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OSI Model vs. TCP/IP Model

OSI Reference Model

Application - Identifying and establishing the availability of intended communication partner and whether there are sufficient resources

Presentation - Data translation, encryption, code formatting

Session - Setting up, managing and tearing down sessions. Keeps application's data separate

Protocol Data Units (PDUs)

Segment — **Transport** - Provides end-to-end transport services - establishes logical connections between hosts. Connection-oriented or connectionless data transfer.

packet — **Network** - Manages logical addressing and path determination

frame — **Data Link** - Provides physical transmission of data, handles error notification, flow control and network topology. Split into two sub layers (LLC and MAC)

bits — **Physical** - Specifies electrical, mechanical, procedural and functional requirements for activating, maintaining and deactivating a physical link.

TCP/IP Model Protocol Suite

Process/Application layer
FTP - TCP file transfer service – port 20-21
Telnet - Terminal emulation program – port 23
TFTP - UDP file transfer – port 69
SMTP - Send email service – port 25
DHCP – Assigns IP addresses to hosts – ports 67 and 68
DNS – Resolves FQDNs to IP addresses – port 53

Host-to-Host layer
TCP - Connection-oriented protocol, provides reliable connections (acknowledgments, flow control, windowing)
UDP - Connectionless protocol, low overhead but unreliable

Internet layer
IP - connectionless protocol, provides network addressing and routing
ARP - finds MAC addresses from known IPs
RARP - finds IPs from known MAC addresses
ICMP - provides diagnostics, used by ping and traceroute

Network Access

Cisco 3-Layer Hierarchical Model

Core - *Backbone*, common to all users, needs to be as fast as possible and fault tolerant, avoid ACL, VLAN trunking and packet filtering here.
Distribution - *Routing* - provides access control policies, filtering, WAN access and VLAN trunking
Access - *Switching* - User and workgroup access, segmentation

Patch Cable Types

Straight-through - Connect PC to hub or switch (router to switch or hub)
Crossover - Connect hub to hub/ switch to switch/PC to PC
Rolled - Console connection for PC to router

Half Duplex Ethernet shares a collision domain resulting in lower throughput than **Full Duplex Ethernet** which requires a point-to-point link between two compatible nodes

Causes of LAN congestion - Broadcast storms, too many hosts with a broadcast domain, multicasting, low bandwidth, bottlenecks

Collision domain - Switches/bridges breakup collision domains, hubs extend them

Broadcast domains - Routers and VLANs breakup broadcast domains

Troubleshooting Steps

1. Ping loopback
2. Ping NIC
3. Ping default gateway
4. Ping remote device

Cisco IOS Troubleshooting Commands

- ping 127.0.0.1
- traceroute

Windows DOS Troubleshooting Commands

- ping 127.0.0.1
- tracert
- ipconfig/all
- arp -a

IP Classes

Private Address Ranges

Class A - 10.0.0.0 - 10.255.255.255
Class B - 172.16.0.0 - 172.31.255.255
Class C - 192.168.0.0 - 192.168.255.255

Class Ranges

Class A - 1-126 - network.node.node.node
Class B - 128-191 - network.network.node.node
Class C - 192-223 - network.network.network.node

Subnet Mask CIDR Notation

(Classless Inter-Domain Routing)

255.0.0.0	/8
255.128.0.0	/9
255.192.0.0	/10
255.224.0.0	/11
255.240.0.0	/12
255.248.0.0	/13
255.252.0.0	/14
255.254.0.0	/15
255.255.0.0	/16
255.255.128.0	/17
255.255.192.0	/18
255.255.224.0	/19
255.255.240.0	/20
255.255.248.0	/21
255.255.252.0	/22
255.255.254.0	/23
255.255.255.0	/24
255.255.255.128	/25
255.255.255.192	/26
255.255.255.224	/27
255.255.255.240	/28
255.255.255.248	/29
255.255.255.252	/30

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