



Basics of Computer Networking



Last Updated : 16 May, 2024

Computer Networking is the practice of connecting computers together to enable communication and data exchange between them. In general, Computer Network is a collection of two or more computers. It helps users to communicate more easily. In this article, we are going to discuss the basics which everyone must know before going deep into Computer Networking.



Computer Networking

How Does a Computer Network Work?

Basic building blocks of a Computer network are Nodes and Links. A Network Node can be illustrated as Equipment for Data Communication like a Modem, Router, etc., or Equipment of a Data Terminal like connecting two computers or more. Link in Computer Networks can be defined as wires or cables or free space of wireless networks.

The working of Computer Networks can be simply defined as rules or protocols which help in sending and receiving data via the links which

allow Computer networks to communicate. Each device has an IP Address, that helps in identifying a device.

Basic Terminologies of Computer Networks

- **Network:** A network is a collection of computers and devices that are connected together to enable communication and data exchange.
- **Nodes:** Nodes are devices that are connected to a network. These can include computers, Servers, Printers, [Routers](#), [Switches](#), and other devices.
- **Protocol:** A protocol is a set of rules and standards that govern how data is transmitted over a network. Examples of protocols include [TCP/IP](#), [HTTP](#), and [FTP](#).
- **Topology:** Network topology refers to the physical and logical arrangement of nodes on a network. The common network topologies include bus, star, ring, mesh, and tree.
- **Service Provider Networks:** These types of Networks give permission to take Network Capacity and Functionality on lease from the Provider. Service Provider Networks include Wireless Communications, Data Carriers, etc.
- **IP Address:** An IP address is a unique numerical identifier that is assigned to every device on a network. IP addresses are used to identify devices and enable communication between them.
- **DNS:** The [Domain Name System \(DNS\)](#) is a protocol that is used to translate human-readable domain names (such as [www.google.com](#)) into IP addresses that computers can understand.
- **Firewall:** A [firewall](#) is a security device that is used to monitor and control incoming and outgoing network traffic. Firewalls are used to protect networks from unauthorized access and other security threats.

Types of Enterprise Computer Networks

- **LAN:** A [Local Area Network \(LAN\)](#) is a network that covers a small area, such as an office or a home. LANs are typically used to connect computers and other devices within a building or a campus.

- **WAN:** A [Wide Area Network \(WAN\)](#) is a network that covers a large geographic area, such as a city, country, or even the entire world. WANs are used to connect LANs together and are typically used for long-distance communication.
- **Cloud Networks:** [Cloud Networks](#) can be visualized with a Wide Area Network (WAN) as they can be hosted on public or private cloud service providers and cloud networks are available if there is a demand. Cloud Networks consist of Virtual Routers, Firewalls, etc.

These are just a few basic concepts of computer networking. Networking is a vast and complex field, and there are many more concepts and technologies involved in building and maintaining networks. Now we are going to discuss some more concepts on Computer Networking.

- **Open system:** A system that is connected to the network and is ready for communication.
- **Closed system:** A system that is not connected to the network and can't be communicated with.

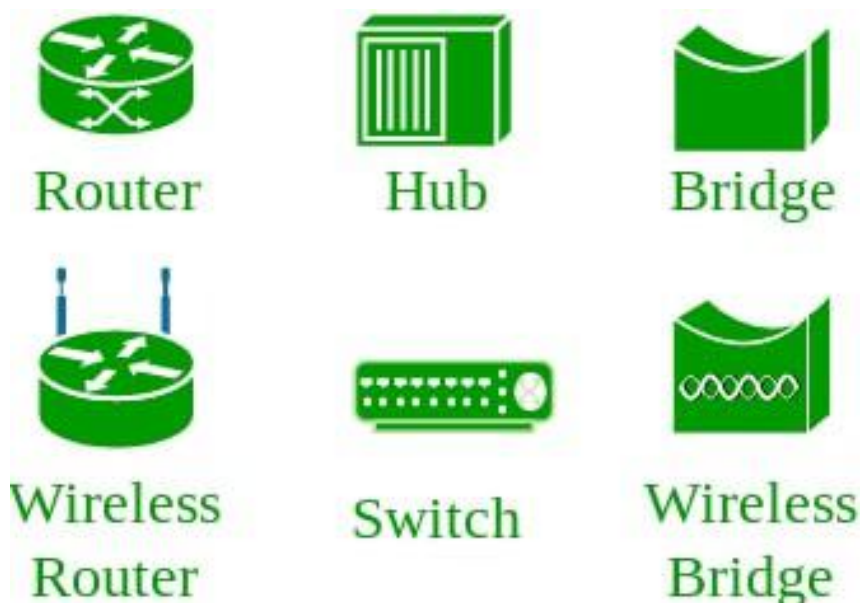
Types of Computer Network Architecture

Computer Network falls under these broad Categories:

- **Client-Server Architecture:** [Client-Server Architecture](#) is a type of Computer Network Architecture in which Nodes can be Servers or Clients. Here, the server node can manage the Client Node Behaviour.
- **Peer-to-Peer Architecture:** In [P2P \(Peer-to-Peer\) Architecture](#), there is not any concept of a Central Server. Each device is free for working as either client or server.

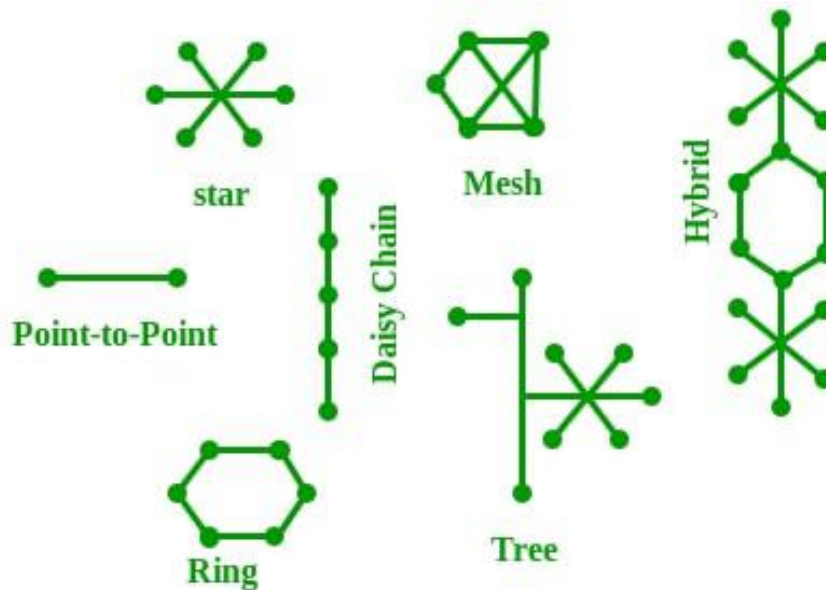
Network Devices

An interconnection of multiple devices, also known as hosts, that are connected using multiple paths for the purpose of sending/receiving data or media. Computer networks can also include multiple devices/mediums which help in the communication between two different devices; these are known as [Network devices](#) and include things such as routers, switches, hubs, and bridges.



Network Topology

The [Network Topology](#) is the layout arrangement of the different devices in a network. Common examples include Bus, Star, Mesh, Ring, and Daisy chain.



Network Topology

OSI Model

OSI stands for [Open Systems Interconnection](#). It is a reference model that specifies standards for communications protocols and also the functionalities of each layer. The OSI has been developed by the International Organization For Standardization and it is 7 layer architecture. Each layer of OSI has different functions and each layer has to follow different protocols. The 7 layers are as follows:

- [Physical Layer](#)
- [Data link Layer](#)
- [Network Layer](#)
- [Transport Layer](#)
- [Session Layer](#)
- [Presentation Layer](#)

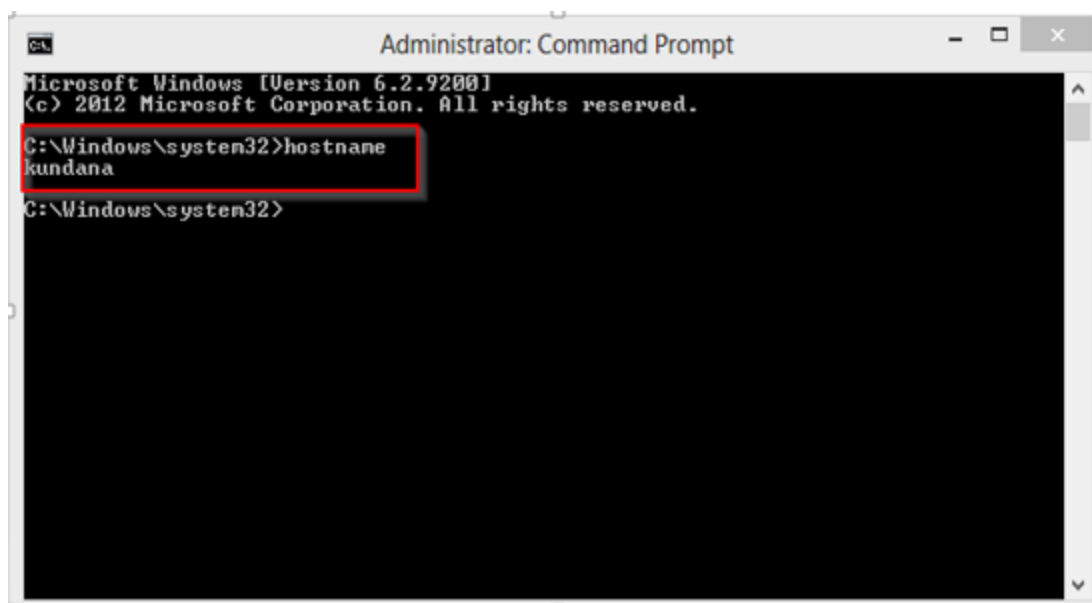
- [Application Layer](#)

Protocol

A protocol is a set of rules or algorithms which define the way how two entities can communicate across the network and there exists a different protocol defined at each layer of the OSI model. A few such protocols are TCP, IP, UDP, ARP, DHCP, FTP, and so on.

Unique Identifiers of Network

Hostname: Each device in the network is associated with a unique device name known as Hostname. Type “hostname” in the command prompt(Administrator Mode) and press ‘Enter’, this displays the hostname of your machine.

A screenshot of a Windows Command Prompt window titled "Administrator: Command Prompt". The window shows the following text: "Microsoft Windows [Version 6.2.9200] (c) 2012 Microsoft Corporation. All rights reserved. C:\Windows\system32>hostname kundana C:\Windows\system32>". The command and its output are highlighted with a red rectangular box.

HostName

IP Address (Internet Protocol address): Also known as the Logical Address, the IP Address is the network address of the system across the network. To identify each device in the world-wide-web, the Internet Assigned Numbers Authority (IANA) assigns an IPV4 (Version 4) address as a unique identifier to each device on the Internet. The length of an

IPv4 address is 32 bits, hence, we have 2^{32} IP addresses available. The length of an IPv6 address is 128 bits.

In **Windows** Type “ipconfig” in the command prompt and press ‘Enter’, this gives us the IP address of the device. For **Linux**, Type “ifconfig” in the terminal and press ‘Enter’ this gives us the IP address of the device.

MAC Address (Media Access Control address): Also known as physical address, the [MAC Address](#) is the unique identifier of each host and is associated with its [NIC \(Network Interface Card\)](#). A MAC address is assigned to the NIC at the time of manufacturing. The length of the MAC address is: 12-nibble/ 6 bytes/ 48 bits Type “ipconfig/all” in the command prompt and press ‘Enter’, this gives us the MAC address.

Port: A port can be referred to as a logical channel through which data can be sent/received to an application. Any host may have multiple applications running, and each of these applications is identified using the port number on which they are running.

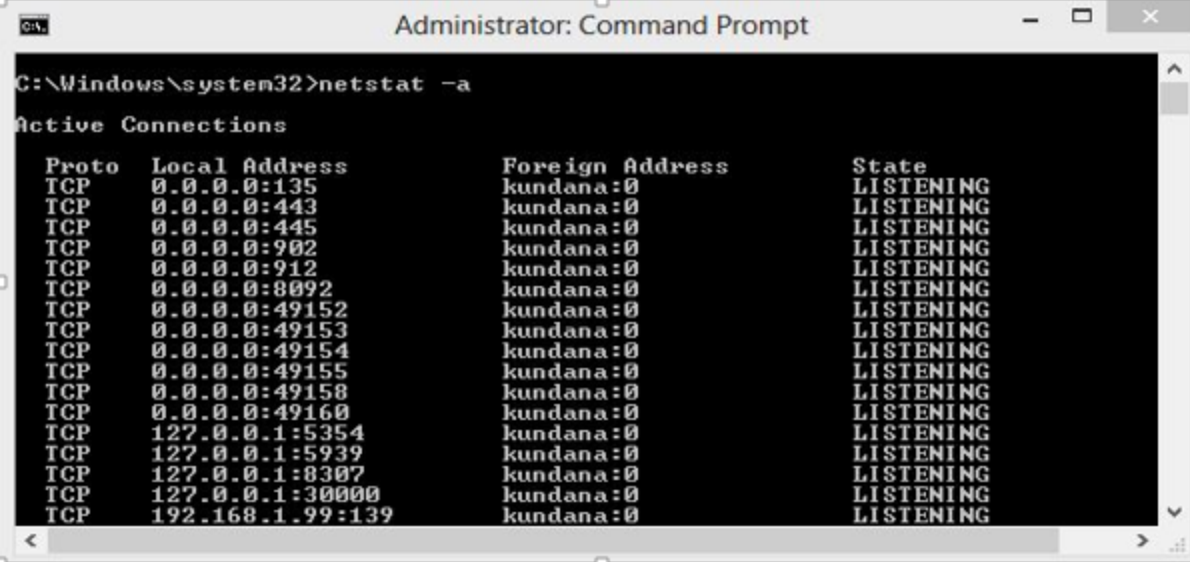
A port number is a 16-bit integer, hence, we have 2^{16} ports available which are categorized as shown below:

Port Types	Range
Well known Ports	0 – 1023
Registered Ports	1024 – 49151
Ephemeral Ports	49152 – 65535

Number of ports: 65,536

Range: 0 – 65535

Type “**netstat -a**” in the command prompt and press ‘Enter’, this lists all the ports being used.

A screenshot of a Windows Command Prompt window titled "Administrator: Command Prompt". The command "netstat -a" has been executed, displaying a list of active connections. The output is organized into four columns: "Proto", "Local Address", "Foreign Address", and "State". All connections are in a "LISTENING" state and are associated with the "kundana:0" foreign address. The local addresses include various IP addresses and ports, such as 0.0.0.0:135, 0.0.0.0:443, 0.0.0.0:445, 0.0.0.0:902, 0.0.0.0:912, 0.0.0.0:8092, 0.0.0.0:49152, 0.0.0.0:49153, 0.0.0.0:49154, 0.0.0.0:49155, 0.0.0.0:49158, 0.0.0.0:49160, 127.0.0.1:5354, 127.0.0.1:5939, 127.0.0.1:8307, 127.0.0.1:30000, and 192.168.1.99:139.

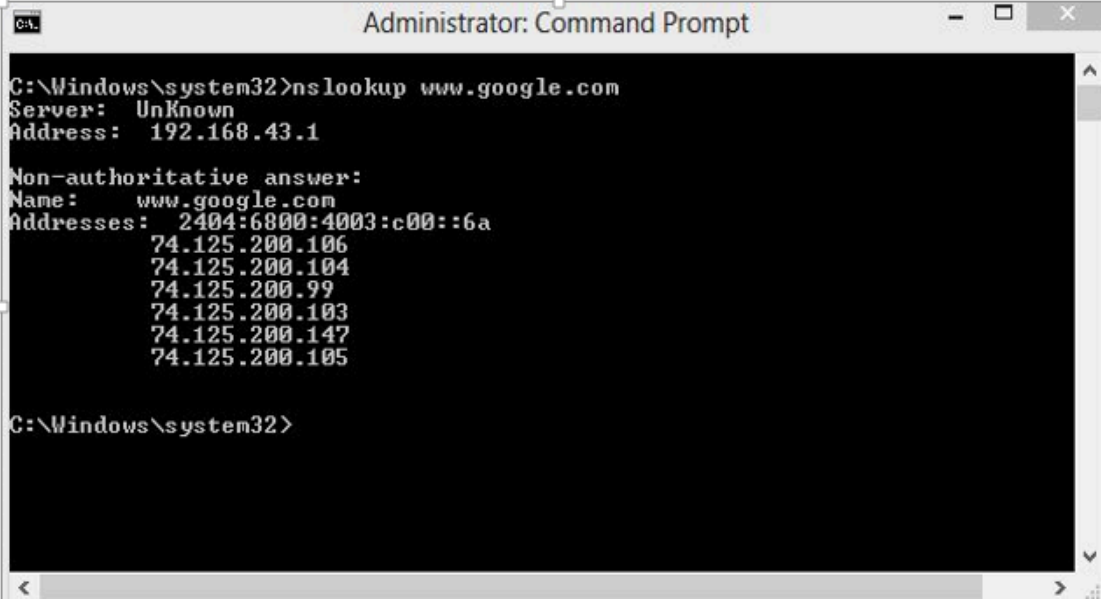
Proto	Local Address	Foreign Address	State
TCP	0.0.0.0:135	kundana:0	LISTENING
TCP	0.0.0.0:443	kundana:0	LISTENING
TCP	0.0.0.0:445	kundana:0	LISTENING
TCP	0.0.0.0:902	kundana:0	LISTENING
TCP	0.0.0.0:912	kundana:0	LISTENING
TCP	0.0.0.0:8092	kundana:0	LISTENING
TCP	0.0.0.0:49152	kundana:0	LISTENING
TCP	0.0.0.0:49153	kundana:0	LISTENING
TCP	0.0.0.0:49154	kundana:0	LISTENING
TCP	0.0.0.0:49155	kundana:0	LISTENING
TCP	0.0.0.0:49158	kundana:0	LISTENING
TCP	0.0.0.0:49160	kundana:0	LISTENING
TCP	127.0.0.1:5354	kundana:0	LISTENING
TCP	127.0.0.1:5939	kundana:0	LISTENING
TCP	127.0.0.1:8307	kundana:0	LISTENING
TCP	127.0.0.1:30000	kundana:0	LISTENING
TCP	192.168.1.99:139	kundana:0	LISTENING

List of Ports

Socket: The unique combination of IP address and Port number together is termed a Socket.

Other Related Concepts

DNS Server: [DNS](#) stands for **Domain Name System**. DNS is basically a server that translates web addresses or URLs (ex: [www.google.com](#)) into their corresponding IP addresses. We don't have to remember all the IP addresses of each and every website. The command '**nslookup**' gives you the IP address of the domain you are looking for. This also provides information on our DNS Server. \

A screenshot of a Windows Command Prompt window titled "Administrator: Command Prompt". The command "nslookup www.google.com" has been executed. The output shows the server as "UnKnown" and the address as "192.168.43.1". It then displays a "Non-authoritative answer:" followed by the name "www.google.com" and a list of addresses: "2404:6800:4003:c00::6a", "74.125.200.106", "74.125.200.104", "74.125.200.99", "74.125.200.103", "74.125.200.147", and "74.125.200.105".

```
C:\Windows\system32>nslookup www.google.com
Server: UnKnown
Address: 192.168.43.1

Non-authoritative answer:
Name: www.google.com
Addresses: 2404:6800:4003:c00::6a
           74.125.200.106
           74.125.200.104
           74.125.200.99
           74.125.200.103
           74.125.200.147
           74.125.200.105

C:\Windows\system32>
```


ARP: [ARP](#) stands for **Address Resolution Protocol**. It is used to convert an IP address to its corresponding physical address(i.e., MAC Address). ARP is used by the Data Link Layer to identify the MAC address of the Receiver's machine.

RARP: [RARP](#) stands for **Reverse Address Resolution Protocol**. As the name suggests, it provides the IP address of the device given a physical address as input. But RARP has become obsolete since the time DHCP has come into the picture.

"GeeksforGeeks helped me ace the GATE exam! Whenever I had any doubt regarding any topic, GFG always helped me and made my concepts quiet clear." - Anshika Modi | AIR 21

Choose GeeksforGeeks as your perfect GATE 2025 Preparation partner with these newly launched programs

[GATE CS & IT- Online](#)

[GATE DS & AI- Online](#)

[GATE Offline \(Delhi/NCR\).](#)

Over 150,000+ students already trust us to be their GATE Exam guide.
Join them & let us help you in opening the GATE to top-tech IITs & NITs!



GeeksforGeeks

1.31k

Next Article

Types of Network Topology

Similar Reads

Advantages and Disadvantages of Computer Networking

Pre-requisites: What is Computer Networking? The computer network is defined as a set of interconnected autonomous systems that facilitate...

5 min read

MAN Full Form in Computer Networking

Introduction : A Metropolitan Area Network (MAN) is a type of computer network that spans over a metropolitan area, typically a city. It provides...

6 min read

TCP/IP in Computer Networking

Introduction : TCP/IP (Transmission Control Protocol/Internet Protocol) is a suite of communication protocols that define the standards for transmittin...

8 min read

Importance of Computer Networking

Introduction : Computer networking refers to the practice of connecting computers and other digital devices together to share resources and...

7 min read

Difference Between BOOTP and RARP in Computer Networking

A computer networking protocol helps the users to establish the rules for the data transmission between two users. The main purpose of the...

3 min read

[View More Articles](#)

Article Tags :

[Computer Networks](#)



Corporate & Communications Address:- A-143, 9th Floor, Sovereign Corporate Tower, Sector- 136, Noida, Uttar Pradesh (201305)
| Registered Address:- K 061, Tower K, Gulshan Vivante Apartment, Sector 137, Noida, Gautam Buddh Nagar, Uttar Pradesh, 201305



Company

About Us
Legal
In Media
Contact Us
Advertise with us
GFG Corporate Solution
Placement Training Program
GeeksforGeeks Community

Languages

Python
Java
C++
PHP
GoLang
SQL
R Language
Android Tutorial
Tutorials Archive

DSA

Data Structures
Algorithms
DSA for Beginners
Basic DSA Problems
DSA Roadmap
Top 100 DSA Interview Problems
DSA Roadmap by Sandeep Jain
All Cheat Sheets

Data Science & ML

Data Science With Python
Data Science For Beginner
Machine Learning Tutorial
ML Maths
Data Visualisation Tutorial
Pandas Tutorial
NumPy Tutorial
NLP Tutorial
Deep Learning Tutorial

Web Technologies

HTML
CSS
JavaScript
TypeScript
ReactJS
NextJS
Bootstrap
Web Design

Computer Science

Operating Systems
Computer Network
Database Management System
Software Engineering
Digital Logic Design
Engineering Maths
Software Development
Software Testing

System Design

High Level Design
Low Level Design
UML Diagrams
Interview Guide
Design Patterns
OOAD
System Design Bootcamp
Interview Questions

School Subjects

Mathematics
Physics
Chemistry
Biology
Social Science
English Grammar
Commerce
World GK

Python Tutorial

Python Programming Examples
Python Projects
Python Tkinter
Web Scraping
OpenCV Tutorial
Python Interview Question
Django

DevOps

Git
Linux
AWS
Docker
Kubernetes
Azure
GCP
DevOps Roadmap

Interview Preparation

Competitive Programming
Top DS or Algo for CP
Company-Wise Recruitment Process
Company-Wise Preparation
Aptitude Preparation
Puzzles

GeeksforGeeks Videos

DSA
Python
Java
C++
Web Development
Data Science
CS Subjects

@GeeksforGeeks, Sanchhaya Education Private Limited, All rights reserved