Computer Network Home_2

1. Computer Networks and Internets 6th

1.1 21.4 In the original IPv4 classful address scheme, was it possible to determine the class of an address from the address itself? Explain.

Yes, since in the classful address scheme initial bit(s) give indication about the class being used.

1.2 21.7 If an ISP assigned you a /28 IPv4 address block , how many computers could be assigned an address from the block ?

When an organization is assigned /28 CIDR address , it means 28 bits out of 32 bits are fixed , so 32-28=4 bits available for user space . So number of users $2^4 - 2 = 4$, since all 0s and all 1s addresses have special uses and can ' t be assigned to a user.

1.3 21.13 Suppose you are an ISP that owns a /22 IPv4 address block. Can you accommodate requests from six customers who need addresses for 9, 15, 20, 41, 128, and 260 computers, respectively? If so, how? If not , explain why.

Answer:

It is not possible.

Explanation:

In this example, we need to accommodate 473 computers for six clients, that are 473 IP addresses.

For this request just we have /22 IPv4 address blocks, this mean

22 red bits 11111111111111111111110000000000 <--- 10 host bits

We must increase red bits to 25. We need these 3 bits to create 6 sub red, in this case, 2^3 = 8 sub red.

Why did we ask for 3 bits? Because if we ask only 2, 2^2 = 4, and we need 6 sub reds.

25 red bits 1111111111111111111111110000000 7 host bits.

In this case, we need more than 260 computers, but we just have 7 bits, this means.

2^7 = 128 and just one customer needs 260, for that is **impossible**.

1.4 22.1 What are the two basic communication paradigms that designers consider when designing an Internet?

Two basic communication paradigms that designers consider when designing an Internet are:

- Connection-oriented
- Connectionless service

1.5 22.11 Assume two routers are misconfigured to form a routing loop for some destination, D. Explain why a datagram destined for D will not go around the loop forever.

To ensure IP packets have a limited lifetime on the network all IP packets have an 8 bit **Time to Live(TTL)** (IPv4) or **Hop Limit** (IPv6) header field and value which specifies the maximum number of layer three hops (typically routers) that can be traversed on the path to their destination. Each time the packet arrives at a layer three network device(a hop) the value is reduced by one before it is routed onward. When the value eventually reaches one the packet is discarded by the device that receives it (as the value will be reduced to zero). Whilst this won't prevent network issues caused by a routing loop or similar, it reduces their impact and may help avoid router failures. As it is an 8 bit field, the maximum possible value is 255 (11111111 in binary).

1.6 22.13 Where in a frame does an IP datagram travel?

An IP datagram travels inside a physical frame(as the payload of the physical frame) when it is in transit. The header of a physical frame typically has a type field. The sender uses that type field to indicate that the payload of the physical frame is an IP datagram.

Figure 22.7 Illustration of an IP datagram encapsulated in a frame.

1.7 22.14 If one captures an IP datagram passing across a network in the middle of the Internet, how many frame headers will appear before the datagram?

1.8 23.2 What term is used to describe the mapping between a protocol address and a hardware address?

The address resolution protocol (ARP) is aprotocol used by the InternetProtocol(IP) [RFC826], specifically IPv4, tomaplP network addresses to the hardware addresses used by a data link protocol.

Translation from a computer’ s IP address to an equivalent hardware address is known as address resolution, and an IP address is said to be resolved to the correct MAC address. The TCP/IP protocol being used for this is called Address Resolution Protocol (ARP). Address resolution is local to a network.

1.9 23.3 Can ARP be used on a network that does not provide broadcast? Why or why not?

Both a and d ARP find Hardware address from host IP and store it in its cache

1.10 23.6 How does a computer know whether an arriving frame contains an IP datagram or an ARP message?

Answer:

The computer knows whether an arriving frame contains an IP datagram or an ARP message by **typing field** . It is **800** for **ARP** and **806+** for **IP datagram**.

Explanation:

The Internet Protocol is used to sent data from one **host or a computer** to another over Internet. Each computer has at least one **IP address** that is used to identify that host from all other hosts on the Internet. It is used by **Ethernet**.

Address Resolution Protocol is used to convert an **Internet Protocol** address to a **MAC address** in a local area network **(LAN).**

1.11 24.2 List the features of UDP?

UDP has the following features :

● End-to-end, UDP is a transport protocol that can distinguish among multiple application programs running on a given computer.

● Connectionless. The interface that UDP supplies to applications follows a connectionless paradigm.

● Message-oriented An application that uses UDP sends and receives individual messages,

● Best-effort. UDP offers applications the same best-effort delivery semantics as IP.

● Arbitrary Interaction. UDP allows an application to send to many other applications, receive from many other applications, or communicate with exactly one other application.

● Operating System Independent. UDP provides a means of identifying application programs that do not depend on identifiers used by the local operating system.

1.12 24.8 What are the semantics of UDP?.

UDP provides applications with exactly the same best-effort delivery semantics as IP, which means messages can be:

- Lost
- Duplicated
- Delayed
- Delivered out-of-order
- Corrupted

1.13 25.2 List the features of TCP.

Features of TCP can be listed as folows :

- Connection Orientation. TCP provides connection-oriented service in which an application must first request a connection to a destination, and then use the connection to transfer data.
- Point-to-Point communication. Each TCP connection has exactly two endpoints.
- complete Reliabilit. TCP guarantees that the data sent across a connection will be delivered exactly as sent, complete and in order.
- Full Duplex communication. A TCP connection allows data to flow in either direction, and allows either application program to send data at any time.
- Stream Interface. TCP provides a stream interface in which an application sends a continuous sequence of octets across a connection.
- Reliable Connection Startup. TCP allows two applications to reliably start communication.
- Graceful Connection Shutdown. Before closing a connection, TCP insures that all data has been delivered and that both sides have agreed to shut down the connection.

1.14 25.6 When using a sliding window of size N, how many packets can be sent without requiring a single ACK to be received?

If the size of the window is N, then it means a sender can transmit up to N packets without waiting for an ACK, as long as other controls are in place.

1.15 25.10 How does TCP handle packet loss?

To handle packet loss, transport protocols use positive acknowledgement with retransmission. Whenever a frame arrives intact, the receiving protocol software sends a small acknowledgement (ACK) message that reports successful reception . The sender takes responsibility for ensuring that each packet is transferred successfully. Whenever it sends a packet, the sending-side protocol software starts a timer. If an ACK arrives before the timer expires, the software cancels the timer; if the timer expires before an ACKarrives , the software sends another copy of the packet and starts the timer again. The action of sending a second copy is known as retransmitting , and the copy is commonly called a retransmission.

1.16 25.13 What does the TCP window size control?

The TCP window size field controls the flow of data and is limited to 2 bytes, or a window size of 65,535 bytes.

Since the size field can't be expanded, a scaling factor is used. TCP window scale is an option used to increase the maximum window size from 65,535 bytes to 1 Gigabyte.

1.17 25.16 What problem in a network causes TCP to reduce its window size temporarily?

The reason is usually congestion.

1.18 26.1 List the two broad categories of Internet routing, and explain each?

1. Static Routing

This type is the optimal path between all possible pairs of sources & destinations in the given network, is pre-defined, and fed into the routing table of the network's routers.

2. Dynamic Routing

This type gives the router the ability to discover the network by protocols like OSPF (Open Shortest Path First) and RIP (Routing Information Protocol), update the routing table by itself, and effectively decides upon the path that the incoming packet must follow to reach its destination.

1.19 26.11 List the characteristics of RIP?

RIP has the following characteristics :

- Routing Within An Autonomous System. RIP is designed as an IGP used to pass information among routers within an AS
- Hop Count Metric. RIP measures distance in network hops, where each network between the source and destination counts as a single hop; RIP counts a directly connected network as one hop away.
- Unreliable Transport . RIP uses UDP to transfer messages among routers.
- Broadcast Or Multicast Deliver. RIP is intended for use over LAN technologies that support broadcast or multicast(e.g. Ethernet).
- Support For CIDR And Subnetting . RIP version 2 includes an address mask with each destination address .
- Support For Default Route Propagation. In addition to specifying explicit destinations, RIP allows a router to advertise a default route.
- Distance Vector Algorithm . RIP uses the distance - vector approach

Passive Version For Hosts. RIP allows a host to listen passively and update its forwarding table. Passive RIP is useful on networks where a host selects among multiple routers.

1.20 26.15 List the characteristics of OSPF?

OSPF is a link-state protocol in which all routers in the routing domain exchange information and thus know about the complete topology of the network. Because each router knows the complete topology of the network, the use of the SPF algorithm creates an extremely fast convergence. Other key characteristics of OSPF are as follows:

- Provides routing information to the IP section of the TCP/IP protocol suite, the most commonly used alternative to RIP.
- Sends updates only to tables, instead of entire tables, to routers.
- It is a more economical routing protocol than RIP over time because it involves less network traffic.