Network Protocols

Protocol	Port	Description
SSH	22	Secure Shell protocol used for secure remote access and file transfer.
FTP	20/21	File Transfer Protocol used for transferring files between computers.
SMTP	25	Simple Mail Transfer Protocol used for sending email messages between servers.
DNS	53	Domain Name System protocol used for translating domain names into IP addresses.
DHCP	67/68	Dynamic Host Configuration Protocol used for assigning IP addresses to devices on a network.
HTTP	80	Hypertext Transfer Protocol used for web browsing.
POP3	110	Post Office Protocol (ver. 3) used for retrieving email messages from a mail server.
IMAP	143	Internet Message Access Protocol used for retrieving email messages and managing mailboxes on a mail server.
SNMP	161/162	Simple Network Management Protocol used for managing and monitoring network devices.
HTTPS	443	HTTP over SSL/TLS encrypted protocol for secure web browsing.
TCP	-	Transmission Control Protocol used for establishing reliable connections between devices on a network.
UDP	-	User Datagram Protocol used for establishing unreliable connections between devices on a network.
ICMP	-	Internet Control Message Protocol used for error reporting and diagnostic messages.
ARP	-	Address Resolution Protocol used for mapping IP addresses to MAC addresses.

OSI Model

Layer	Name	Protocol Data Unit (PDU)	Protocols
7	Application	Data	HTTP, FTP, SSH, DNS
Provides user interfaces and support for services such as email, file transfer, and network printing.			
6	Presentation	Data	SSL, SSH, IMAP, MPEG, JPEG
Formats and encrypts data for transmission.			
5	Session	Data	APIs, Sockets
Manages connections between applications.			
4	Transport	Segment	TCP, UDP
Provides reliable, end-to-end data delivery and error recovery.			
3	Network	Packet	IP, ICMP, IPSec, IGMP
Determines the best path for data transmission and performs logical addressing.			
2	Data Link	Frame	Ethernet, PPP, Switch
Transfers data between network devices and manages physical addressing.			
1	Physical	Bit	Fiber, Access Points, Copper Cabling

OSI Model (cont)

Defines physical specifications for network hardware and cabling.

TCP/IP Model

Layer	Name	Protocol Data Unit (PDU)
4	Application	Data
Provides network services to end-user applications, such as email, file transfer, and web browsing.		
3	Transport	Segment
Provides reliable, end-to-end data delivery and error recovery.		
2	Internet	Packet
Determines the best path for data transmission and performs logical addressing.		
1	Network Link	Frame
Transfers data between network devices and manages physical addressing.		

Network Topologies

Network Topology	Description
Bus Topology	A single cable connects all devices in a linear sequence. Each device communicates with the others through the cable. If the cable fails, the entire network goes down.
Star Topology	All devices are connected to a central hub or switch. If a cable fails, only the device connected to that cable is affected.
Ring Topology	Devices are connected in a circular loop. Each device communicates with the device next to it, and messages travel around the loop in one direction. If a cable fails, the entire network goes down.
Mesh Topology	Each device is connected to every other device in the network. This provides redundancy and fault tolerance, but requires more cabling than other topologies.
Tree Topology	Also known as a hierarchical topology, devices are organized in a hierarchical structure with multiple levels. This provides scalability and fault tolerance, but can be complex to manage.
Hybrid Topology	A combination of two or more different topologies. This provides the benefits of each topology, but can be more complex to manage.

Network Classes

Class	Range of IP Adresses	Default Subnet Mask
Class A	1.0.0.0 to 126.255.255.255	255.0.0.0
Class B	128.0.0.0 to 191.255.255.255	255.255.0.0
Class C	192.0.0.0 to 223.255.255.255	255.255.255.0
Class D	224.0.0.0 to 239.255.255.255	N/A
Class E	240.0.0.0 to 255.255.255.255	N/A

Subnetting

Subnet Mask	CIDR	Usable IPs	Network Address	Broadcast Address
255.255.255.128	/25	126	192.168.1.0	192.168.1.127
255.255.255.192	/26	62	192.168.1.0	192.168.1.63
255.255.255.224	/27	30	192.168.1.0	192.168.1.31
255.255.255.240	/28	14	192.168.1.0	192.168.1.15
255.255.255.248	/29	6	192.168.1.0	192.168.1.7
255.255.255.252	/30	2	192.168.1.0	192.168.1.3

Network Cables - Copper

Cable Type	Max Data Transfer Speed	Max Operating Lenghts
CAT5	100 Mbps	100 Meters
CAT5e	1 Gbps	100 Meters
CAT6	10 Gbps	55 Meters
CAT6a	10 Gbps	100 Meters
CAT7	10 Gbps	100 Meters
CAT8	40 Gbps	30 Meters

Network Cables - Fiber

Cable Type	Max Data Transfer Speed	Max Operating Lenghts	Typical Use
OM1 - Orange Jacket	10 Gbps	33 Meters	100 Mbps Ethernet
OM2 - Orange Jacket	10 Gbps	82 Meters	1 Gbps Ethernet
OM3 - Aqua Jacket	10 Gbps	300 Meters	10 Gbps Ethernet
OM4 - Aqua Jacket	10 Gbps	400 Meters	100 Gbps at 150 Meters
OM5 - Green Jacket	10 Gbps	400 Meters	Improvements on OM4.
OS1 - Yellow Jacket	100 Gbps	10 Kilometers	Single mode fiber for connecting indoor nodes.
OS2 - Yellow Jacket	100 Gbps	200 Kilometers	Single mode fiber for connecting infrastructure outdoors.

IEEE 802

IEEE 802 Standard	Description
802.1Q	Virtual LAN (VLAN) tagging standard.
802.1X	Port-based network access control (PNAC) standard.
802.2	Logical link control (LLC) layer protocol.
802.3	Ethernet standard.
802.3ab	Gigabit Ethernet standard.
802.3ae	10 Gigabit Ethernet standard.
802.3af	Power over Ethernet (PoE) standard.

IEEE 802 (cont)	
802.3at	PoE+ standard.
802.3bt	4-pair PoE standard.
802.11	Wireless LAN (WLAN) standard.
802.11a	WLAN standard operating in the 5 GHz frequency band.
802.11b	WLAN standard operating in the 2.4 GHz frequency band.
802.11g	WLAN standard operating in the 2.4 GHz frequency band with higher data rates than 802.11b.
802.11n	WLAN standard with improved speed and range.
802.11ac	WLAN standard with even higher speed and range than 802.11n.
802.11ax	WLAN standard designed for high-density environments with many devices.
802.15	Wireless personal area network (WPAN) standard.
802.15.4	Low-rate WPAN standard used in Zigbee and other mesh networking protocols.
802.16	Broadband Wireless Access (BWA) standard.
802.22	Wireless regional area network (WRAN) standard for long-range, rural broadband.