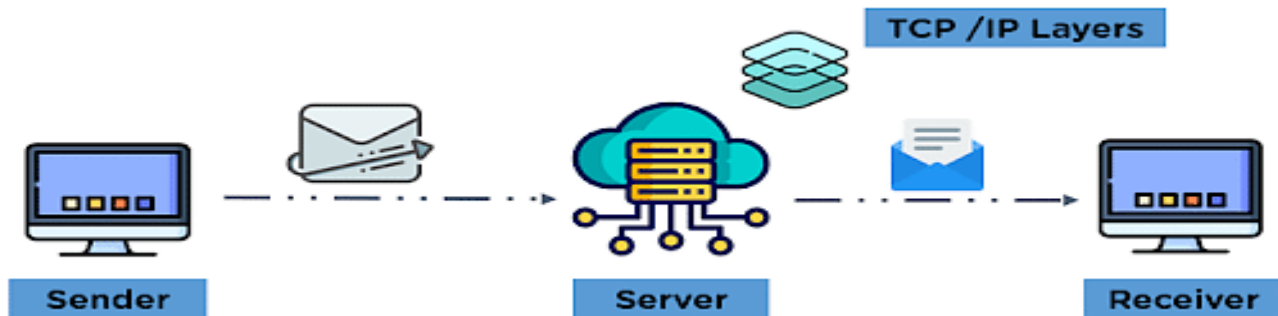


TCP/IP Model

What Is the TCP/IP Model?



The TCP/IP model refers to the Transmission Control Protocol/Internet Protocol Model. This model is a part of the network domain designed specifically for overseeing efficient and error-free transmission of data.

The model works on a four-layered architecture model, where each layer implicit the required network protocols on the data to be transmitted, which remodels the data to the most optimum structure for efficient transmission over the network.

In this tutorial on what is TCP/IP model is, you will understand the working of each layer in detail to better understand the functioning of the model.

The History of TCP/IP

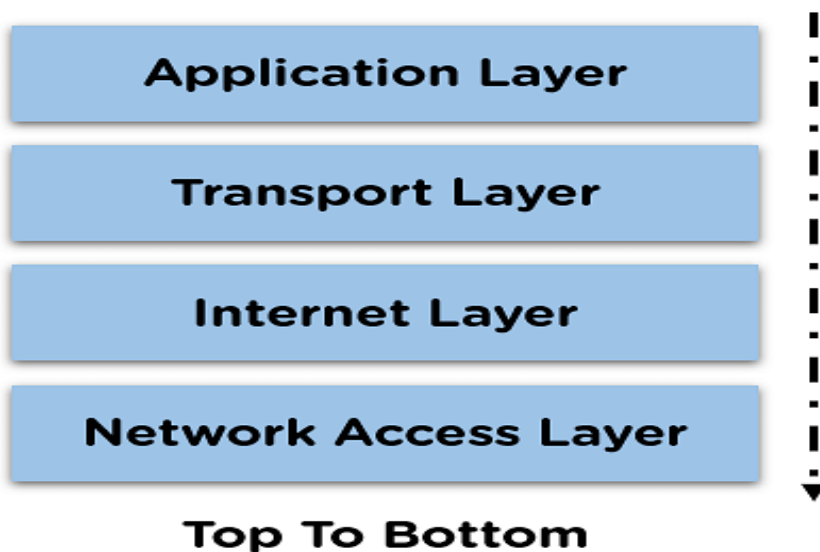
The Internet Protocol Suite, or TCP/IP for short, is the set of protocols that make up the network layer of the Internet.

- TCP/IP was developed during the Cold War as a way for the U.S. Department of Defense to connect computers within their networks and

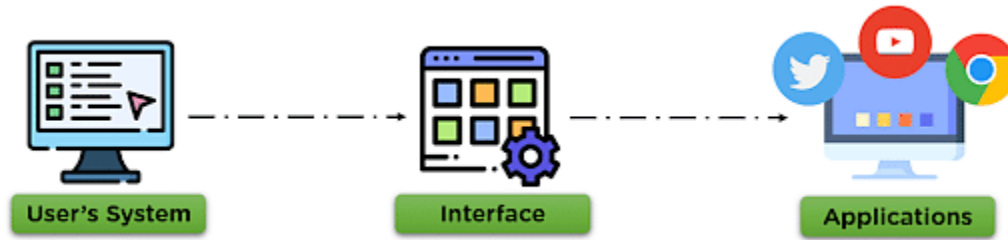
with each other across national boundaries. It's been used since the late 1960s when it was formalized by DARPA and later adopted by government agencies and universities worldwide as a common networking standard.

- The first version of TCP/IP was ARPANET (1975), which stands for Advanced Research Projects Administration Network. The name changed to TCP/IP in 1983, when it became an open standard that could be used on any network.
- To give researchers access to each other's equipment, they needed to send messages quickly over long distances without having them re-transmitted by any intermediate nodes along the way. This necessity led to the development of the Transmission Control Protocol (TCP) and Internet Protocol (IP). These protocols were intended for machine-to-machine connections, such as between computers over local area networks or wide-area networks

Layers of the TCP/IP Model



4.Application Layer



This is the topmost layer which indicates the applications and programs that utilize the TCP/IP model for communicating with the user through applications and various tasks performed by the layer, including data representation for the applications executed by the user and forwards it to the transport layer.

The application layer maintains a smooth connection between the application and user for data exchange and offers various features as remote handling of the system, e-mail services, etc.

Some of the protocols used in this layer are:

- HTTP: Hypertext transfer protocol is used for accessing the information available on the internet.
- SMTP: Simple mail transfer protocol, assigned the task of handling e-mail-related steps and issues.
- FTP: This is the standard protocol that oversees the transfer of files over the network channel.

3.Transport Layer



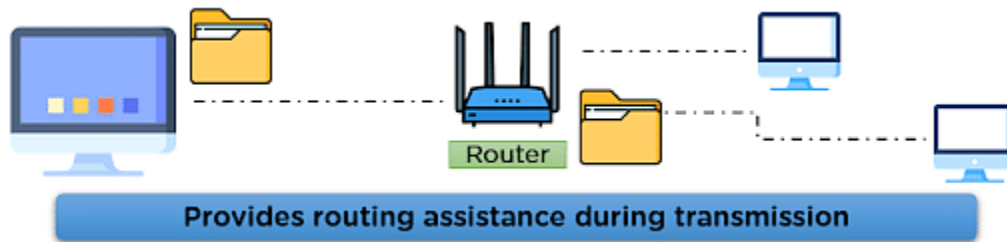
This layer is responsible for establishing the connection between the sender and the receiver device and also performs the task of dividing the data from the application layer into packets, which are then used to create sequences.

It also performs the task of maintaining the data, i.e., to be transmitted without error, and controls the data flow rate over the communication channel for smooth transmission of data.

The protocols used in this layer are:

- TCP: Transmission Control Protocol is responsible for the proper transmission of segments over the communication channel. It also establishes a network connection between the source and destination system.
- UDP: User Datagram Protocol is responsible for identifying errors, and other tasks during the transmission of information. UDP maintains various fields for data transmission such as:
 - Source Port Address: This port is responsible for designing the application that makes up the message to be transmitted.
 - Destination Port Address: This port receives the message sent from the sender side.
 - Total Length: The total number of bytes of the user datagram.
 - Checksum: Used for error detection of the message at the destination side.

2. Internet Layer



The Internet layer performs the task of controlling the transmission of the data over the network modes and enacts protocols related to the various steps related to the transmission of data over the channel, which is in the form of packets sent by the previous layer.

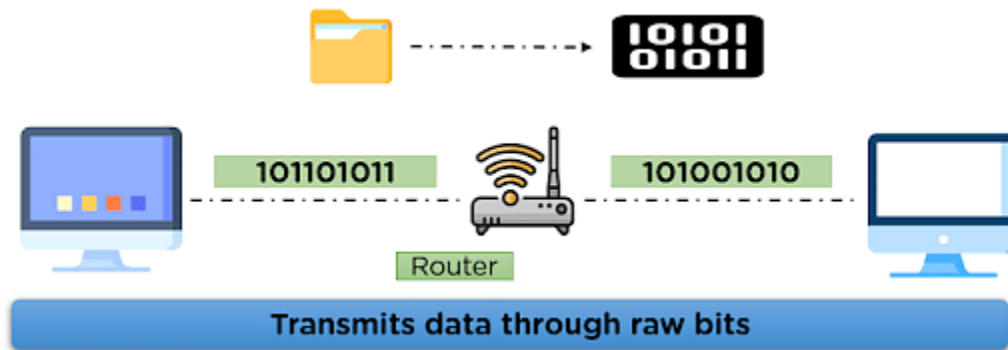
This layer performs many important functions in the TCP/IP model, some of which are:

1. It is responsible for specifying the path that the data packets will use for transmission.
2. This layer is responsible for providing IP addresses to the system for the identification matters over the network channel.

Some of the protocols applied in this layer are:

- IP: This protocol assigns your device with a unique address; the IP address is also responsible for routing the data over the communication channel.
- ARP: This protocol refers to the Address Resolution Protocol that is responsible for finding the physical address using the IP address.

1. Network Access Layer



This layer is the combination of data-link and physical layer, where it is responsible for maintaining the task of sending and receiving data in raw bits, i.e., in binary format over the physical communication modes in the network channel.

- It uses the physical address of the system for mapping the path of transmission over the network channel.
- Till this point in this tutorial on what is TCP/IP model, you understood the basic idea behind the model and details about its layers, now compare the model with another network model

How Does TCP/IP Work?

The TCP/IP protocol suite is the set of communication protocols used to connect hosts on the Internet. TCP/IP allows computers on the same network to identify and communicate with each other. TCP/IP is a two-layer protocol, with the transport layer (TCP) responsible for reliable end-to-end communication and the Internet layer (IP) accountable for routing packets from the host to the host.

- At the transport layer, TCP provides a reliable byte-stream service to applications. TCP guarantees the delivery of data and that data will be delivered in the same order in which it was sent. TCP uses several mechanisms to provide this service, including sequence numbers, acknowledgments, and timeouts.
- At the Internet layer, IP is responsible for routing datagrams (packets) from host to host. IP does not guarantee the delivery of datagrams, but it tries to deliver them as best. If a datagram cannot be delivered, IP will return an error message to the source host.

The TCP/IP protocol suite is the most commonly used protocol suite on the Internet today, and it is also the protocol suite used by most LANs and WANs.

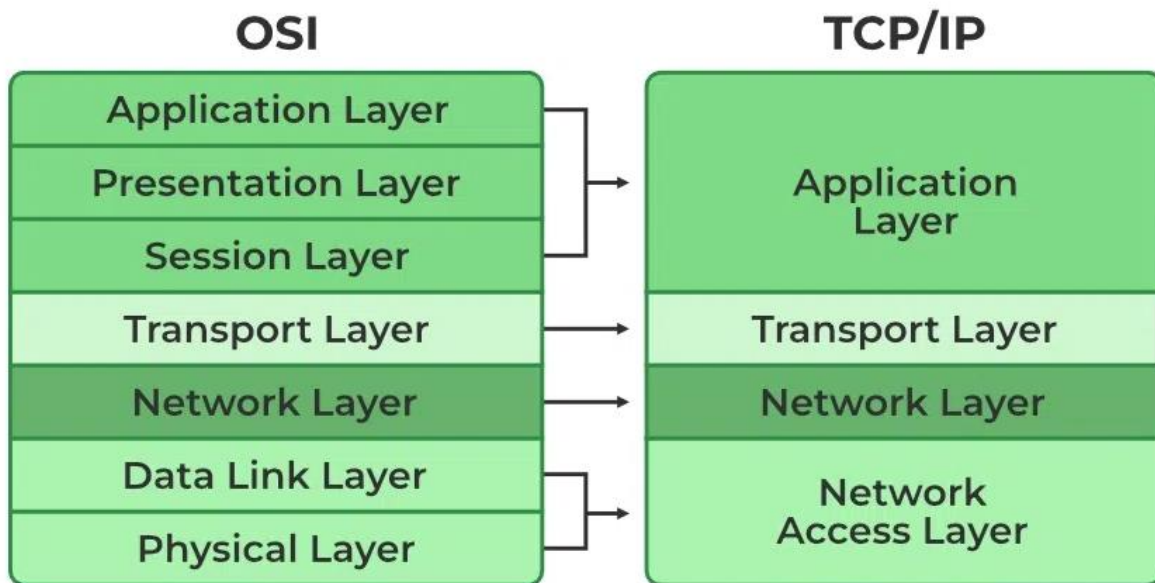
Functions of TCP/IP Layers

The TCP/IP model is a four-layer model that divides network communications into four distinct categories or layers. The model is often referred to as the TCP/IP stack. The four important layers are the application layer, the transport layer, the network layer, and the link layer.

- **The Application Layer:** The application layer is closest to the end user. And this is the layer that users interact with directly, including protocols such as HTTP, FTP, and SSH. This layer is responsible for providing applications with access to the network.

- The Transport Layer: The transport layer ensures that data is delivered reliably and efficiently from one point to another. This layer handles data transmission between hosts, including protocols like TCP and UDP.
- The Internet Layer: The network layer is responsible for routing data through the web. This layer delivers data packets from one host to another, including the IP protocol.
- The Link Layer: The link layer provides reliable data links between the two nodes — for example, protocols like ethernet and Wi-Fi.

The diagrammatic comparison of the **TCP/IP and OSI** model is as follows:



TCP/IP and OSI MODEL