

# Computer Network - Cheat Sheet

A computer network is an interconnected computing device that can exchange data and share resources. These connected devices use a set of rules called communication protocols to transfer information over physical or wireless technology. Modern networks offer more than just connectivity. Enterprises start with digital transformation. Networks are essential to this transformation and its success.

Here is a cheat sheet of computer networks that is given below:

## Network Topologies:

Name	Description
<a href="#">Bus Topology</a>	A bus topology, also called a line topology, is a type of network topology in which all network devices are connected through a central RJ-45 network cable or coaxial cable.
<a href="#">Ring Topology</a>	A ring topology is a type of network topology in which each device is connected to two other devices on either side using RJ-45 or coaxial cables.
<a href="#">Star Topology</a>	A star topology is a network topology in which each element of the network is physically connected to a central node such as a router, hub, or switch. In a star topology, hubs act as servers, and connecting nodes act as clients.
<a href="#">Mesh Topology</a>	In a mesh topology, each node is connected to at least one other node and often to multiple nodes. Each node can send and receive messages from other nodes.
<a href="#">Tree Topology</a>	A tree topology is a hybrid network topology in which star networks are interconnected by bus networks. Tree networks are hierarchical and each node can have any number of child nodes.
<a href="#">Hybrid Topology</a>	A hybrid topology is a type of network topology that uses two or more different network topologies. These topologies can include mixed bus topologies, mesh topologies, ring topologies, star topologies, and tree topologies.

## Types of Network:

Network Type	Description
<a href="#">PAN</a>	Personal Network is a network consisting of only a small number of devices owned by an individual.
<a href="#">LAN</a>	A local area network is a network that covers a small area (for example, a company's network).
<a href="#">WAN</a>	A wide Area Network is a network that includes many devices and covers a large area. Usually collectively owned.
<a href="#">MAN</a>	MAN stands for Metropolitan Area Network. It is a computer network that connects a findnumber of LANs to form a larger network so that the computer resources can be shared.

## TCP/IP Model and OSI Model:

TCP/IP	OSI Model	Protocols
<a href="#">Application Layer</a>	<a href="#">Application Layer</a>	DNS, DHCP, FTP, HTTPS, IMAP, LDAP, NTP,POP3, RTP, RTSP, SSH, SIP, SMTP, SNMP, Telnet, TFTP
	<a href="#">Presentation Layer</a>	JPEG, MIDI, MPEG, PICT, TIFF
	<a href="#">Session Layer</a>	NetBIOS, NFS, PAP, SCP, SQL, ZIP
<a href="#">Transport Layer</a>	<a href="#">Transport Layer</a>	TCP, UDP
<a href="#">Internet Layer</a>	<a href="#">Network Layer</a>	ICMP, IGMP, IPsec, IPv4, IPv6, IPX, RIP
<a href="#">Link Layer</a>	<a href="#">Data Link Layer</a>	ARP, ATM, CDP, FDDI, Frame Relay, HDLC, MPLS, PPP, STP, Token Ring
	<a href="#">Physical Layer</a>	Bluetooth, Ethernet, DSL, ISDN, 802.11 Wi-Fi

## Computer Network Protocols:

		<b>Port</b>
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Network Protocol	Description	number of protocol
<a href="#">Ethernet</a>	A family of protocols that specify how devices on the same network segment format and transmit data.	44818, 2222
<a href="#">Wi-Fi or WLAN</a>	A family of protocols that deal with wireless transmission.	-
<a href="#">TCP</a>	Splits data into packets (reassembles later). Error checking is also included, as the acknowledgment is expected to be sent within a specified timeframe.	22
<a href="#">UDP</a>	User Datagram Protocol	<a href="#">4096-65535</a>
<a href="#">IP</a>	Every device has an IP address. Packets are "addressed" to ensure they reach the correct user.	-
<a href="#">HTTP</a>	Used to access web pages from a web server.	80
HTTP'S	uses encryption to protect data.	443
<a href="#">FTP</a>	File Transfer Protocol: Handles file uploads and downloads, transferring data and programs.	21
<a href="#">SMTP</a>	SMTP server has a database of user email addresses. Internet Message Access Protocol: Handles incoming mail.	587
<a href="#">IMAP</a>	Internet Message Access Protocol: Process incoming mail.	993
<a href="#">ARP</a>	ARP finds a host's hardware address (also known as MAC (Media Access Control) address) based on its known IP address.	-
<a href="#">DNS</a>	DNS is the host name for the IP address translation service. DNS is a distributed database implemented on a hierarchy of name servers. It is an application layer protocol for messaging between clients and servers.	53
<a href="#">FTPS</a>	FTPS is known as FTP SSL which refers to <a href="#">File Transfer Protocol (FTP)</a> over <a href="#">Secure Sockets Layer (SSL)</a> which is more secure from FTP. FTPS also called as File Transfer Protocol Secure.	21
<a href="#">POP3</a>	POP3 is a simple protocol that only allows downloading messages from your Inbox to your local computer.	110
	<a href="#">Session Initiation Protocol</a> was designed by IETF and is described in RFC 3261. It's the protocol of <a href="#">application layer</a> that describes the way to	

<a href="#">SIP</a>	found out Internet telephone calls, video conferences and other multimedia connections, manage them and terminate them.	5060,5061
<a href="#">SMB</a>	The SMB protocol was developed by Microsoft for direct file sharing over local networks.	139
<a href="#">SNMP</a>	SNMP is an application layer protocol that uses UDP port numbers 161/162. SNMP is also used to monitor networks, detect network errors, and sometimes configure remote devices.	161
<a href="#">SSH</a>	SSH (Secure Shell) is the permissions used by the SSH protocol. That is, a cryptographic network protocol used to send encrypted data over a network.	22
<a href="#">VNC</a>	VNC stands for Virtual Network Communication.	5900
<a href="#">RPC</a>	Remote Procedure Call (RPC) is a powerful technique for building distributed client-server based applications. It is based on extending traditional calls to local procedures so that the called procedure does not have to be in the same address space as the calling procedure.	1024 to 5000
<a href="#">NFS</a>	NFS uses file handles to uniquely identify the file or directory on which the current operation is being performed. Internet Control Message Protocol (ICMP) to provide error control. Used for reporting errors and administrative queries.	2049
<a href="#">ICMP</a>	Internet Control Message Protocol(ICMP) to provide an error control. It is used for reporting errors and management queries.	-
<a href="#">BOOTP</a>	Bootstrap Protocol (BOOTP) is a network protocol used by network management to assign IP addresses to each member of that network in order to join other network devices through a main server.	67
<a href="#">DHCP</a>	Dynamic Host Configuration Protocol (DHCP) is an application layer protocol. DHCP is based on a client-server model, based on discoveries, offers, requests, and ACKs.	68
<a href="#">NAT</a>	Network Address Translation (NAT) is the process of translating one or more local IP addresses into one or more global IP addresses, or vice versa, in order to provide Internet access to local hosts.	5351
<a href="#">PPP</a>	Point-to-Point Protocol (PPP) is basically an asymmetric protocol suite for various connections or links without framing. H. Raw bit pipe. PPP also expects other protocols to establish connections, authenticate users, and carry network layer data as well.	1994
	Routing Information Protocol (RIP) is a dynamic routing protocol that	

<a href="#">RIP</a>	uses hop count as a routing metric to find the best path between source and destination networks.	520
<a href="#">OSPF</a>	Open Shortest Path First (OSPF) is a link-state routing protocol used to find the best path between a source and destination router using its own shortest path first).	89
<a href="#">EIGRP</a>	Enhanced Interior Gateway Routing Protocol (EIGRP) is a dynamic routing protocol used to find the best path and deliver packets between any two Layer 3 devices.	88
<a href="#">BGP</a>	Border Gateway Protocol (BGP) is a protocol used to exchange Internet routing information and is used between ISPs in different ASes.	179
<a href="#">STP</a>	Spanning Tree Protocol (STP) is used to create a loop-free network by monitoring the network, tracking all connections, and shutting down the least redundant connections.	0 to 255
<a href="#">RARP</a>	RARP, stand for Reverse Address Resolution Protocol, is a computer network-based protocol used by client computers to request IP addresses from a gateway server's Address Resolution Protocol table or cache.	-
<a href="#">LAPD</a>	The D-channel LAPD or Link Access Protocol is basically the Layer 2 protocol normally required for the ISDN D-channel. It is derived from the LAPB (Link Access Protocol Balanced) protocol.	-
<a href="#">IPsec</a>	IP Security (IPSec) is a standard suite of Internet Engineering Task Force (IETF) protocols between two communication points on IP networks to provide data authentication, integrity, and confidentiality. It also defines encrypted, decrypted, and authenticated packets.	4500
<a href="#">ASCII</a>	ASCII (American Standard Code for Information Interchange) is the standard character encoding used in telecommunications. The ASCII representation "ask-ee" is strictly a 7-bit code based on the English alphabet. ASCII codes are used to represent alphanumeric data.	9500
EBCDIC	EBCDIC (Extended Binary Encoded Decimal Interchange Code) (pronounced "ehb-suh-dik" or "ehb-kuh-dik") is an alphanumeric binary code developed by IBM to run large-scale computer systems .	-
<a href="#">X.25 PAD</a>	X.25 is an International Telecommunication Union Telecommunication Standardization Sector (ITU-T) protocol standard simply for <a href="#">Wide Area Network (WAN)</a> communications that basically describes how the connections among user devices and network devices are established and maintained.	-

<a href="#">HDLC</a>	High-Level Data Link Control (HDLC) commonly uses the term "frame" to denote units or logs of units of data that are frequently transmitted or transmitted from one station to another, express. Each frame on the link must start and end with a flag sequence field (F).	-
<a href="#">SLIP</a>	SLIP stands for Serial Line Internet Protocol. It is a TCP/IP implementation which was described under RFC 1055 (Request for Comments).	
<a href="#">LAP</a>	Link Access Procedure (LAP) is basically considered as an ITU family of <a href="#">Data Link Layer (DLL) protocols</a> that are subsets of <a href="#">High-Level Data Link Control (HDLC)</a> . LAP is particularly derived from IBM's <a href="#">System Development Life Cycle (SDLC)</a> .	-
NCP	Network Control Protocol (NCP) is a set of protocols that are part of Point-to-Point Protocol (PPP).	524
<a href="#">Mobile IP</a>	Mobile IP is a communication protocol (created by extending the Internet Protocol, IP) that allows a user to move from one network to another using the same her IP address.	434
<a href="#">VOIP</a>	Voice over Internet Protocol (VoIP), is a technology that allowing you to make voice calls over a broadband Internet connection instead of an analog (regular) phone line. Some VoIP services allow you to call people using the same service, but others may allow you to call anyone.	5060
<a href="#">LDAP</a>	Lightweight Directory Access Protocol (LDAP) is an internet protocol works on TCP/IP, used to access information from directories. LDAP protocol is basically used to access an active directory.	389
<a href="#">GRE</a>	GRE or Generic Routing Encapsulation is a tunneling protocol developed by Cisco. It encapsulates IP packets i.e. deliverable inner packets into outer packets.	47
<a href="#">AH</a>	The HTTP headers Authorization header is a request type header that used to contains the credentials information to authenticate a user through a server. If the server responds with 401 Unauthorized and the WWW-Authenticate header not usually.	51
<a href="#">ESP</a>	Encapsulation security payload, also abbreviated as ESP plays a very important role in network security. ESP or Encapsulation security payload is an individual protocol in IPSec.	500
<a href="#">NNTP</a>	Network News Transfer Protocol (NNTP) is the underlying protocol of UseNet, which is a worldwide discussion system which contains posts or articles which are known as news.	119

<a href="#">RPC-DCOM</a>	<a href="#">DCOM- Distributed Component Object Model</a> – helps remote object via running on a protocol known as the Object Remote Procedure Call (ORPC).	-
<a href="#">IRC</a>	Internet Relay Chat (IRC) is an Internet application that was developed by Jakko Oikarinen in Finland. Chat is the most convenient immediate way to communicate with others via Internet.	6667

## IEEE Standards:

Standards	Description
IEEE 802	<a href="#">LAN/MAN</a>
IEEE 802.1	LAN/MAN Bridging and management
IEEE 802.1s	<a href="#">Multiple spanning tree</a>
IEEE 802.1w	<a href="#">Rapid reconfiguration of spanning tree</a>
IEEE 802.1x	<a href="#">Port-based network access control</a>
IEEE 802.2	<a href="#">Logical Link Control (LLC)</a>
IEEE 802.3	<a href="#">CSMA/CD access method (Ethernet)</a>
IEEE 802.3ae	<a href="#">10 Gigabit Ethernet</a>
IEEE 802.4	Token passing bus access method and Physical layer specifications
IEEE 802.5	Token Ring access method and Physical layer specifications
IEEE 802.6	<a href="#">Distributed Queue Dual Bus (DQDB) access method and Physical layer specifications (MAN)</a>
IEEE 802.7	<a href="#">Broadband LAN</a>
IEEE 802.8	<a href="#">Fiber Optic</a>
IEEE 802.9	Isochronous LANs (standard withdrawn)
IEEE 802.10	Interoperable LAN/MAN Security
IEEE 802.11	<a href="#">Wireless LAN MAC and Physical layer specifications</a>
IEEE 802.11a	Wireless with speed upto 54 Mbps
IEEE 802.11b	<a href="#">Wireless with speed upto 11 Mbps</a>
IEEE 802.11g	Wireless with speed upto 54 Mbps

IEEE 802.11n	Wireless with speed upto 600 Mbps
IEEE 802.12	Demand-priority access method, physical layer and repeater specifications
IEEE 802.13	Not used
IEEE 802.14	<a href="#">Cable modems (proposed standard was withdrawn)</a> .
IEEE 802.15	<a href="#">Wireless Personal Area Network (WPAN)</a> .
IEEE 802.16	<a href="#">Wireless Metropolitan Area Network (Wireless MAN)</a> .
IEEE 802.17	Resilient Packet Ring (RPR) Access

## Networking Devices:

Device	Description
Client	Any device, such as a workstation, laptop, tablet, or smartphone, that is used to access a network.
Server	Provides resources to network users, including email, web pages, or files.
Hub	A Layer 1 device that does not perform any inspection of traffic. A <a href="#">hub</a> simply receives traffic in a port and repeats that traffic out of all the other ports.
Switch	A Layer 2 device that makes its forwarding decisions based on the destination <a href="#">Media Access Control (MAC) address</a> . A switch learns which devices reside off which ports by examining the source MAC address. The switch then forwards traffic only to the appropriate port, and not to all the other ports.
Router	A Layer 3 device that makes forwarding decisions based on <a href="#">Internet Protocol (IP)</a> addressing. Based on the routing table, the router intelligently forwards the traffic out of the appropriate interface.
Multilayer switch	Can operate at both <a href="#">Layer 2</a> and <a href="#">Layer 3</a> . Also called a Layer 3 switch, a multilayer switch is a high-performance device that can switch traffic within the LAN and forward packets between subnets.
Media	Media can be copper cabling, <a href="#">fiber-optic cabling</a> , or radio waves. Media varies in its cost, bandwidth capacity, and distance limitation.
Analog	Modem is short for <a href="#">modulator/demodulator</a> . An analog modem converts the digital



modem	signals generated by a computer into analog signals that can travel over conventional phone lines.
Broadband modem	A digital modem used with <a href="#">high-speed DSL</a> or cable Internet service. Both operate in a similar manner to the analog modem, but use higher broadband frequencies and transmission speeds.
Access point (AP)	A network device with a built-in antenna, transmitter, and adapter that provides a connection point between WLANs and a wired Ethernet LAN. APs usually have several wired RJ-45 ports to support LAN clients. Most small office or home office (SOHO) routers integrate an AP.

## Cables in Networking Devices:

Ethernet Standards (IEEE)	Data Rate	Cable Fiber Type	Maximum Distance (IEEE)
<a href="#">Ethernet (10Base-FL)</a>	10 Mbps	50m or 62.5um Multimode @ 850nm	2km
<a href="#">Fast Ethernet (100Base-FX)</a>	100 Mbps	50m or 62.5um Multimode @ 1300nm	2km
<a href="#">Fast Ethernet (100Base-SX)</a>	100 Mbps	50m or 62.5um Multimode @ 850nm	300m
<a href="#">Gigabit Ethernet (1000Base-SX)</a>	1000 Mbps	50m Multimode @ 850nm	550m
<a href="#">Gigabit Ethernet (1000Base-SX)</a>	1000 Mbps	62.5um Multimode @ 850nm	220m
<a href="#">Gigabit Ethernet (1000Base-LX)</a>	1000 Mbps	50m or 62.5um Multimode @ 1300nm	550m
<a href="#">Gigabit Ethernet (1000Base-LX)</a>	1000 Mbps	9um Singlemode @1310nm	5km
<a href="#">Gigabit Ethernet (1000Base-LH)</a>	1000 Mbps	9um Singlemode @1550nm	70km

## Types of Ethernet Networks:

Speed	Common Name	Informal IEEE Standard Name	Formal IEEE Standard Name	Cable Type, Maximum Length
10 Mbps	Ethernet	10BASE-T	802.3	Copper, 100 m

100 Mbps	Fast Ethernet	100BASE-T	802.3u	Copper, 100 m
1000 Mbps	<a href="#">Gigabit Ethernet</a>	1000BASE-LX	802.3z	Fiber, 5000 m
1000 Mbps	<a href="#">Gigabit Ethernet</a>	1000BASE-T	802.3ab	Copper, 100 m
10 Gbps	<a href="#">10 Gig Ethernet</a>	10GBASE-T	802.3an	Copper, 100 m

## Types of Network Connections:

Type	Description
<a href="#">Internet</a>	A network of millions of interconnected and cooperatively connected computers is called the Internet. Internet includes people, resources and means of collaboration
<a href="#">Intranet</a>	It is an internal private network built within an organization using Internet and World Wide Web standards and products that provides access to corporate information for the organization's employees.
<a href="#">Extranet</a>	This is a type of network that allows external users to access an organization's intranet.

## Transmission Media:

- **Guided Media:**

Type of media	Description
<a href="#">Twisted Pair Cable</a>	It is a superimposed winding of two separately insulated conductors. As a rule, several such pairs are grouped together in a protective cover. They are the most widely used transmission media.
<a href="#">Coaxial Cable</a>	It has a PVC or Teflon insulating layer and an outer plastic sheath containing two parallel conductors, each with a separate conformal protective cover.
<a href="#">Optical Fiber Cable</a>	It uses the concept of light reflection through a glass or plastic core. The core is surrounded by a less dense glass or plastic shell called the cladding. Used to transfer large amounts of data.
<a href="#">Stripline</a>	Stripline is a transverse electromagnetic (TEM) transmission line medium invented by Robert M. Barrett at the Air Force Cambridge Research Center in the 1950s. Stripline is the earliest form of planar transmission line.
<a href="#">Microstripline</a>	Conductive material is separated from the ground plane by a dielectric layer.

- **Unguided Media:**

Type of media	Description
<a href="#">Radio waves</a>	These are easy to generate and can penetrate buildings. There is no need to align the transmit and receive antennas. Frequency Range: 3kHz - 1GHz AM radios, FM radios, and cordless phones use radio waves for transmission.
<a href="#">Microwaves</a>	<b>Multiplexer types:</b> line-of-sight transmission. H. Transmitting and receiving antennas should be placed properly. The distance a signal travels is directly proportional to the height of the antenna. Frequency Range: 1GHz - 300GHz They are mainly used for mobile telephony and television distribution.
<a href="#">Infrared</a>	Infrared is used for short distance communication. Obstacles cannot be penetrated. This prevents interference between systems. Frequency Range: 300GHz - 400THz It is used in TV remote controls, wireless mice, keyboards, printers, etc.

## Types of Multiplexers:

Type	Description
<a href="#">Frequency Division Multiplexing (FDM)</a>	The frequency spectrum is divided into logical channels and each user has exclusive access to his channel. It transmits signals in several different frequency ranges and multiple video channels over a single cable. Each signal is modulated onto a different carrier frequency and the carrier frequencies are separated by guard bands.
<a href="#">Time Division Multiplexing (TDM)</a>	Each user gets full bandwidth for a short period of time on a regular basis. The entire channel is dedicated to her one user, but only for a short time.
<a href="#">Wavelength Division Multiplexing</a>	This is the same as FDM but applied to fiber, with the difference that here the operating frequency is much higher, actually in the optical range. Due to its extremely high bandwidth, fiber optic has great potential.

## Collision Detection:

Type	Description
<a href="#">Carrier Sense Multiple Access with Collision Detection</a>	In this method, after sending a frame, the station monitors the media to see if the transmission was successful. If successful, the transmission is terminated, otherwise the frame is retransmitted.

<a href="#">(CSMA/CD).</a>	
<a href="#">Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).</a>	The basic idea behind CSMA/CA is that stations must be able to receive while transmitting in order to detect collisions from different stations. A collision in a wired network nearly doubles the energy of the received signal, allowing stations to detect a potential collision.
<a href="#">ALOHA</a>	It was developed for wifi, but can also be used for shared media. Multiple stations can transmit data at the same time, which can lead to collisions and data corruption.

## Network Layer Services:

Type	Description
<a href="#">Packetizing</a>	The process of encapsulating data (also called payload) received from upper layers of the network into network layer packets at the source and decapsulating the payload from the network layer packets at the destination is called packetization.
<a href="#">Routing</a> and Forwarding	These are two other services provided by the network layer. A network has many routes from a source to a destination. The network layer sets some strategies for finding the best possible route. This process is called routing.

## Mode of Communication:

Types	Description
<a href="#">Simplex Mode</a>	In simplex mode, communication is one-way, like one-way. Only one of the two devices on the link can transmit, the other can only receive. Simplex mode allows data to be sent in one direction using the full capacity of the channel.
<a href="#">Half-Duplex Mode</a>	In half-duplex mode, each station can both transmit and receive, but not at the same time. When one device transmits, the other device can only receive and vice versa. Half-duplex mode is used when simultaneous communication in both directions is not required.
<a href="#">Full-Duplex Mode</a>	In full-duplex mode, both stations can transmit and receive at the same time. In full-duplex mode, signals in one direction share the capacity of the link with signals in the other direction. This sharing can be done in two ways: <ul style="list-style-type: none"> <li>• Either the link must contain two physically separate transmission paths, one for sending and the other for receiving.</li> <li>• Or the capacity is divided between signals traveling in both directions.</li> </ul>

# Classes in Computer Networking:

CLASS	LEADING BITS	NET ID BITS	HOST ID BITS	NO. OF NETWORKS	ADDRESSES PER NETWORK	START ADDRESS	END ADDRESS
<a href="#">CLASS A</a>	0	8	24	2 <sup>7</sup> ( 128)	2 <sup>24</sup> (16,777,216)	0.0.0.0	127.255.255.255
<a href="#">CLASS B</a>	10	16	16	2 <sup>14</sup> (16,384)	2 <sup>16</sup> (65,536)	128.0.0.0	191.255.255.255
<a href="#">CLASS C</a>	110	24	8	2 <sup>21</sup> (2,097,152)	2 <sup>8</sup> (256)	192.0.0.0	223.255.255.255
<a href="#">CLASS D</a>	1110	NOT DEFINED	NOT DEFINED	NOT DEFINED	NOT DEFINED	224.0.0.0	239.255.255.255
<a href="#">CLASS E</a>	1111	NOT DEFINED	NOT DEFINED	NOT DEFINED	NOT DEFINED	240.0.0.0	255.255.255.255

  

Subnet Address or Subnet ID Using/16Prefix	1st Usable IP Address	Last usable IP Address	Broadcast Address
120.0.0.0/24	120.0.0.1	120.0.255.254	120.0.255.255
120.1.0.0/24	120.1.0.1	120.1.255.254	120.1.255.255
120.2.0.0/24	120.2.0.1	120.2.255.254	120.2.255.255
120.3.0.0/24	120.3.0.1	120.3.255.254	120.3.255.255
120.100.0.0/24	120.100.0.1	120.100.255.254	120.100.255.255
120.101.0.0/24	120.101.0.1	120.101.255.254	120.101.255.255
120.200.0.0/24	120.200.0.1	120.200.255.254	120.200.255.255
120.201.0.0/24	120.201.0.1	120.201.255.254	120.201.255.255
120.253.0.0/24	120.253.0.1	120.253.255.254	120.253.255.255
120.254.0.0/24	120.254.0.1	120.254.255.254	120.254.255.255
120.255.0.0/24	120.255.0.1	120.255.255.254	120.255.255.255

## Subnetting:

Private IP Address with Subnet Mask	Private IP Range	Private IP Range denoted in CIDR
10.0.0.0 255.0.0.0	10.0.0.0 to 10.255.255.255	10.0.0.0/8
172.16.0.0 255.240.0.0	172.16.0.0 to 172.31.255.255	172.16.0.0/12

192.168.0.0 255.255.0.0		192.168.0.0 to 192.168.255.255	192.168.0.0/16	
CIDR	SUBNET MASK	WILDCARD MASK	# OF IP ADDRESSES	# OF USABLE IP ADDRESSES
/32	255.255.255.255	0.0.0.0	1	1
/31	255.255.255.254	0.0.0.1	2	2*
/30	255.255.255.252	0.0.0.3	4	2
/29	255.255.255.248	0.0.0.7	8	6
/28	255.255.255.240	0.0.0.15	16	14
/27	255.255.255.224	0.0.0.31	32	30
/26	255.255.255.192	0.0.0.63	64	62
/25	255.255.255.128	0.0.0.127	128	126
/24	255.255.255.0	0.0.0.255	256	254
/23	255.255.254.0	0.0.1.255	512	510
/22	255.255.252.0	0.0.3.255	1,024	1,022
/21	255.255.248.0	0.0.7.255	2,048	2,046
/20	255.255.240.0	0.0.15.255	4,096	4,094
/19	255.255.224.0	0.0.31.255	8,192	8,190
/18	255.255.192.0	0.0.63.255	16,384	16,382
/17	255.255.128.0	0.0.127.255	32,768	32,766
/16	255.255.0.0	0.0.255.255	65,536	65,534
/15	255.254.0.0	0.1.255.255	131,072	131,070
/14	255.252.0.0	0.3.255.255	262,144	262,142
/13	255.248.0.0	0.7.255.255	524,288	524,286
/12	255.240.0.0	0.15.255.255	1,048,576	1,048,574
/11	255.224.0.0	0.31.255.255	2,097,152	2,097,150
/10	255.192.0.0	0.63.255.255	4,194,304	4,194,302
/9	255.128.0.0	0.127.255.255	8,388,608	8,388,606
/8	255.0.0.0	0.255.255.255	16,777,216	16,777,214
/7	254.0.0.0	1.255.255.255	33,554,432	33,554,430
/6	252.0.0.0	3.255.255.255	67,108,864	67,108,862
/5	248.0.0.0	7.255.255.255	134,217,728	134,217,726
/4	240.0.0.0	15.255.255.255	268,435,456	268,435,454
/3	224.0.0.0	31.255.255.255	536,870,912	536,870,910

/2	192.0.0.0	63.255.255.255	1,073,741,824	1,073,741,822
/1	128.0.0.0	127.255.255.255	2,147,483,648	2,147,483,646
/0	0.0.0.0	255.255.255.255	4,294,967,296	4,294,967,294

## Methods of Network Security:

Method	Description
<a href="#">Authentic- ation</a>	Verify a user's identity, usually by asking them to enter a password or biometric identifier.
<a href="#">Encryption</a>	Encrypt data with a key, that is, the same key is required to decrypt the data. This is how HTTPS works.
<a href="#">Firewalls</a>	Protect the network from unauthorized access.
<a href="#">MAC Address Filtering</a>	Allow devices to access or be prevented from accessing the network based on their physical address embedded in the device's network adapter.