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TIRUCHIRAPPALLI CAMPUS

COMPUTER NETWORKS ASSIGNMENT

QUESTION BANK 1 & 2

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CN Assignment (Question Bank 1&2)

1) Network topology refers to the layout or arrangement like various element in a computers networks Different types of topologies save different purpose. based on network size, essiciency and reliability.

Types:-

1. Bus Topology:

→ In a bus topology, all devices share a single communication line or cable. Data is transmitted line in both direction along the bus, but only one device can send data at a time. It is cost-effective easy to set up for small networks.

Ring Topology:

Each device is connected to two other, forming a circular (ring) pathway for signals. Data travels in one direction, passing through each devices untill it reaches it final destination. It is simple to install and manage, suitable for small networks.

Star Topology:

All devices are connected to a central hub (or) switch, communication between devices goes through this central point. It is easy to manage, troubleshoot and expand as the failure of one device does not affect the others if the central hub fails, the network fails.

Mesh Topology: Each devices is connected to every other device, allowing multiple paths for data. This topology is often used in mission-critical environment. high redundancy and reliability, as failure in one path doesn't distrupt the network, Expensive and complex to implement for large network due to the number of connection needed.

2. Topology use LAN, MAN, WAN

LAN (Local Area Network).

- common Topologies: Star, Bus, and sometimes Ring.

Explenation:

- Star topology is prevalent in LANs. due to its ease of management and scalability. Most LANs, especially those in homes and small offices. use it for its efficiency

• Bus Topology was common in early LAN Setup, but not now due to it's limitations

• Ring Topology can also be used, but, it's popular due it's complexity and vulnerability to network disruptions.

2. Metropolitan Area Network (MAN)

• Ring and Sometimes Mesh

Explanations:

• Ring Topology is often used in MANs for it's structured layout, especially when connecting network across a city

• Mesh Topology may be used in certain MAN setups for enhanced redundacy, ensuring reliable communications for critical infrastructures.

5) Wide Area Network

.Mesh and Hierachical (Tree)

Explanation:-

'Mesh Topology is favored in WANs due to it's .high .reliability .and fault tolerance especially for .connecting .geographically distant .locations.

. 'Hierarchical (Tree) Topology may also be used .to organize .complex .WANs by connecting different .LANs .and MANs under a structured .backbone, which simplifies management .across regions.

2) Circuit Switching

In circuit switching, a dedicated communi-cation path is established .between the sender and the reciver for the entire duration of communication process. This path is exclusive for the communication for that session.

How it works

· Connection Establishment: A path is established before the communication data transmission starts. Each intermidiate link form an unbroken link.

· Data Transmission: After the setup, data transmission begun without interuptions.

· Connection Termination: After the period ends. the path is closed. and is opend other transmission.

Advantages:-

· guaranteed bandwidth and consistent
· low Latency

Disadvantages:-

· inefficient for data traffic. with bursty
· connection setup time. can. introduce - delay.

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Pocket switching :-

Data is divided into seprate Pockets and then transmitted across the network. Each packet may take different route to reach distinations. Then they are reassembled in the orignal data.

· Data segmentation : Data divided into Pocket, each with header like source, destination and sequence number.

· Transmission and Routing :- Each Packet is trasmitted across using different and most efficient route to the destination

· Reassembly :- At reassembly data Packet is assembled according to their sequence number.

Advantage :-

- efficient use of network resources
- flexiable and resilient.

Disadvantage :

- variable (delay).
- Requires more time to process the divided data

3) Guided media :-

It refers to the physical pathway that carry data signal in a specific direction, data travels along the solid medium, like a cable The main type of guided media are twisted pair cable, coaxial cable, and fiber optic cable

Types of guided media

1) Twisted pair cable
2) coaxial cable
3) fiber optic able.

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Twisted pair cable:

It consists of pairs of insulated copper wire twisted together to reduce electromagnetic interference from external source & other pair.

Types:

(i) Unshielded Twisted pair (UTP)

- The most common type.
- used in LAN

(ii) Shielded Twisted pair:

- Additional layer of shield

Coaxial cable:

It has central copper conductor surronded by an insulation layer, a metallic shield and outer insuleting cable

Types:

(i) Thick coaxial cable

- Provides longer range Transmission.

(ii) Thin coaxial cable

- flexible, easier to install
- less common today.

Fiber optic cable

It transmit data through a pulse of light through glass or plastic fiber, allowing for high data transmission. speed over long distance.

Types

- Single Mode Fiber (SMF)
- Small core diameter.
- multimode fibe (MMF)
- has a larger core diameter

These are some types of ungided media data transfer method with each it's advantage and Disadvantages.

6) Given

185.28.17.9.

Soln
No. of address:-

· 124 network has $2^{32-24} = 2^8 = 256$ address

First address = 185.28.17.0

Last address :- 185.28.17.255.

8) given

IP 216.21.5.0

Soln :-

$2^{32-x} = 32.$

$x \Rightarrow$

$2^{32-x} = 32 \Rightarrow 32-x = 5 \Rightarrow x = 27$

∴ /27 subnet mask.

Subnetting the network:-

Start with 216.21.5.0/27, subnet with 32 address each

Subnet 1:-

Network Address : 216.21.5.0
Range of usable IPs : 216.21.5.1 to 216.21.5.30
Boardcast Address : 216.21.5.31

Subnet 2:-

Network Address : 216.21.5.32
Range of usable : 216.21.5.33 to 216.21.5.62
Boardcast Address : 216.21.5.63

Subnet 3:-

Network Address : 216.21.5.64
Range of usable : 216.21.5.65 to 216.21.5.94
Boardcast Address : 216.21.5.95.

Subnet 4:-

Network Address : 216.21.5.96
Range of usable : 216.21.5.97 to 216.21.126
Boardcast Address : 216.21.5.127

Subnet 5:-

Network Address : 216.21.5.128
Range of usable : 216.21.5.129 to 216.21.5.158
Boardcast Address : 216.21.5.159.

23) ISO / OSI Model

The OSI/ISO mode (open system interconnection Model) is a conceptual framework developed by the International Organisation for Standardigation (ISO) that standardize and simplifies Seven distinct layers, each with specific function that facilitate smooth connection. Introduced in 1984 communication between devices over the network It helps design and understand complex network interactions by breaking them into manageable layers.

Physical Layer (Layer 1)

The physical layer is responsible for the actual transmission of raw data (bits) over a physical medium, such as cable, radio waves, or fiber optics. It defines the hardware elements involved, including cable, switches and network interface cards.

- Bit-level transmission
- Physical network topology and signal transmission.
- Data encoding and modulation for various transmission media.

Example:-

Ethernet cable, PPP, MAC, network switches.

2) Data Link layer :-

This layer handels data framing error detection and corrections. as well as flow control, it pacakages bits into frames and insures that they are error free when moving across the network error fra in a single network.

- Frame synchronization and addressing
- Flow control
- Error dection

Examples :-

- Ether
- PPP
- MAC

3) Network Layer:

It manages data link across (data routing) across multiple link and subnet, determining the best path for data transfer between devices in different network.

- Logical addressing and routing
- Error handling
- Path selection, forwarding,

Example:-

IP, routers

routing protocol OSPF

BGP.

Transport Layer:

It ensures reliable data transfer between systems by managing error detection, correction, and data flow, it establishes, maintains and terminates connections between devices.

- Data segmentation and reassembly
- Reliable (TCP) and unreliable (UDP)
- Flow control.

- Examples:
  - Tcp
  - UDP
  - Port number for application.

Session Layer:

It manages sessions or connection between applications on different devices, allowing them to start, maintain, and terminate communication sessions.

- Session establisment, maintenance & termination.
- Dialog control to manage data flow in either full duplex or half duplex mode
- Synchronization and checkpointing to ensure continuity.

Examples:

- RPC
- Net BIOS
- Session management in network applications

Presentation Layer :-

It handles data transmission, encryption and compression, ensuring that data sent from one system can be correctly interpreted by other

- Data transmission
- Data translation
- Data encryption
- Data compression

Example :-

- SSL / TLS
- JPEG.
- ASCII encoding.

Application Layer:-

It is the closest to the end user and provides interfaces for software application to access network services directly. This layer communication between software on different devices.

- Network service requests and responses
- user authentication, data integrity
- Interfacing with other application

Example:-

- HTTP
- FTP
- SMTP.
- DNS.

4 Unguided Media:-

It is also called wireless media, Transmitted data through air. without using physical means. conductor.

Types:

(i) Radio waves:

Suitable for long-distance communication, used in radio and TV board casting, and mobile network. It's reliable but susceptible to interference.

· Micro waves:

used in point-to-point communication, used in radio and TV broadcasting, and mobile networks, It's reliable but susceptible to interference.

· Infrared:

used for short range communication like remote control and some wireless peripheral devices.

5. Given

Packet size = 5000 bits

Line Bandwidth = 1 GbPs

Propagation Delay per Link = 10 microseconds.

From the given Information:-

· Transmission Delay per Link = $\frac{\text{Packet size}}{\text{Bandwidth}}$

$= \frac{5000}{1\ GbPS}$

$\Rightarrow 5$ microsecond

· Total Delay per Link : 5 + 10

: 15 microsecond.

9. Subnet 150.15.0.0 into 500 hosts

1. $2^9 = 512$

2. 9 bits for host. /23 (or) 255.255.254.0.

3. Subnets: Each subnet 512 address.

· First subnet: 150.15.0.0 to 150.15.1.255

· Second subnet: 150.15.2.0 to 150.15.3.255.

10) Subnet 10.0.0.0 into 100 hosts.

1. $2^7 = 128$.

2. /25 (or) 255.255.255.128 using 7 bits for host.

3. /28 subnet provides 126 usable address.

First subnet: 10.0.0.0 to 10.0.0.127

Second subnet: 10.0.0.128 to 10.10.0.0.255

Connects upto 100 hosts per subnet.

21) Bandwidth: 10 mBPS = 10^6 bPS

Data network can pass on average = 12,000 in 60 seconds.

1 frame = 10,000 bits.

calc:

∴ data network can pass in 60 seconds;

12,000 × 10,000

Throughput is data network can pass in 1 second

$$\text{Throughput} = \frac{12,000 \times 10,000}{60} \Rightarrow 2,000000 \text{ bPS}$$

$\Rightarrow$ 2 mbPS.

11) A host in a block has

25.3a.12.56/16

1. First Address (Network Address)

25.34.0.0.

2. Last Address (Broadcast Address)

25.34.255.255.

3. .128 subnet provides 126 usable address.

First subnet: 10.0.0.0 to 10.0.0.127

second subnet: 10.0.0.128 to 10.10.0.0.255

Connects upto 100 hots per subnet.

21) Bandwidth: 10 mBPS = 10^6 bPS

Data network can pass on average = 12,000 in 60 seconds.

1 frame = 10,000 bits.

Calc:

∴ data network can pass in 60 seconds,

$12,000 \times 10,000$

Throughput is data network can pass in 1 second

Throughput = $\frac{12,000 \times 10,000}{60}$ => 2,000,000 bps

=> 2 mbps.

11) A host in a block has

25.34.12.56/16

1. First Address (Network Address)

25.34.0.0.

2. Last Address (Broadcast Address)

25.34.255.255.

The 116 marks indicates that the network portion is the first two octets.

12. class B network with subnet mask

255.255.248.0

1. Subnet mask (in binary)

11111111.11111111.11111000.00000000

(/21)

2. most bits : 11 most bits are available

3. maximum host per subnet : $2^{11} - 2 = 2046$ hosts.

26 VLSM:

Variable length subnet masking (VLSM) allows the creation of subnet with different size based one the specific requirement of the network. It's more efficient than fixed length subnetting as it uses IP address more effectively.

Ex: Requirement

- Subnet A needs 100 host
- Subnet B needs 50 host

2. For subnet A (100 hosts):

needed: 128 address, so, 25 (subnet mask 255.255.255.128) will be used.

The 116 makes indicates that the network portion is the first two octets.

12. Class B network with subnet mask

255.255.248.0

1. Subnet mask (in binary)

11111111.11111111.11111000.00000000

(/21)

2. most bits : 11 most bits are available

3. maximum host per subnet : $2^{11} - 2 = 2046$ hosts.

· Subnet A : 192.168.10.0125.

Range : 192.168.10.1 – 192 - 168.10.12.61)

Boardcast : 192.168.10.127).

For subnet B (50 host) : We needs 64 host address, so 126 will be used.

· Subnet B . 192 . 168 .10. 128/126

Range : 192.168.10.129 – 192 . 168.10.190)

Boardcast : 192.168.10.191 .

25. Fixed length subnetting involves dividing a network into smaller, equally sized subnets by borrowing bits from the host portion of the IP address. Every subnet has the same number of host addresses, which provides simplicity but less flexibility.