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**Lab 4 Post-lab Questions and Answers**

1. **Explain how Layer 4 (Transport Layer) supports reliable transmission between two subnets.**

   Layer 4 of the OSI model, the Transport Layer, is responsible for ensuring that the data packets arrive accurately and reliably between the sender and receiver. It manages network traffic between hosts and end systems to ensure complete data transfers. The transport layer most often uses Transmission Control Protocol (TCP) or User Datagram Protocol (UDP).

   TCP is the more feature-rich transport protocol – it is connection-oriented, uses synchronization and acknowledgement messages to ensure delivery, retransmits and reorders packets if needed and can even negotiate sending and receiving rates. Additionally, even though TCP is slower than UDP, it remains the most commonly used protocol on the internet.

   On the other hand, UDP is a simple and fast transport protocol since it can be used for connectionless transmissions. Unfortunately, it is considered unreliable because it does not use acknowledgements or retransmissions, so packets may be lost from time to time. Nonetheless, UDP remains the best for real-time data transmission where speed of delivery is more important than reliability, such as for video conferencing.

2. **What would happen if the subnet masks were incorrectly configured on the PCs?**

   If the subnet masks on PCs are incorrectly configured, it can cause several network issues. The PC may misinterpret whether devices are on the same subnet or not, leading to incorrect routing of traffic. This could result in the PC sending packets to the wrong destinations or unnecessarily routing local traffic through the default gateway, causing delays or communication failures. Devices that should be on the same subnet might not be able to communicate, and broadcast traffic could be mismanaged, either overwhelming the network or missing key communications. Additionally, services like DHCP and peer-to-peer applications may fail, and overall network connectivity can become unreliable or slow.

3. **How does the router ensure traffic is routed properly between the two subnets?**

   A router ensures traffic is routed properly between subnets by utilizing IP addressing, subnet masks, and its routing table. It uses the subnet mask to distinguish the network portion of an IP address from the host portion, allowing it to identify different subnets. The router maintains a routing table with network destinations and next-hop information, which it consults to determine the correct path for forwarding packets. When a packet arrives, the router checks if the destination is within the same subnet or a different one. If it's a different subnet, the router forwards the packet to the appropriate interface or next-hop router. Additionally, the router uses ARP (Address Resolution Protocol) to map

IP addresses to MAC addresses for delivering packets within directly connected subnets. Each interface on the router connects to a different subnet, ensuring traffic is sent to the right destination.

4. **How can you identify Layer 4 protocols (TCP/UDP) in the network traffic?**

   To identify Layer 4 protocols such as TCP and UDP in network traffic, you can examine specific fields in the packet headers captured by tools like Wireshark or tcpdump. The protocol field in the IPv4 header (or next header in IPv6) reveals the Layer 4 protocol, with TCP having a protocol number of 6 and UDP assigned 17. Once identified, you can further inspect the TCP or UDP headers. TCP headers contain source and destination ports, as well as control flags (SYN, ACK, FIN) that indicate the state of the connection, while UDP headers also include source and destination ports but are simpler, lacking connection control flags. Tools like Wireshark allow you to filter traffic by applying tcp or udp filters, and tcpdump can be used in a similar way with the -n flag for raw output. Additionally, common port numbers can help infer the protocol, such as TCP on port 80 (HTTP) or UDP on port 53 (DNS).