UDP Protocol

What is UDP and how it operates

User Datagram Protocol (UDP) is a communications protocol for time-sensitive applications like gaming, playing videos, or **Domain Name System (DNS)** lookups. UDP results in speedier communication because it does not spend time forming a firm connection with the destination before transferring the data. Because establishing the connection takes time, eliminating this step results in faster data transfer speeds.

In comparison to other networking protocols, the process behind UDP is fairly simple. A target computer is identified and the data packets, called "datagrams," are sent to it. There is nothing in place to indicate the order in which the packets should arrive. There is also no process for checking if the datagrams reached the destination.

Common use cases for UDP

1. The straightforward request/response communication of relatively small amounts of data, eliminating concerns regarding controlling errors or the flow of the packets
2. Multicasting because UDP works well with packet switching
3. Routing update protocols such as Routing Information Protocol (RIP)
4. Real-time applications in which the information needs to be delivered quickly and smoothly
5. The following implementations where it is a useful transport layer protocol:

- Network Time Protocol (NTP)
- Network News Protocol (NNP)
- **Dynamic Host Configuration Protocol (DHCP)**, Bootstrap Protocol (BOOTP)
- Real Time Streaming Protocol (RTSP), Trivial File Transfer Protocol (TFTP), RIP
- Quote of the Day Protocol (QOTD)
- DNS

Advantages and disadvantages of using UDP.

1) Advantages:

➡It uses small packet size with small header (8 bytes). This fewer bytes in the overhead makes UDP protocol need less time in processing the packet and need less memory.

➡It does not require connection to be established and maintained.

➡Also absence of acknowledgement field in UDP makes it faster as it need not have to wait on ACK or need not have to hold data in memory until they are ACKed.

➡It uses checksum with all the packets for error detection.

➡It can be used in events where a single packet of data needs to be exchanged between the hosts

2) **Disadvantages:**

➡It is connectionless and unreliable transport protocol. There is no windowing and no function to ensure data is received in the same order as it was transmitted.

➡It does not use any error control. Hence if UDP detects any error in the received packet, it silently drops it.

➡There is no congestion control. Hence large number of users transmitting lots of data via UDP can cause congestion and no one can do anything about it.

➡There is no flow control and no acknowledgement for received data.

➡Only application layer deals with error recovery. Hence applications can simply turn to the user to send the message again.

➡Routers can be careless with UDP. They do not retransmit a UDP datagram after collision and will often discard UDP packets before TCP packets.

CAN Protocol

What is CAN and how it operates:

CAN stands for **Controller Area Network** protocol. The CAN protocol is a standard designed to allow the microcontroller and other devices to communicate with each other without any host computer. The feature that makes the CAN protocol unique among other communication protocols is the broadcast type of bus. Here, broadcast means that the information is transmitted to all the nodes. The node can be a sensor, microcontroller, or a gateway that allows the computer to communicate over the network through the USB cable or ethernet port. The CAN is a message-based protocol, which means that message carries the message identifier, and based on the identifier, priority is decided. There is no need for node identification in the CAN network, so it becomes very easy to insert or delete it from the network.

Typical applications of CAN:

CAN protocol is widely used by all types of motor industry applications including passenger vehicles, heavy goods and utility vehicles, and agricultural vehicles. Being a robust, reliable, and versatile serial communication protocol, CAN is not just limited to automobiles. The protocol is used by the control modules of high-speed trains and aircraft. It is used by entertainment and infotainment systems in automobiles. The protocol is used for controlling and monitoring cranes and drilling probes. It is used by elevators and lift control systems. The protocol is utilized for building automation like heating and air-conditioning systems. It is also used by

automatic doors and curtain openers. It is used for automated watering in glasshouses and farms.

Advantages and disadvantages of using CAN.

Advantages:

- **Reliability**: CAN Bus is highly reliable, ensuring the integrity of critical data in demanding applications
- **Flexibility**: Multi-master operation and decentralized architecture enable easy system expansion and modification
- **Real-Time Communication**: Supports real-time communication for timely data exchange
- **Cost-Effective**: Reduces the need for complex wiring harnesses, resulting in cost savings during development and maintenance

Disadvantages:

- **Bandwidth Limitation**: CAN Bus has limited bandwidth which may pose challenges in high-speed data transmission applications
- **Cable Length Limitation**: The length of the CAN Bus cable is restricted, impacting system design considerations
- **Limited Data Payload**: CAN Bus has a restricted data payl