SERVERS** |
| NETWORK OPERATIONS CENTRE   (NOC) | **12 hosts** |
| IT DEPARTMENT | **10 hosts** |
| BRANCH MANAGER ROOM | **5 hosts** |
| SERVER ROOM | 5 Servers: Printer, Database, Mail, File, and Web |

The Ipoh Branch functions through a dedicated team that oversees all operational processes. Single PC systems with one shared printer serve each department to fulfil daily needs at this location. A central management system operates through switches which control network connections at the facility. All operational requirements at this facility receive support from five servers which consist of printer server, database server, mail server, file server along with web server.

The office links cell phone networking through a wireless LAN controller and access point combination. Serial DCE technology enables the branch to communicate effortlessly with headquarters by providing interoffice data exchange. A standalone computer system together with mobile phones and tablets carries out tasks at this location.

3.4 KEDAH

The Kedah Branch plays a crucial role as NeuroByte's main trading operations hub, ensuring smooth and efficient trading activities across the entire network.

NeuroBytes' Kedah Branch will have four departments: IT Department, Trading Room, Branch Manager Room, and Server Room. The following is a breakdown of the entire workforce and their respective hosts/servers across these four departments:

|  |  |
| --- | --- |
| **DEPARTMENT/ROOM NAME** | **NO. OF HOSTS/SERVERS** |
| IT DEPARTMENT | **12 hosts** |
| TRADING ROOM | **10 hosts** |
| BRANCH MANAGER ROOM | **5 hosts** |
| SERVER ROOM | **5 Servers:** web, mail, printer, database, file |

The Kedah site implements a full team structure that oversees day-to-day operational efficiency. Departments situated on individual PC workstations share one printer to fulfil office printing requirements. All network connections operate through central management systems based on switches. These five servers enable operational support by combining a printer server with a database server and mail server and file server and web server.

The office operates wireless connectivity through a wireless LAN controller and access point combination. Seamless data exchange operates between the branch and headquarters through serial DCE technology. A specific PC accompanies mobile devices including smartphones and tablets which serve the needs of the Branch Manager.

# A blue rectangular object with orange text Description automatically generatedCHAPTER 4: FLOOR PLANS

**A diagram of a room

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A diagram of a room

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# CHAPTER 5: NETWORK DIAGRAMS

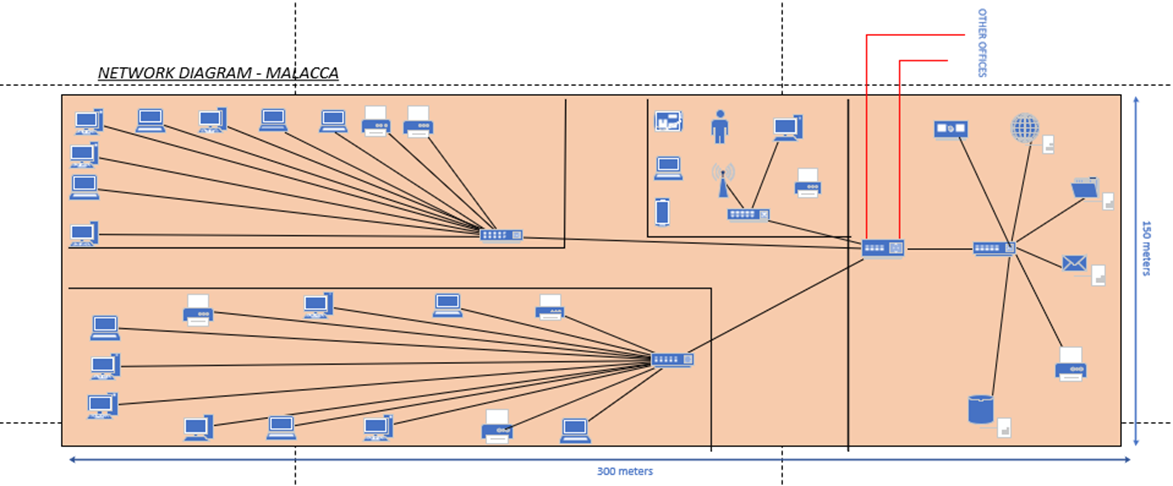
**A computer network diagram with many computers connected to each other

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**LEGEND**

A diagram of a computer server

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**LEGEND**

A diagram of a computer network

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**A diagram of a computer network

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**LEGEND**

A screenshot of a computer

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**A diagram of a computer network

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**A diagram of a computer

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# **CHAPTER 6: LAN TOPOLOGY**

***Star Topology***   
Star topology consists of a central node to which all other nodes are connected by a single path. It is the topology used in most existing information networks involving data processing or voice communications. ​(Arora, 2024)​

**A diagram of a computer network

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**A diagram of a computer network

Description automatically generated*Mesh Topology***In Mesh topology, each node is connected to more than one node to provide an alternative route in the case the host is either down or too busy. The mesh topology is excellent for long distance working because it provides extensive back-up, rerouting and pass-through capabilities. ​(Arora, 2024)

***RING TOPOLOGY***In Ring Topology, each node is connected to two and only two neighboring nodes. Data is accepted from one of the neighboring nodes and is transmitted onwards to another. Thus, in ring topology data travels in one direction only, from node to node around the ring. After passing through each node, it returns to the sending node, which removes it. ​(Arora, 2024)​

**Diagram of a diagram of a computer network

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***Advantages and Disadvantages of each LAN Topology***

|  |  |  |
| --- | --- | --- |
| TOPOLOGY | ADVANTAGES | DISADVANTAGES |
| *STAR TOPOLOGY* | * Easy to setup and troubleshoot * Centralized management * High speed due to dedicated links  (GeeksforGeeks, 2024) | * High dependency on the central hub * High cabling costs * If hub fails, entire network fails (GeeksforGeeks, 2024) |
| *MESH TOPOLOGY* | * Extremely reliable * Faults are easily isolated * High Scalability and robustness (GeeksforGeeks, 2024) | * High cost of implementation * Complex to Install and maintain * Requires extensive cabling  (GeeksforGeeks, 2024) |
| *RING TOPOLOGY* | * Equal access for all devices * Short cable length & simple layout * Predictable data flow (GeeksforGeeks, 2022) | * Difficult to diagnose faults * Not easily scalable * Entire network fails if one node fails (GeeksforGeeks, 2022) |

***Justification for the Implementation of STAR TOPOLOGY in the Local Area Networks (LANs) of Perlis, Malacca, Kedah, and Ipoh.***

1. ***Centralized Management and Control***

Central Hub: In a star topology, all devices connect to a central hub or switch, enabling centralized monitoring and control of the network. This makes managing resources, troubleshooting, and implementing policies straightforward.

Ease of Troubleshooting: Faults in individual devices or connections can be quickly identified without disrupting the entire network. For instance, if one computer's connection fails, the rest of the network remains operational. ​(Arora, 2024)​

1. ***High Speed and Performance***Dedicated Connections: Each device has a direct link to the central hub, ensuring minimal congestion and high data transfer speeds. This is ideal for offices requiring smooth communication between workstations and servers.

Efficient Data Flow: The absence of data collisions, common in bus or ring topologies, ensures optimal network performance, particularly in environments with high data traffic. (Roberts, 2024)

1. ***Scalability***  
   Ease of Expansion: Adding new devices is simple and cost-effective. Technicians only need to connect a new cable to the hub, minimizing downtime and disruption.    
   Flexibility: This adaptability allows the network to grow alongside the organization’s needs, supporting new workstations, printers, or other devices.
2. ***Reliability***   
   Fault Isolation: A problem in one node or cable does not affect the overall network, reducing the risk of complete outages.   
      
   Fault Isolation: A problem in one node or cable does not affect the overall network, reducing the risk of complete outages. ​ (GeeksforGeeks, 2024)
3. ***Compatibility and Standardization***    
   *Widely Supported Technology:* Most modern networking hardware, including routers, switches, and wireless access points, are optimized for star topology, ensuring compatibility with office setups. (GeeksforGeeks, 2024)  
   *Support for High-Bandwidth Media:* Star topology works well with Ethernet and fiber-optic cables, enabling high-speed internet and seamless connectivity.
4. ***Security***  
   Controlled Access: The hub acts as a gatekeeper, providing an opportunity to enforce security measures such as firewalls, encryption, and user authentication.   
   Isolated Failures: An individual device being compromised does not necessarily affect the others, enhancing network security. ​(Arora, 2024)​
5. ***Cost-Effectiveness in the Long Run***   
   While initial cabling and equipment costs might be higher, the ease of maintenance, troubleshooting, and upgrades make star topology cost-efficient over time. (Roberts, 2024)

***In conclusion, star topology balances performance, reliability, and manageability, making it an ideal choice for office networks.***

# CHAPTER 7: WAN TOPOLOGY

The WAN topology is comprehensive, allowing for single point data access and easy expansion, but comes with the drawbacks of having high installation and maintenance expenses, high management difficulty, and possible latency problems. There are mainly three types of WAN topologies:

|  |  |  |
| --- | --- | --- |
| TOPOLOGY | ADVANTAGES | DISADVANTAGES |
| *POINT-TO-POINT TOPOLOGY* | * Simple and easy to set up. * Direct and dedicated connection * Low latency with direct connection.  (GeeksforGeeks, 2023) | * Limited scalability * Costly Long-distance links. * Total communication loss if link fails  (GeeksforGeeks, 2023) |
| *HUB AND SPOKE TOPOLOGY* | * Easy centralized control * Cost-effective for multiple branches * Simple to add new branches  (Mikac, 2023) | * High dependency on central hub * Network impact if hub fails * Potential bottlenecks at hub   (Mikac, 2023) |
| *FULL MESH TOPOLOGY* | * High availability and redundancy * Fault isolation is easy * Scalable and robust design (BasuMallick, 2022) | * High implementation cost * Complex installation & maintenance * Increased power consumption    (BasuMallick, 2022) |

***Justification for the Implementation of MESH TOPOLOGY in the Wide Area Networks (WANs) of Perlis, Malacca, Kedah, and Ipoh***

1. ***High Redundancy and Reliability***

Multiple Connections: Mesh topology provides multiple data paths, ensuring uninterrupted connectivity even during link failures.

Fault Tolerance: A single failure does not disrupt the entire network, maintaining consistent communication across locations.  (Arora, 2024)

1. **Performance and Bandwidth**

Direct Communication: Nodes communicate directly, reducing latency and ensuring high-speed data transfer.

Load Balancing: Traffic is efficiently distributed across multiple paths, minimizing bottlenecks.  (BasuMallick, 2022)

1. **Scalability**

Seamless Expansion: New nodes can be added without impacting the existing network.  (Computer Hope, 2018)

Futureproofing: Easily integrates new technologies to meet growing data demands.

1. ***Security***

Decentralized Design: No single point of failure, enhancing network resilience against cyberattacks.

Encrypted Links: Direct connections are easily secured, ensuring safe data transfer.  
(BasuMallick, 2022)

1. ***Reliability***

Dynamic Routing: Automatic rerouting ensures continuous connectivity during link or node failures.

Data Integrity: Redundant links prevent data loss, maintaining uninterrupted operations.  (GeeksforGeeks, 2024)

1. ***Compatibility and Adaptability***

Flexible Infrastructure: Supports diverse technologies like fiber optics, wireless, and satellite connections.

Wide Coverage: Ideal for large-scale WANs, providing reliable communication across distant offices.  (Arora, 2024)

1. ***Cost-Effectiveness in the Long Run***

Although setup costs are higher, reduced downtime and efficient resource utilization make mesh topology cost-efficient over time. (Computer Hope, 2018)

***In conclusion, mesh topology provides unparalleled reliability, scalability, and performance, making it a robust choice for WANs in Perlis, Malacca, Ipoh, and Kedah.***

# **CHAPTER 8: VLSM BOX SOLUTION**

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***LEGEND***

**A1: PERLIS IT DEPARTMENT (12 hosts)**

**A2: MALACCA IT DEPARTMENT (12 hosts)**

**A3: IPOH NETWORK OPERATIONS CENTRE (NOC) (12 hosts)**

**A4: KEDAH IT DEPARTMENT (12 hosts)**

**B1: PERLIS FINANCE DEPARTMENT (10 hosts)**

**B2: MALACCA HR DEPARTMENT (10 hosts)**

**B3: IPOH IT DEPARTMENT (10 hosts)**

**B4: KEDAH TRADING ROOM (10 hosts)**

**C1: PERLIS CEO ROOM (5 hosts)**

**C2: MALACCA MANAGERS ROOM (5 hosts)**

**C3: IPOH MANAGERS ROOM (5 hosts)**

**C4: KEDAH MANAGERS ROOM (5 hosts)**

**D1: PERLIS SERVER ROOM (5 servers)**

**D2: MALACCA SERVER ROOM (5 servers)**

**D3: IPOH SERVER ROOM (5 servers)**

**D4: KEDAH SERVER ROOM (5 servers)**

**E1: PERLIS SE4/0 DCE – KEDAH SE4/0 (wan link 1)**

**E2: KEDAH SE5/0 DCE – IPOH SE4/0 (wan link 2)**

**E3: IPOH SE5/0 – MALACCA SE4/0 DCE (wan link 3)**

**E4: MALACCA SE5/0 DCE – PERLIS SE5/0 (wan link 4)**

**E5: PERLIS SE6/0 – IPOH SE6/0 DCE (wan link 5)**

**E6: KEDAH SE6/0 DCE – MALACCA SE6/0 (wan link 6)**

# **CHAPTER 9: VLSM IP ADDRESSING SCHEME**

*PERLIS BRANCH IP ADDRESS TABLE*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Device | Interface | Department Name | Network Address | IP Address | Usable Address Range | Broadcast Address |
| Router – Perlis | Se4/0 | N / A | 200.150.70.192/30 | 200.150.70.193 | 200.150.70.193- 200.150.70.194 | 200.150.70.195 |
| Se5/0 | N / A | 200.150.70.204 | 200.150.70.206 | 200.150.70.205 -200.150.70.206 | 200.150.70.207 |
| Se6/0 | N / A | 200.150.70.208 | 200.150.70.209 | 200.150.70.209 - 200.150.70.210 | 200.150.70.211 |
| Gig0/0 | IT Department | 200.150.70.0/28 | 200.150.70.1 | 200.150.70.1 – 200.150.70.14 | 200.150.70.15 |
| Gig 3/0 | Finance Department | 200.150.70.64/28 | 200.150.70.65 | 200.150.70.66 - 200.150.70.78 | 200.150.70.79 |
| Gig 2/0 | C.E.O Room | 200.150.70.128/29 | 200.150.70.129 | 200.150.70.129 - 200.150.70.134 | 200.150.70.135 |
| Gig 1/0 | Server Room | 200.150.70.160 | 200.150.70.161 | 200.150.70.161 - 200.150.70.166 | 200.150.70.167 |

*PERLIS IT DEPARTMENT IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Switch - Interface | IP Address | Subnet Mask | Default Gateway |
| Perlis IT PC1 | Fa0/1 | 200.150.70.2 | 255.255.255.240 | 200.150.70.1 |
| Perlis IT PC2 | Fa0/2 | 200.150.70.3 |
| Perlis IT PC3 | Fa0/3 | 200.150.70.4 |
| Perlis IT PC4 | Fa0/4 | 200.150.70.5 |
| Perlis IT PC5 | Fa0/5 | 200.150.70.6 |
| Perlis IT Laptop1 | Fa0/6 | 200.150.70.7 |
| Perlis IT Laptop2 | Fa0/7 | 200.150.70.8 |
| Perlis IT Laptop3 | Fa0/8 | 200.150.70.9 |
| Perlis IT Laptop4 | Fa0/9 | 200.150.70.10 |
| Perlis IT Printer1 | Fa0/10 | 200.150.70.11 |
| Perlis IT Printer2 | Fa0/11 | 200.150.70.12 |
| Perlis IT Printer3 | Fa0/12 | 200.150.70.13 |

*PERLIS FINANCE DEPARTMENT IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Perlis Finance Laptop1 | Fa0/1 | 200.150.70.66 | 255.255.255.240 | 200.150.70.65 |
| Perlis Finance Laptop2 | Fa0/3 | 200.150.70.67 |
| Perlis Finance Laptop3 | Fa0/5 | 200.150.70.68 |
| Perlis Finance Laptop4 | Fa0/9 | 200.150.70.69 |
| Perlis Finance PC1 | Fa0/2 | 200.150.70.70 |
| Perlis Finance PC2 | Fa0/4 | 200.150.70.71 |
| Perlis Finance PC3 | Fa0/7 | 200.150.70.72 |
| Perlis Finance PC4 | Fa0/10 | 200.150.70.73 |
| Perlis Finance Printer1 | Fa0/6 | 200.150.70.74 |
| Perlis Finance Printer2 | Fa0/8 | 200.150.70.75 |

*PERLIS CEO ROOM IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Perlis CEO Laptop1 | Wireless Access Point | 200.150.70.130 | 255.255.255.248 | 200.150.70.129 |
| Perlis CEO Smartphone1 | Wireless Access Point | 200.150.70.131 |
| Perlis CEO Tablet1 | Wireless Access Point | 200.150.70.132 |
| Perlis CEO Printer1 | Wireless Access Point | 200.150.70.133 |
| Perlis CEO PC1 | Fa0/1 | 200.150.70.134 |

*PERLIS SERVER ROOM IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Server Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Perlis Web Server | Fa0/1 | 200.150.70.162 | 255.255.255.248 | 200.150.70.161 |
| Perlis Mail Server | Fa0/2 | 200.150.70.163 |
| Perlis Print Server | Fa0/4 | 200.150.70.164 |
| Perlis File Server | Fa0/5 | 200.150.70.165 |
| Perlis Database Server | Fa0/3 | 200.150.70.166 |

*MALACCA BRANCH IP ADDRESS TABLE*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Device** | **Interface** | **Department Name** | **Network Address** | **IP Address** | **Usable Address Range** | **Broadcast Address** |
| **Router – Malacca** | **Se4/0** | N / A | 200.150.70.200/30 | 200.150.70.202 | 200.150.70.201 - 200.150.70.202 | 200.150.70.203 |
| **Se5/0** | N / A | 200.150.70.204/30 | 200.150.70.205 | 200.150.70.205 -200.150.70.206 | 200.150.70.207 |
| **Se6/0** | N / A | 200.150.70.212/30 | 200.150.70.214 | 200.150.70.213 -200.150.70.214 | 200.150.70.215 |
| **Gig0/0** | IT Department | 200.150.70.16/28 | 200.150.70.17 | 200.150.70.17 - 200.150.70.30 | 200.150.70.31 |
| **Gig1/0** | HR Department | 200.150.70.80/28 | 200.150.70.81 | 200.150.70.82 - 200.150.70.94 | 200.150.70.95 |
| **Gig2/0** | Manager Room | 200.150.70.136/28 | 200.150.70.137 | 200.150.70.137 - 200.150.70.142 | 200.150.70.143 |
| **Gig3/0** | Server Room | 200.150.70.168/28 | 200.150.70.169 | 200.150.70.169 - 200.150.70.174 | 200.150.70.175 |

*MALACCA IT DEPARTMENT IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Malacca IT PC1 | Fa0/2 | 200.150.70.18 | 255.255.255.240 | 200.150.70.17 |
| Malacca IT PC2 | Fa0/1 | 200.150.70.19 |
| Malacca IT PC3 | Fa0/3 | 200.150.70.20 |
| Malacca IT PC4 | Fa0/4 | 200.150.70.21 |
| Malacca IT PC5 | Fa0/5 | 200.150.70.22 |
| Malacca IT Laptop1 | Fa0/6 | 200.150.70.23 |
| Malacca IT Laptop2 | Fa0/7 | 200.150.70.24 |
| Malacca IT Laptop3 | Fa0/9 | 200.150.70.25 |
| Malacca IT Laptop4 | Fa0/10 | 200.150.70.26 |
| Malacca IT Printer1 | Fa0/11 | 200.150.70.27 |
| Malacca IT Printer2 | Fa0/12 | 200.150.70.28 |
| Malacca IT Printer3 | Fa0/8 | 200.150.70.29 |

*MALACCA HR DEPARTMENT IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Malacca HR PC1 | Fa0/9 | 200.150.70.82 | 255.255.255.240 | 200.150.70.81 |
| Malacca HR PC2 | Fa0/8 | 200.150.70.83 |
| Malacca HR PC3 | Fa0/10 | 200.150.70.84 |
| Malacca HR PC4 | Fa0/7 | 200.150.70.85 |
| Malacca HR Laptop1 | Fa0/3 | 200.150.70.86 |
| Malacca HR Laptop2 | Fa0/4 | 200.150.70.87 |
| Malacca HR Laptop3 | Fa0/5 | 200.150.70.88 |
| Malacca HR Laptop4 | Fa0/6 | 200.150.70.89 |
| Malacca HR Printer1 | Fa0/2 | 200.150.70.90 |
| Malacca HR Printer2 | Fa0/1 | 200.150.70.91 |

*MALACCA MANAGER ROOM IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Malacca Manager Laptop1 | Wireless Access Point | 200.150.70.138 | 255.255.255.248 | 200.150.70.137 |
| Malacca Manager Smartphone1 | Wireless Access Point | 200.150.70.139 |
| Malacca Manager Tablet1 | Wireless Access Point | 200.150.70.140 |
| Malacca Manager Printer1 | Wireless Access Point | 200.150.70.141 |
| Malacca Manager PC1 | Fa0/1 | 200.150.70.142 |

*MALACCA SERVER ROOM IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Server Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Malacca Web Server | Fa0/5 | 200.150.70.170 | 255.255.255.248 | 200.150.70.169 |
| Malacca Mail Server | Fa0/4 | 200.150.70.171 |
| Malacca Print Server | Fa0/1 | 200.150.70.172 |
| Malacca File Server | Fa0/3 | 200.150.70.173 |
| Malacca Database Server | Fa0/2 | 200.150.70.174 |

*IPOH BRANCH IP ADDRESS TABLE*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Device** | **Interface** | **Department Name** | **Network Address** | **IP Address** | **Usable Address Range** | **Broadcast Address** |
| **Router – Ipoh** | **Se4/0** | N / A | 200.150.70.196/30 | 200.150.70.198 | 200.150.70.197- 200.150.70.198 | 200.150.70.199 |
| **Se5/0** | N / A | 200.150.70.200/30 | 200.150.70.201 | 200.150.70.201 - 200.150.70.202 | 200.150.70.203 |
| **Se6/0** | N / A | 200.150.70.208/30 | 200.150.70.210 | 200.150.70.209 - 200.150.70.210 | 200.150.70.211 |
| **Gig1/0** | IT Department | 200.150.70.96/28 | 200.150.70.97 | 200.150.70.98 - 200.150.70.110 | 200.150.70.111 |
| **Gig0/0** | NOC Department | 200.150.70.32/28 | 200.150.70.33 | 200.150.70.33 – 200.150.70.46 | 200.150.70.47 |
| **Gig3/0** | Manager Room | 200.150.70.144/29 | 200.150.70.145 | 200.150.70.145 – 200.150.70.150 | 200.150.70.151 |
| **Gig2/0** | Server Room | 200.150.70.176/29 | 200.150.70.177 | 200.150.70.176 - 200.150.70.182 | 200.150.70.183 |

*IPOH IT DEPARTMENT ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Ipoh IT PC1 | Fa0/1 | 200.150.70.97 | 255.255.255.240 | 200.150.70.97 |
| Ipoh IT PC2 | Fa0/9 | 200.150.70.98 |
| Ipoh IT PC3 | Fa0/5 | 200.150.70.99 |
| Ipoh IT PC4 | Fa0/3 | 200.150.70.100 |
| Ipoh IT Laptop1 | sFa0/10 | 200.150.70.101 |
| Ipoh IT Laptop2 | Fa0/7 | 200.150.70.102 |
| Ipoh IT Laptop3 | Fa0/4 | 200.150.70.103 |
| Ipoh IT Laptop4 | Fa0/6 | 200.150.70.104 |
| Ipoh IT Printer1 | Fa0/8 | 200.150.70.105 |
| Ipoh IT Printer2 | Fa0/2 | 200.150.70.106 |

*IPOH NETWORK OPERATIONS CENTRE (NOC) ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Ipoh NOC PC1 | Fa0/2 | 200.150.70.34 | 255.255.255.240 | 200.150.70.33 |
| Ipoh NOC PC2 | Fa0/6 | 200.150.70.35 |
| Ipoh NOC PC3 | Fa0/7 | 200.150.70.36 |
| Ipoh NOC PC4 | Fa0/8 | 200.150.70.37 |
| Ipoh NOC PC5 | Fa0/10 | 200.150.70.38 |
| Ipoh NOC Laptop1 | Fa0/3 | 200.150.70.39 |
| Ipoh NOC Laptop2 | Fa0/4 | 200.150.70.40 |
| Ipoh NOC Laptop3 | Fa0/9 | 200.150.70.41 |
| Ipoh NOC Laptop4 | Fa0/12 | 200.150.70.42 |
| Ipoh NOC Printer1 | Fa0/1 | 200.150.70.43 |
| Ipoh NOC Printer2 | Fa0/5 | 200.150.70.44 |
| Ipoh NOC Printer3 | Fa0/11 | 200.150.70.45 |

*IPOH MANAGER ROOM IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Interface | IP Address | Subnet Mask | Default Gateway |
| Ipoh Manager Laptop1 | Wireless Access Point | 200.150.70.146 | 255.255.255.248 | 200.150.70.145 |
| Ipoh Manager Smartphon1 | Wireless Access Point | 200.150.70.147 |
| Ipoh Manager Tablet1 | Wireless Access Point | 200.150.70.148 |
| Ipoh Manager Printer1 | Wireless Access Point | 200.150.70.149 |
| Ipoh Manager PC1 | Fa0/2 | 200.150.70.150 |

*IPOH SERVER ROOM IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Server Name | Interface | IP Address | Subnet Mask | Default Gateway |
| Ipoh Web Server | Fa0/1 | 200.150.70.177 | 255.255.255.248 | 200.150.70.177 |
| Ipoh Mail Server | Fa0/3 | 200.150.70.178 |
| Ipoh Print Server | Fa0/5 | 200.150.70.179 |
| Ipoh File Server | Fa0/2 | 200.150.70.180 |
| Ipoh Database Server | Fa0/4 | 200.150.70.181 |

*KEDAH BRANCH IP ADDRESS TABLE*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Device** | **Interface** | **Department Name** | **Network Address** | **IP Address** | **Usable Address Range** | **Broadcast Address** |
| **Router – Kedah** | **Se4/0** | N / A | 200.150.70.192/30 | 200.150.70.194 | 200.150.70.193 - 200.150.70.194 | 200.150.70.195 |
| **Se5/0** | N / A | 200.150.70.196/30 | 200.150.70.197 | 200.150.70.197 - 200.150.70.198 | 200.150.70.199 |
| **Se6/0** | N / A | 200.150.70.212/30 | 200.150.70.213 | 200.150.70.213 -200.150.70.214 | 200.150.70.215 |
| **Gig0/0** | IT Department | 200.150.70.48/28 | 200.150.70.49 | 200.150.70.50 - 200.150.70.62 | 200.150.70.63 |
| **Gig3/0** | Trading Room | 200.150.70.112/28 | 200.150.70.113 | 200.150.70.114 - 200.150.70.126 | 200.150.70.127 |
| **Gig1/0** | Manager Room | 200.150.70.152/29 | 200.150.70.153 | 200.150.70.153 - 200.150.70.158 | 200.150.70.159 |
| **Gig2/0** | Server Room | 200.150.70.184/29 | 200.150.70.185 | 200.150.70.185 - 200.150.70.190 | 200.150.70.191 |

*KEDAH IT DEPARTMENT IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Kedah IT PC1 | Fa0/1 | 200.150.70.50 | 255.255.255.240 | 200.150.70.49 |
| Kedah IT PC2 | Fa0/2 | 200.150.70.51 |
| Kedah IT PC3 | Fa0/3 | 200.150.70.52 |
| Kedah IT PC4 | Fa0/4 | 200.150.70.53 |
| Kedah IT PC5 | Fa0/5 | 200.150.70.54 |
| Kedah IT Laptop1 | Fa0/6 | 200.150.70.55 |
| Kedah IT Laptop2 | Fa0/7 | 200.150.70.56 |
| Kedah IT Laptop3 | Fa0/8 | 200.150.70.57 |
| Kedah IT Laptop4 | Fa0/9 | 200.150.70.58 |
| Kedah IT Printer1 | Fa0/10 | 200.150.70.59 |
| Kedah IT Printer2 | Fa0/11 | 200.150.70.60 |
| Kedah IT Printer3 | Fa0/12 | 200.150.70.61 |

*KEDAH TRADING ROOM IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Kedah Trading PC1 | Fa0/1 | 200.150.70.114 | 255.255.255.240 | 200.150.70.113 |
| Kedah Trading PC2 | Fa0/2 | 200.150.70.115 |
| Kedah Trading PC3 | Fa0/3 | 200.150.70.116 |
| Kedah Trading PC4 | Fa0/4 | 200.150.70.117 |
| Kedah Trading Laptop1 | Fa0/5 | 200.150.70.118 |
| Kedah Trading Laptop2 | Fa0/6 | 200.150.70.119 |
| Kedah Trading Laptop3 | Fa0/7 | 200.150.70.120 |
| Kedah Trading Laptop4 | Fa0/8 | 200.150.70.121 |
| Kedah Trading Printer1 | Fa0/9 | 200.150.70.122 |
| Kedah Trading Printer2 | Fa0/10 | 200.150.70.123 |

*KEDAH MANAGER ROOM IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Kedah Manager Laptop1 | Wireless Access Point | 200.150.70.154 | 255.255.255.248 | 200.150.70.153 |
| Kedah Manager Smartphone1 | Wireless Access Point | 200.150.70.155 |
| Kedah Manager Tablet1 | Wireless Access Point | 200.150.70.156 |
| Kedah Manager Printer1 | Wireless Access Point | 200.150.70.157 |
| Kedah Manager PC1 | Fa0/2 | 200.150.70.158 |

*KEDAH SERVER ROOM IP ADDRESS TABLE*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Server Name | Switch Interface | IP Address | Subnet Mask | Default Gateway |
| Kedah Web Server | Fa0/2 | 200.150.70.186 | 255.255.255.248 | 200.150.70.185 |
| Kedah Mail Server | Fa0/5 | 200.150.70.187 |
| Kedah Print Server | Fa0/3 | 200.150.70.189 |
| Kedah File Server | Fa0/4 | 200.150.70.190 |
| Kedah Database Server | Fa0/1 | 200.150.70.191 |

*Ip Addressing Justification*

Network ID: 200.150.70.0

Subnet Mask: 255.255.255.0 (Class C Default)

128 64 32 16 8 4 2 1

. 0 0 0 0 0 0 0 0

Subnet Ids. to use:

128 64 32 16 8 4

0 0 0 0 0 0 - .0 Perlis IT Department

0 0 0 0 0 1 - .4

0 0 0 0 1 0 - .8

0 0 0 0 1 1 - .12

0 0 0 1 0 0 - .16 Malacca IT Department

0 0 0 1 0 1 - .20

0 0 0 1 1 0 - .24

0 0 0 1 1 1 - .28

0 0 1 0 0 0 - .32 Ipoh NOC Department

0 0 1 0 0 1 - .36

0 0 1 0 1 0 - .40

0 0 1 0 1 1 - .44

0 0 1 1 0 0 - .48 Kedah IT Department

0 0 1 1 0 1 - .52

0 0 1 1 1 0 - .56

0 0 1 1 1 1 - .60

0 1 0 0 0 0 - .64 Perlis Finance Department

0 1 0 0 0 1 - .68

0 1 0 0 1 0 - .72

0 1 0 0 1 1 - .76

0 1 0 1 0 0 - .80 Malacca HR Department

0 1 0 1 0 1 - .84

0 1 0 1 1 0 - .88

0 1 0 1 1 1 - .92

0 1 1 0 0 0 - .96 Ipoh IT Department

0 1 1 0 0 1 - .100

0 1 1 0 1 0 - .104

0 1 1 0 1 1 - .108

0 1 1 1 0 0 - .112 Kedah Trading Room

0 1 1 1 0 1 - .116

0 1 1 1 1 0 - .120

0 1 1 1 1 1 - .124

1 0 0 0 0 0 - .128 Perlis C.E.O Room

1 0 0 0 0 1 - .132

1 0 0 0 1 0 - .136 Malacca Manager Room

1 0 0 0 1 1 - .140

1 0 0 1 0 0 - .144 Ipoh Manager Room

1 0 0 1 0 1 - .148

1 0 0 1 1 0 - .152 Kedah Manager Room

1 0 0 1 1 1 - .156

1 0 1 0 0 0 - .160 Perlis Server Room

1 0 1 0 0 1 - .164

1 0 1 0 1 0 - .168 Malacca Server Room

1 0 1 0 1 1 - .172

1 0 1 1 0 0 - .176 Ipoh Server Room

1 0 1 1 0 1 - .180

1 0 1 1 1 0 - .184 Kedah Server Room

1 0 1 1 1 1 - .188

1 1 0 0 0 0 - .192 Wan Link 1

1 1 0 0 0 1 - .196 Wan Link 2

1 1 0 0 1 0 - .200 Wan Link 3

1 1 0 0 1 1 - .204 Wan Link 4

1 1 0 1 0 0 - .208 Wan Link 5

1 1 0 1 0 1 - .212 Wan Link 6

1 1 0 1 1 0 - .216

1 1 0 1 1 1 - .220

1 1 1 0 0 0 - .224

1 1 1 0 0 1 - .228

1 1 1 0 1 0 - .232

1 1 1 0 1 1 - .236

1 1 1 1 0 0 - .240

1 1 1 1 0 1 - .244

1 1 1 1 1 0 - .248

1 1 1 1 1 1 - .252

# **CONCLUSION**

NeuroByte's proposed network design development has enabled our team to grasp the complete spectrum of challenges found in current network infrastructure requirements. The system design follows networking principles to create an operationally efficient solution that scales well and maintains security. Some key learnings concern the choice of topology: Network designers implemented Star Topology for Local Area Networks together with Mesh Topology for Wide Area Networks as distinct solutions for their branch requirements. We refined our subnetting and IP addressing and network device configuration skills because these protocols determine the quality of communication and performance optimization. (GeeksforGeeks, 2024)

The entire project examines IoT devices among high-tech components which enabled the development of an automated network monitoring system which operates continuously and remains future-ready. Our infrastructure maintains a special server room alongside static routing functions to provide present-day operations support while preserving flexibility for future growth using various technological solutions.

The practical skills taught in this assignment give us the ability to strategically develop and maintain sophisticated enterprise business networks and apply these competencies directly to real-world scenarios. Our practical experience builds comprehensive knowledge about building dependable and affordable networks that ensure security

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# **WORK BREAKDOWN STRUCTURE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Student Name:*  *TP Number:* | AHMED MIRAHUSAIN ALVI  (TP084807) | SULTAN ABDULLA OMAR TAKRORI (TP085327) | ABDALLAH MOHAMED MAHMOUD MOHAMMED MAHMOUD (TP085097) | MOHHAMED ABDIFATAH ALI (TP082459) |
| **Group Component** | | | | |
| Creativity for network design | ✓ | ✓ | ✓ | ✓ |
| Technical concepts for configuration | ✓ | ✓ | ✓ | ✓ |
| Q & A | ✓ | ✓ | ✓ | ✓ |
| Communication Skills | ✓ | ✓ | ✓ | ✓ |
| **Total Group Component Contribution Percentage (%)** | **40%** | **40%** | **40%** | **40%** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Individual Component** | | | | |
| Network Topology Design | ✓ | ✓ | ✓ | ✓ |
| Topology Justification | ✓ | ✓ | ✓ | ✓ |
| IP Addressing Plan & Justification | ✓ | ✓ | ✓ | ✓ |
| Justification of the configuration techniques | ✓ | ✓ | ✓ | ✓ |
| Referencing | ✓ | ✓ | ✓ | ✓ |
| Documentation | ✓ | ✓ | ✓ | ✓ |
| **Total Individual Component Contribution Percentage (%)** | **60%** | **60%** | **60%** | **60%** |
| **Signature:** | **Ahmed** | **Sultan** | **Abdo** | **Moha** |