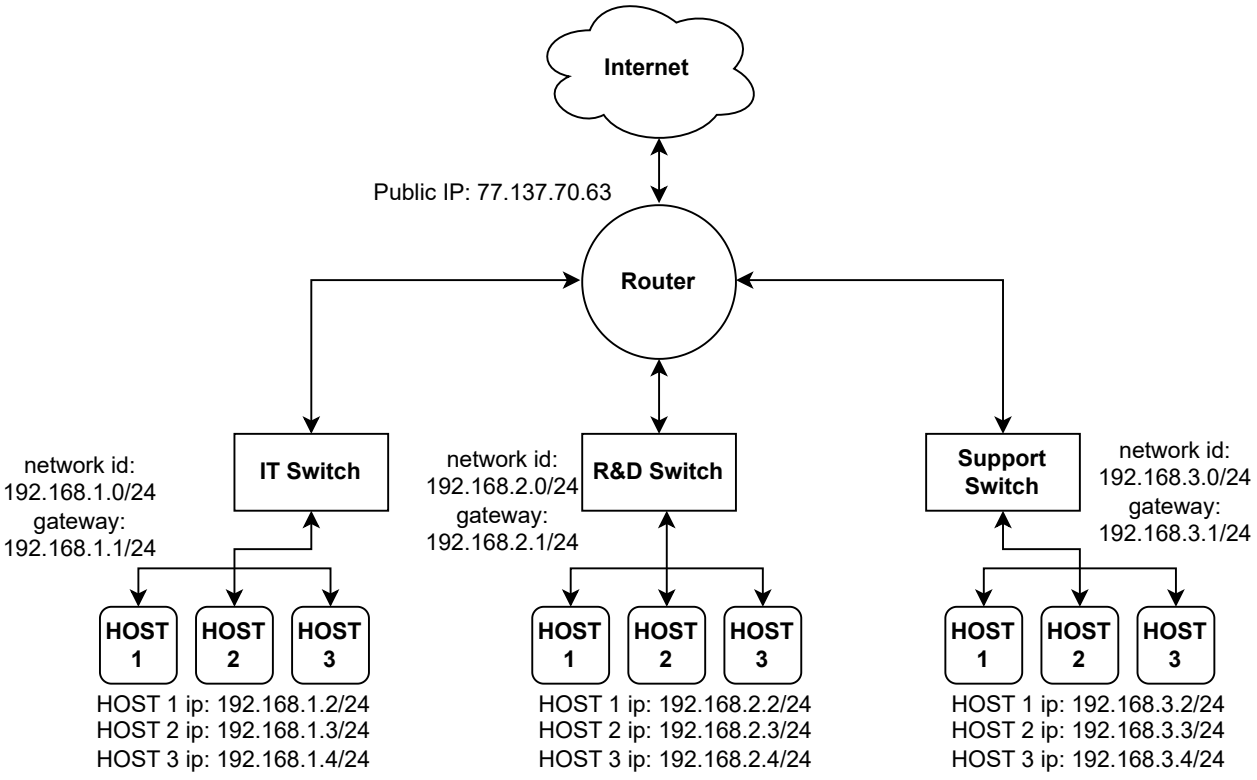
Answer 1

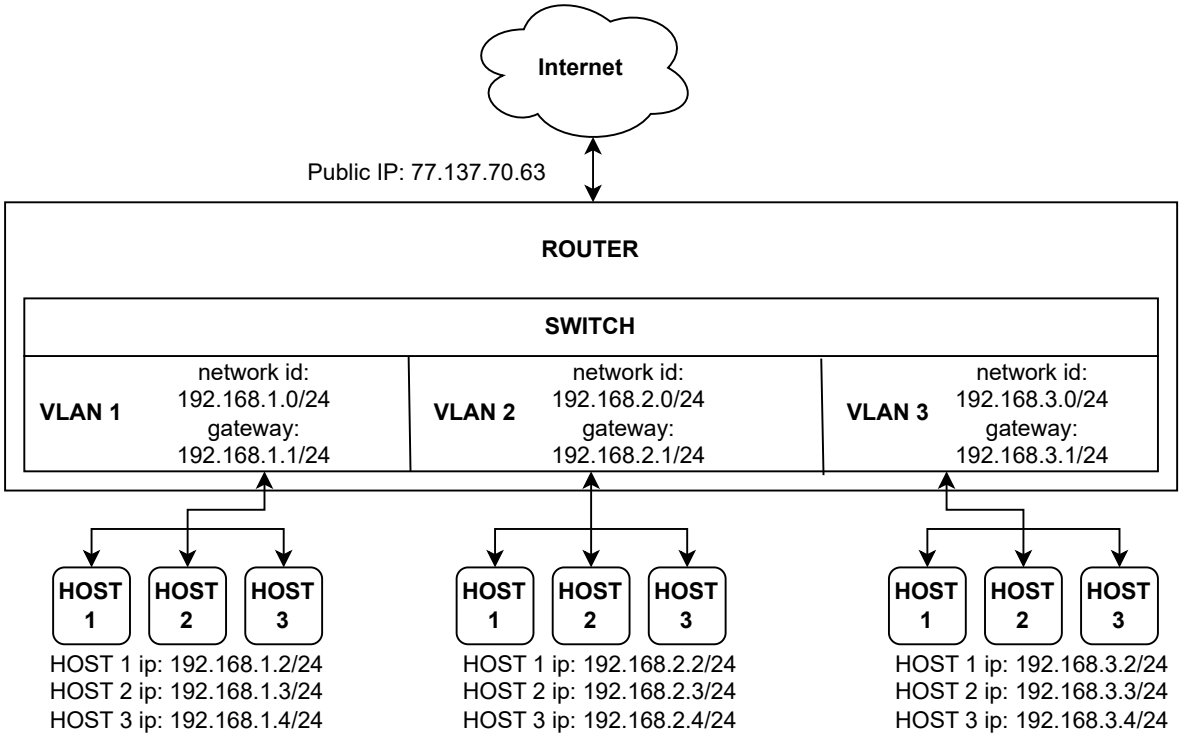
sub-question 1

I would separate the departments into 3 network as follows:



sub-question 2

I would disconnect the 3 switches from the router and get a router that supports VLAN because it will allow the 3 departments to share a single internet connection in a more secure way, I would also make sure to enforce rules on the routers firewall to make it even more secure.



Answer 2

TCP	UDP
Connection based: TCP must first establish a connection with its target through the 3 way handshake before it starts communicating	**Connectionless:** UDP just sends a packet to the destination we tell it too without a connection without any guarantee it will reach the destination
Guaranteed packet order: TCP guarantees us that we will receive all the packets in the destination in the correct order	**Packet order not guaranteed:** UDP just sends packets to the destination and the order they are received is not guaranteed
Retransmits data: TCP re-transmits lost or bad packets to make sure the final data is correct	**No retransmission:** UDP does not care about packet integrity and will not resend packets if they fails to arrive or bad upon arrival
Slower then UDP: the process of checking if a packet is valid or not + re-transmitting it if its bad or didn't arrive takes time and is slower then UDP	**Faster then TCP:** UDP checks only that the checksum of each packet is correct and if its not it just drops the packet. This is way faster then TCP

Answer 3

a.

- In terms of address size IPv4 is 32-bit and IPv6 is 128-bit, IPv4 is 4 octets divided by dots (example ip 192.168.1.100) while IPv6 is 8 16-bit values divided by colons (example ip 2001:0db8:85a3:0000:0000:8a2e:0370:7334)
- in terms of network efficiency, IPv6 is more efficient then IPv4 since it doesn't need a NAT and it has more efficient routing.

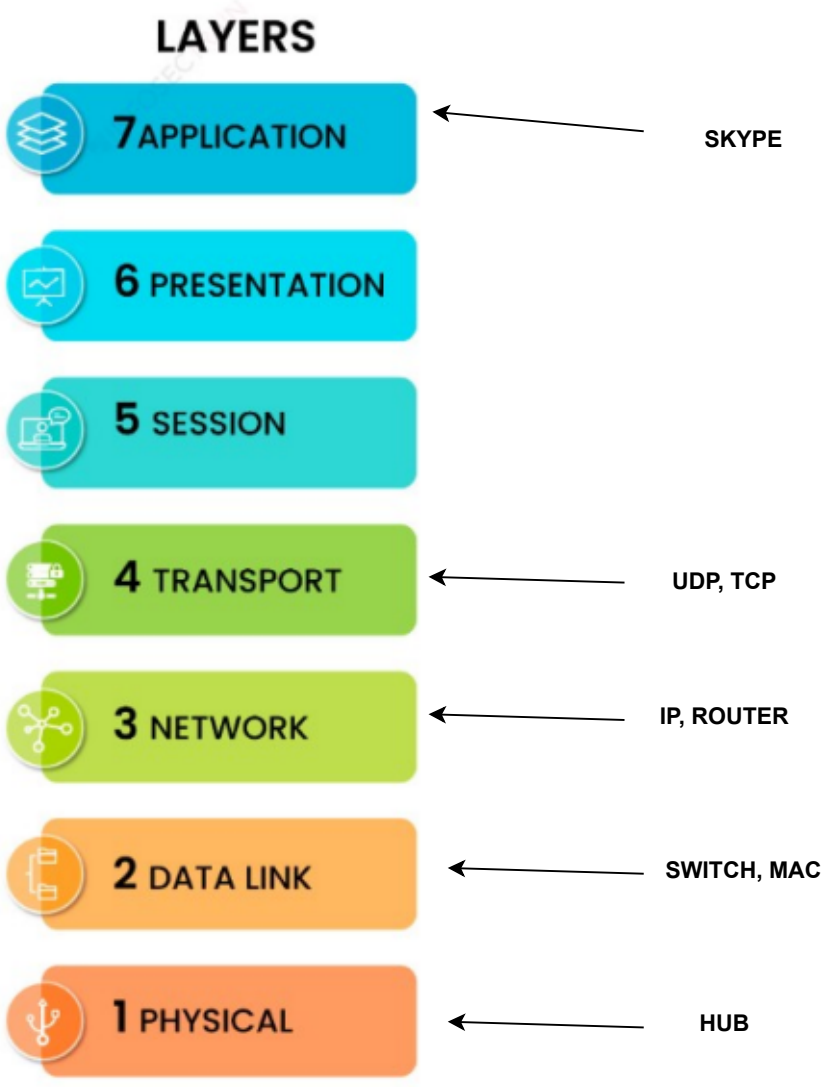
b. MAC addresses are the physical addresses of the hosts and is used by the switches. IP addresses are the virtual addresses and is used by the router. Ports are used to direct data to a certain process. Example of work: we receive a packet from 10.0.0.1 at port 80, the switch uses ARP to translate the ip address to a mac address (if the switch cache didn't already have it in its table) and then sends the packet to the correct mac address (if found). Once the packet arrives to the correct host it is send to the process at port 80.

c. CSMA is a half duplex protocol that often includes collision detection and collision avoidance. it was invented to be used with hubs to make sure that multiple hosts didn't transmit at the same time. and often divided networks into collision domains. if a collision is detected a random time is waited by each host before they attempt to re-transmit again.

Answer 4

1. NAT (Network Address Translation) is used to convert private ip addresses to public ip addresses. It was invented as a "temporary" fix to the limited number of ip addresses IPv4 could provide helping us to expand the number of addresses at the cost of performance.
2. ARP (Address Resolution Protocol) is used to convert IP addresses to MAC addresses.
3. DNS (Domain name system) is a protocol that allows us to map IP addresses to FQDN's (Fully Qualified Domain Names i.e.: google.com)
4. ping -c 10 127.0.0.1 will ping the loopback address (127.0.0.1) 10 times.
5. apr -a gives us the current MAC table (the MAC addresses of all the devices on our network that it can see) in BSD style output format.
6. The route command tells us how many routers we passed until we reached our destination.
7. ipconfig gives us basic information (IPv4 address, IPv6 address, Mac, Gateway, etc...) about the NIC's (Network Interface Cards) on our device.
8. nslookup is used to troubleshoot and diagnose DNS related issues.
9. CNN: 151.101.67.5 | Ynet: 2.18.69.179

Answer 5


LAYERS
7 APPLICATION
6 PRESENTATION
5 SESSION
4 TRANSPORT
3 NETWORK
2 DATA LINK
1 PHYSICAL
SKYPE
UDP, TCP
IP, ROUTER
SWITCH, MAC
HUB

Answer 6

Given IP address: 192.168.1.10/24

1. class C
2. The network id is 192.168.1.0/24
3. The broadcast address is: 192.168.1.255/24
4. Usable range: 192.168.1.1/24 - 192.168.1.254/24
5. 255.255.255.0

Answer 7

There will be 5 fragments: