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**Networks and Networking (NWN)**

**Scenario-Based Assignment**

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# 1.0 Introduction

Boulevard Hotels network’s IP addressing scheme was developed and implemented for the topology as shown in the figure below.

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**Figure 1: Boulevard Hotels Network Topology**

The subnetting has been done with the provided IP addresses, **192.168.50.0** which belong to the Class C addresses block. Class C address block is a private IPv4 address that is commonly utilized within any network internally (Cisco, n.d.). Furthermore, Class C is designed to accommodate up to 254 hosts in small networks like Boulevard Hotels network (Cisco, n.d.). Class C had a fixed /24 prefix, with the first three octets indicating the network and the last octet indicating the host address (Cisco, n.d.).

A topology diagram of the Boulevard Hotels networks as illustrated in the figure above had been generated by using the Packet Tracer. Each device in the network had been configured appropriately with specified IP addressing after the topology diagram is completed. Boulevard Hotels network is tested using proper commands to ensure everything is operating as usual once the configuration is done.

# **2.0 Network Topology**

The topology of Boulevard Hotels network is how nodes, end devices, and connections are physically or logically linked to each other. The operation and performance of the Boulevard Hotels network are strongly affected by network topology. Suitable network topology for Boulevard would improve network performance, makes identifying faults easier, debug issues, and assign resources more effectively throughout Boulevard network to maintain the best network health. Efficient and well-managed network topology for Boulevard can benefit in decreasing operating and maintenance expenses by improving energy and data efficiency (Staff Contributor, 2019).

When it comes to LAN and WAN networks, there are two types of topologies to take into account. Physical topology represents the physical connections between routers, switches and wireless access points which are examples of end devices and intermediary devices. Specific device location may also be included in the topology (Cisco, n.d.). The logical topology shows how Boulevard network is assembled, including which nodes connect to another and in what ways, as well as how data is moved throughout Boulevard network. The topology contains each and every virtual and cloud connections (Staff Contributor, 2019).

Local Area Networks (LANs) and Wide Area Networks (WANs) are the two most widely used types of network infrastructure in today’s era. A Local Area Network (LAN) is a network infrastructure that links users and end devices in a certain geographic region. A LAN is used in different locations of Boulevard Hotels network. A Wide Area Network (WAN) is a network infrastructure which connects networks of all locations across a broad geographic region and is owned and controlled by Boulevard Hotels. Figure 1: Boulevard Hotels Network Topology depicts LANs that are connected to WANs (Cisco, n.d.).

Map

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**Figure 2: LANs of Boulevard Hotels Network**

As shown in Figure 2: LANs of Boulevard Hotels Network, end devices in each hotel location is connected by LANs. The LANs are managed by Boulevard. Boulevard will be in charge of the security access and control policies with administrative control at the network level. As indicated in Figure 2: LANs of Boulevard Hotels Network, LANs offer high-speed bandwidth to end devices and intermediary devices of hotels in different locations (Cisco, n.d.).

Map

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**Figure 3: WANs of Boulevard Hotels Network**

As illustrated in Figure 3: WANs of Boulevard Hotels Network, WANs connect LANs over a large geographical area across hotels in different locations (Cisco, n.d.).

In LANs of Boulevard Hotels Network, end devices and intermediary devices are connected by both star and extended star topologies. As illustrated n Figure 2: LANs of Boulevard Hotels Network, switches are connected to the routers using the star topology. The switches connected to the routers with copper cable acts as a central connection point for LAN. For example, P1, JB1, JB2, Kl1 and OFF switches are connected to their specific routers. Multiple laptops and smartphones are connected to the wireless access points which shows the extended star topology of the network (Cisco, n.d.).

For the WAN of Boulevard Hotels Network, star topology is used in which Penang, JB, KL, and OFF are connected to Offsite router. Every node is connected to a central network device which is the Offsite Router as shown in Figure 3: WANs of Boulevard Hotels Network.Offsite router will serve as a server, while the connected switch and routers are the clients (Computer Hope, 2018). Offsite routers connect clients with serial cable controls data transmission due to every node on the network must send data via it in order for it to reach the destination, and it works as a repeater to assist in avoiding data loss (Staff Contributor, 2019).

Star topology is useful due to this topology make things easy when it comes to controlling the whole Boulevard Hotels network from one location. This is due to the reason that each node is connected to the central hub individually, so if one malfunction, the remaining network will continue to function as normal. As a result, the star topology is a safe and dependable network topology. Without affecting the whole Boulevard Hotels network, devices may be added, removed, or changed (Staff Contributor, 2019).

On the physical topology, the star topology’s structure needs relatively little cable to link the network effectively making implementation and maintenance as Boulevard Hotels network expands or shrinks. The network layout’s clarity also brings convenience to administrators as issues or performance problems can be identified easily (Staff Contributor, 2019).

On the other hand, star topology has disadvantages, The whole Boulevard Hotels network will break down if the central hub breaks down. If the central hub is monitored and maintained appropriately, administrators should not have too many problems. The central node's configuration and technical restrictions also limit the network's bandwidth and performance (Staff Contributor, 2019). Additional cable length is required for star topology compared to the bus topology. This also causes the star topology to be costly to set up and manage (Staff Contributor, 2019).

Star topology is used in Boulevard Hotels network because the major characteristic of this topology is when a cable fails, only one node will be affected rather than the whole network. By linking all end devices and intermediary devices to the Offsite router, the star topology reduces the probabilities of network failure which suits Boulevard Hotels network well (UKEssays, 2021).

# 3.0 IP Addressing Plan

Fixed Length Subnet Masks (FLSM) and Variable Length Subnet Masks (VLSM) defined how each firm's IP address space is distributed. FLSM refers to a method in which all network infrastructure will have the same size. A Fixed Length approach is used to assign IP addresses. VLSM, on the other hand, is a method of subnet deployment that allows variable subnet masks (Harmoush, n.d.).

FLSM has the advantage of allowing Boulevard to service different networks with a single network address. However, in the reality, those local networks are rarely the same size. As a result, deploying FLSM wastes IP addresses (Sportack, 2002).

VLSM overall enhance this with the subnet design that utilizes more than one mask in the same network and allows one mask to be used in various subnets of a single class A, B, C or a network. VLSM is utilized to enhance the usage and efficiency of subnets by utilizing variable sizes to minimize the wastage of IP addresses (aaradhanathapliyal, 2020). VLSM is the best option for Boulevard Hotels network. However, VLSM is not perfect. With all of the various subnets, it's more complex and difficult to manage Boulevard’s network. There’s a higher chance of allocating overlapping subnets (VLSM Pitfalls, 2021).

**Table 1: IP Addressing Table of Boulevard Hotels network**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Subnet** | **Host** | **Subnet Mask** | **Network Address** | **Range of Usable IP** | **Broadcast Address** | **Default Gateway** |
| **KL1** | **80** | **255.255.255.128 or /25** | **192.168.50.0** | **192.168.50.1 - 192.168.50.126** | **192.168.50.127** | **192.168.50.1** |
| **P1** | **58** | **255.255.255.192 or /26** | **192.168.50.128** | **192.168.50.129 - 192.168.50.190** | **192.168.50.191** | **192.168.50.129** |
| **JB2** | **28** | **255.255.255.224 or /27** | **192.168.50.192** | **192.168.50.193 - 192.168.50.222** | **192.168.50.223** | **192.168.50.193** |
| **JB1** | **12** | **255.255.255.240 or /28** | **192.168.50.224** | **192.168.50.225 - 192.168.50.238** | **192.168.50.239** | **192.168.50.225** |
| **OFF** | **8** | **255.255.255.240 or /28** | **192.168.50.240** | **192.168.50.241 - 192.168.50.254** | **192.168.50.255** | **192.168.50.241** |
| **Offsite-Penang** | **2** | **255.255.255.252 or /30** | **200.10.10.0** | **200.10.10.1 - 200.10.10.2** | **200.10.10.3** | **N/A** |
| **Offsite– JB** | **2** | **255.255.255.252 or /30** | **200.10.10.4** | **200.10.10.5 - 200.10.10.6** | **200.10.10.7** | **N/A** |
| **Offsite- KL** | **2** | **255.255.255.252 or /30** | **200.10.10.8** | **200.10.10.9 - 200.10.10.10** | **200.10.10.11** | **N/A** |

**Table 2: IP Addressing Table of Boulevard Hotels network**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Interface** | **IPv4 Address** | **IPv4 Subnet Mask** | **IPv4 Default Gateway** |
| **Offsite** | **Se2/0** | **200.10.10.2** | **255.255.255.252** | **N/A** |
| **Se3/0** | **200.10.10.6** | **255.255.255.252** | **N/A** |
| **Se6/0** | **200.10.10.10** | **255.255.255.252** | **N/A** |
| **Gig8/0** | **192.168.50.241** | **255.255.255.240** | **N/A** |
| **OFF** | **Vlan 1** | **192.168.50.245** | **255.255.255.240** | **192.168.50.241** |
| **Server 1** | **Gig1** | **192.168.50.243** | **255.255.255.240** | **192.168.50.241** |
| **Server 2** | **Gig1** | **192.168.50.244** | **255.255.255.240** | **192.168.50.241** |
| **Server 3** | **Gig1** | **192.168.50.242** | **255.255.255.240** | **192.168.50.241** |
| **JB** | **Se2/0** | **200.10.10.5** | **255.255.255.252** | **N/A** |
| **Fa0/0** | **192.168.50.193** | **255.255.255.224** | **N/A** |
| **Fa1/0** | **192.168.50.225** | **255.255.255.240** | **N/A** |
| **JB1** | **Vlan 1** | **192.168.50.227** | **255.255.255.240** | **192.168.50.225** |
| **JB2** | **Vlan 1** | **192.168.50.197** | **255.255.255.224** | **192.168.50.193** |
| **PC2** | **Fa0** | **192.168.50.226** | **255.255.255.240** | **192.168.50.225** |
| **Smartphone1** | **Wireless0** | **192.168.50.194** | **255.255.255.224** | **192.168.50.193** |
| **Laptop2** | **Wireless0** | **192.168.50.196** | **255.255.255.224** | **192.168.50.193** |
| **Laptop3** | **Wireless0** | **192.168.50.195** | **255.255.255.224** | **192.168.50.193** |
| **Penang** | **Fa0/0** | **192.168.50.129** | **255.255.255.192** | **N/A** |
| **Se2/0** | **200.10.10.1** | **255.255.255.252** | **N/A** |
| **P1** | **Vlan 1** | **192.168.50.188** | **255.255.255.192** | **192.168.50.129** |
| **P2** | **Vlan 1** | **192.168.50.187** | **255.255.255.192** | **192.168.50.129** |
| **P3** | **Vlan 1** | **192.168.50.186** | **255.255.255.192** | **192.168.50.129** |
| **P4** | **Vlan 1** | **192.168.50.135** | **255.255.255.192** | **192.168.50.129** |
| **PC0** | **Fa0** | **192.168.50.190** | **255.255.255.192** | **192.168.50.129** |
| **PC1** | **Fa0** | **192.168.50.189** | **255.255.255.192** | **192.168.50.129** |
| **Smartphone0** | **Wireless0** | **192.168.50.133** | **255.255.255.192** | **192.168.50.129** |
| **Laptop0** | **Wireless0** | **192.168.50.134** | **255.255.255.192** | **192.168.50.129** |
| **Laptop1** | **Wireless0** | **192.168.50.132** | **255.255.255.192** | **192.168.50.129** |
| **KL** | **Fa0/0** | **192.168.50.1** | **255.255.255.128** | **N/A** |
| **Se2/0** | **200.10.10.9** | **255.255.255.252** | **N/A** |
| **KL1** | **Vlan 1** | **192.168.50.7** | **255.255.255.128** | **192.168.50.1** |
| **KL2** | **Vlan 1** | **192.168.50.124** | **255.255.255.128** | **192.168.50.1** |
| **KL3** | **Vlan 1** | **192.168.50.8** | **255.255.255.128** | **192.168.50.1** |
| **KL4** | **Vlan 1** | **192.168.50.123** | **255.255.255.128** | **192.168.50.1** |
| **PC3** | **Fa0** | **192.168.50.126** | **255.255.255.128** | **192.168.50.1** |
| **PC4** | **Fa0** | **192.168.50.125** | **255.255.255.128** | **192.168.50.1** |
| **Smartphone2** | **Wireless0** | **192.168.50.4** | **255.255.255.128** | **192.168.50.1** |
| **Laptop4** | **Wireless0** | **192.168.50.5** | **255.255.255.128** | **192.168.50.1** |
| **Laptop5** | **Wireless0** | **192.168.50.6** | **255.255.255.128** | **192.168.50.1** |

# 4.0 Conclusion

The network architecture designed for Boulevard Hotels network is fault tolerance, scalability and network security. Boulevard Hotels network reduces the number of devices affected by a breakdown with the star and extended star topology. Each packet may travel with a different path to the destination when a device or a link fails (Asia Pacific University, 2016).

Furthermore, the star topology also lets the Boulevard Hotels network to easily add new users and apps without disrupting the functionality of existing customers' services. This makes the network scalable (Asia Pacific University, 2016).

Moreover, Boulevard Hotels network has network infrastructure security and information security. Physical security of devices is implemented appropriately by Boulevard. Encrypted password in the network keeps devices safe from illegal access of information or data transmitted over the network. Confidentiality, integrity and availability of network will be ensured with appropriate network security (Asia Pacific University, 2016).

A backup plan has been implemented in Boulevard Hotels network by using the Offsite router as a backup.

However, purchasing the network cabling can be expensive for Boulevard. This is because the cable length required for star and extended star topology is longer.

# 5.0 References

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