# UDP

User Datagram Protocol (UDP) is a Transport Layer protocol. UDP is a part of the Internet Protocol suite, referred to as UDP/IP suite. Unlike TCP, it is an unreliable and connectionless protocol. So, there is no need to establish a connection before data transfer. The UDP helps to establish low-latency and loss-tolerating connections over the network. The UDP enables process-to-process communication.

The David P. Reed developed the UDP protocol in 1980. It is defined in RFC 768, and it is a part of the TCP/IP protocol, so it is a standard protocol over the internet. The UDP protocol allows the computer applications to send the messages in the form of datagrams from one machine to another machine over the Internet Protocol (IP) network. The UDP is an alternative communication protocol to the TCP protocol (transmission control protocol).

There are many differences between these two protocols. UDP enables the process to process communication, whereas the TCP provides host to host communication. Since UDP sends the messages in the form of datagrams, it is considered the best-effort mode of communication. TCP sends the individual packets, so it is a reliable transport medium. Another difference is that the TCP is a connection-oriented protocol whereas, the UDP is a connectionless protocol as it does not require any virtual circuit to transfer the data.

UDP Header Format
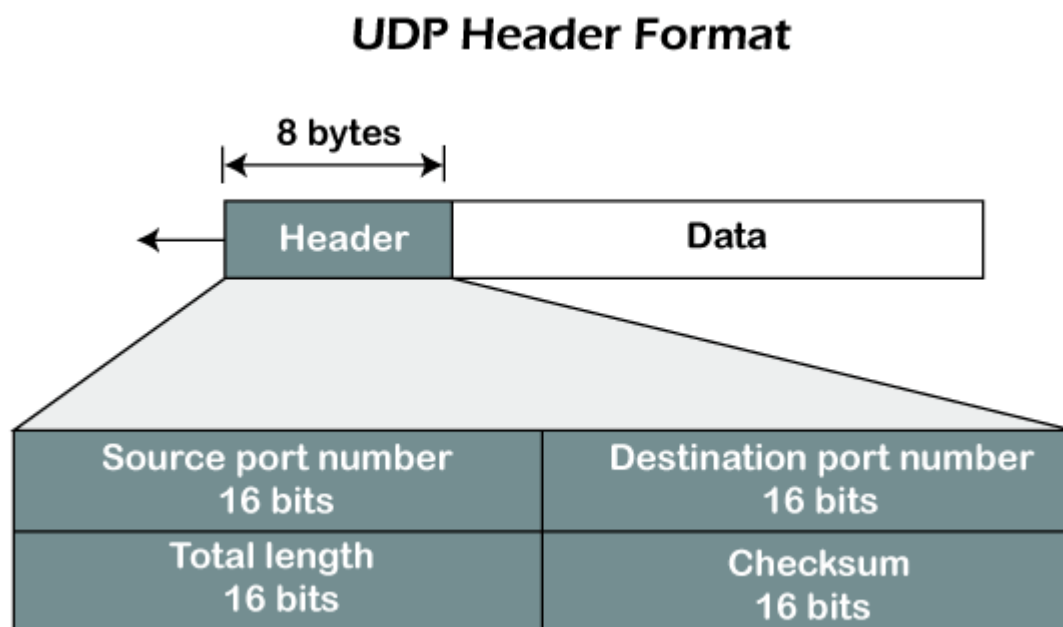
The UDP header contains four fields:

- o   Source port number: It is 16-bit information that identifies which port is going t send the packet.

- Destination port number: It identifies which port is going to accept the information. It is 16-bit information which is used to identify application-level service on the destination machine.
- Length: It is 16-bit field that specifies the entire length of the UDP packet that includes the header also. The minimum value would be 8-byte as the size of the header is 8 bytes.

Checksum:

It is a 16-bits field, and it is an optional field. This checksum field checks whether the information is accurate or not as there is the possibility that the information can be corrupted while transmission. It is an optional field, which means that it depends upon the application, whether it wants to write the checksum or not. If it does not want to write the checksum, then all the 16 bits are zero; otherwise, it writes the checksum. Concept of Queuing in UDP protocol

Concept of Queuing in UPD protocol
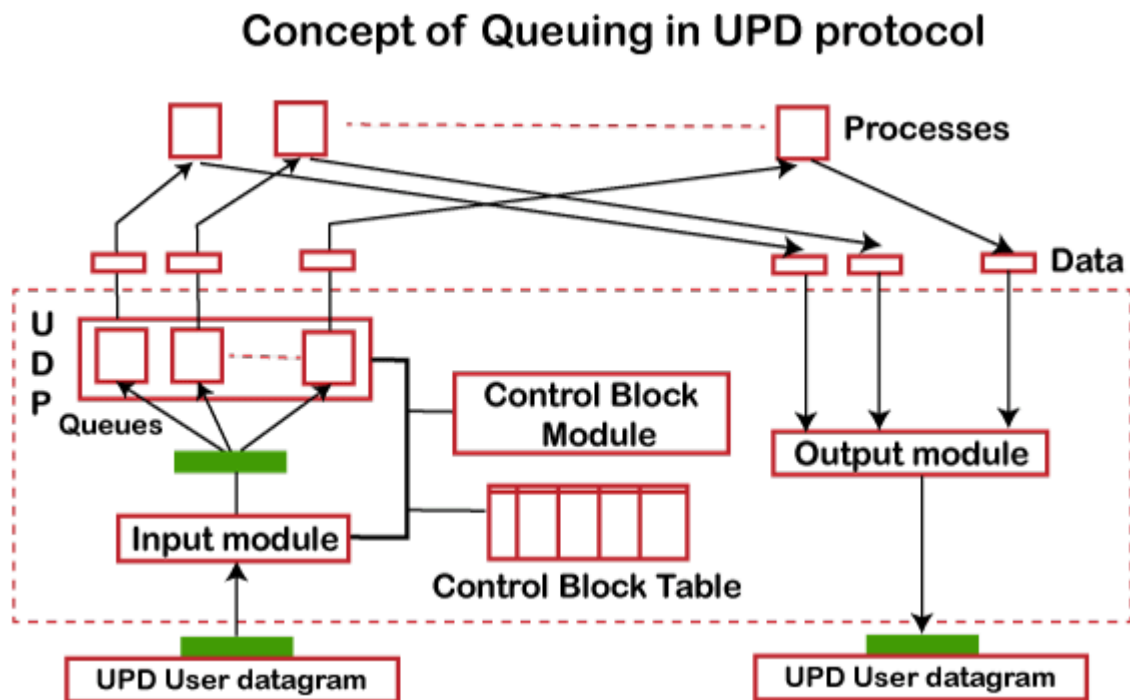
In UDP protocol, numbers are used to distinguish the different processes on a server and client. We know that UDP provides a process to process communication. The client generates the processes that need services while the server generates the processes that provide services. The queues are available for both the processes, i.e., two queues for each process. The first queue is the incoming queue that receives the messages, and the second one is the outgoing queue that sends the messages. The queue functions when the process is running. If the process is terminated then the queue will also get destroyed.

- UDP handles the sending and receiving of the UDP packets with the help of the following components:
- Input queue: The UDP packets uses a set of queues for each process.

o Input module: This module takes the user datagram from the IP, and then it finds the information from the control block table of the same port. If it finds the entry in the control block table with the same port as the user datagram, it enqueues the data.

o Control Block Module: It manages the control block table.

o Control Block Table: The control block table contains the entry of open ports.

o Output module: The output module creates and sends the user datagram.

Advantages of UDP
- Speed: UDP is faster than TCP because it does not have the overhead of establishing a connection and ensuring reliable data delivery.
- Lower latency: Since there is no connection establishment, there is lower latency and faster response time.
- Simplicity: UDP has a simpler protocol design than TCP, making it easier to implement and manage.
- Broadcast support: UDP supports broadcasting to multiple recipients, making it useful for applications such as video streaming and online gaming.
- Smaller packet size: UDP uses smaller packet sizes than TCP, which can reduce network congestion and improve overall network performance.
- User Datagram Protocol (UDP) is more efficient in terms of both latency and bandwidth.

Disadvantages of UDP
- No reliability: UDP does not guarantee delivery of packets or order of delivery, which can lead to missing or duplicate data.
- No congestion control: UDP does not have congestion control, which means that it can send packets at a rate that can cause network congestion.
- No flow control: UDP does not have flow control, which means that it can overwhelm the receiver with packets that it cannot handle.
- Vulnerable to attacks: UDP is vulnerable to denial-of-service attacks, where an attacker can flood a network with UDP packets, overwhelming the network and causing it to crash.
- Limited use cases: UDP is not suitable for applications that require reliable data delivery, such as email or file transfers, and is better suited for applications that can tolerate some data loss, such as video streaming or online gaming.