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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Architecture and Design Principles for IoT

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INTERNET COMMUNICATIONS: AN OVERVIEW

❖ IP:

❖ Data is sent from one machine to another in a packet, with a destination address and a source address in a standardized format (a "protocol").

❖ The packets of data have to go through a number of intermediary machines, called routers, to reach their destination.

❖ An IP packet is a block of data along with the same kind of information like the name and address of the server, and so on.

❖ If an IP packet ever gets transmitted across your local wired network via an Ethernet cable—the cable that connects your home broadband router or your office local area network (LAN) to a desktop PC—then the whole packet will get bundled up into another type of envelope, an Ethernet Frame, which adds additional information.
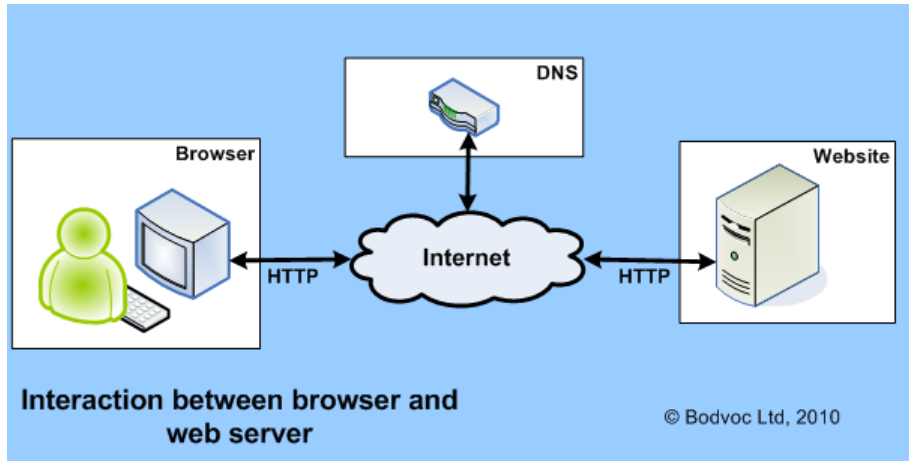
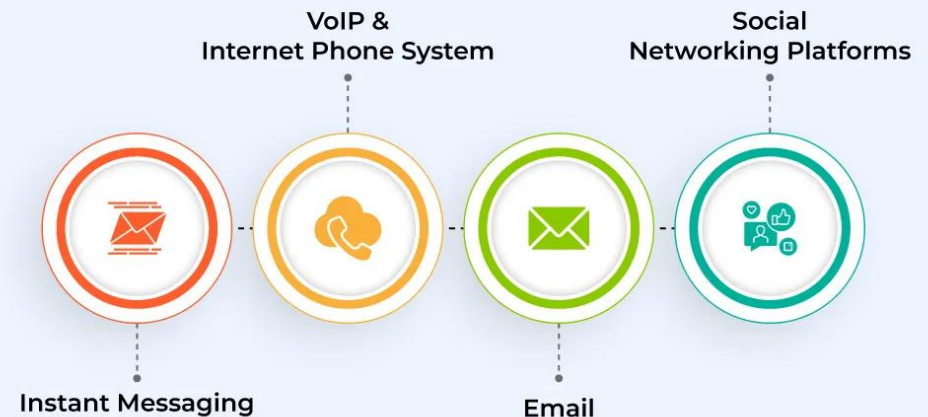# INTERNET COMMUNICATIONS: AN OVERVIEW

Interaction between browser and web server

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What Are The Different Types Of Internet Communication?

Instant Messaging · VoIP & Internet Phone System · Email · Social Networking Platforms

Internet Connectivity

- Internet; "IPv4" and "IPv6" are versions of the Internet Protocol (IP) used to identify and route data on the internet, with IPv6 designed to handle more addresses than the older IPv4;

- "6LoWPAN" is a protocol that allows low-power devices like those in the Internet of Things (IoT) to communicate over the internet using IPv6 by optimizing data packets for limited network capabilities, essentially enabling "internet connectivity" for devices with low power consumption.

- **Internet connectivity:**

- The capability of a device to connect to the internet and access online services.

Internet based Communication

- Internet connectivity" refers to the ability of a device to access the internet, while "internet-based communication" means exchanging data or messages between devices using the **Internet-based communication:**

- Sending and receiving data or messages between devices using the internet, like email, messaging, or video calls.

- **IPv4 (Internet Protocol version 4):**

- The older version of the IP protocol used to identify and route internet traffic, but facing limitations due to its limited address space.

- **IPv6 (Internet Protocol version 6):**

- The newer version of the IP protocol designed to address the issue of running out of IP addresses, offering a much larger addressing space.

- **6LoWPAN (IPv6 over Low-Power Wireless Personal Area Networks):**

- A protocol that enables low-power devices like sensors to communicate over the internet using IPv6 by compressing data packets and optimizing them for networks with limited bandwidth and power.

TCP

❖ The simplest transport protocol on the Internet, Transmission Control Protocol (TCP) is built on top of the basic IP protocol and adds sequence numbers, acknowledgements, and retransmissions.

❖ This means that a message sent with TCP can be arbitrarily long and give the sender some assurance that it actually arrived at the destination intact.

❖ Because the combination of TCP and IP is so useful, many services are built on it in turn, such as email and the HTTP protocol that transmits information across the World Wide Web (WWW).

The IP Protocol Suite (TCP/IP)

- The combination of TCP and IP is often referred as "TCP/IP" to describe a whole suite or stack of protocols layered on top of each other, each layer building on the capabilities of the one below.

- The low-level protocols at the link layer manage the transfer of bits of information across a network link

- by an Ethernet cable,

- by WiFi, or across a telephone network,

- or even by short-range radio standards such as IEEE 802.15.4 designed to carry data between devices carried by an individual (PAN).

- The Internet layer then sits on top of these various links and abstracts away the gory details in favor of a simple destination address.

- Then TCP, which lives in the transport layer, sits on top of IP and extends it with more sophisticated control of the messages passed.

- Finally, the application layer contains the protocols that deal with fetching web pages, sending emails, and Internet telephony.

- Of these, HTTP is the most ubiquitous for the web, and indeed for communication between Internet of Things devices.

UDP

- In UDP each message may or may not arrive.

- No handshake or retransmission occurs, nor is there any delay to wait for messages in sequence.

- These limitations make TCP preferable for many of the tasks that Internet of Things devices will be used for.

- The lack of overhead, makes UDP useful for applications such as streaming data, Voice over IP (VoIP)—computerbased telephony, such as Skype.

- UDP is also the transport for some very important protocols which provide common, low-level functionality, such as DNS and DHCP, which relate to the discovery and resolution of devices on the network.
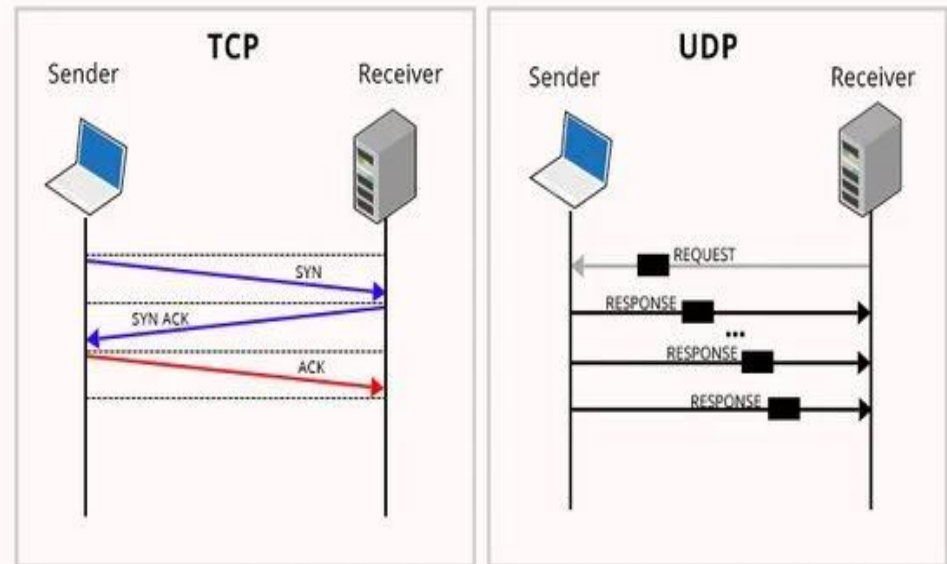
TCP Vs UDP

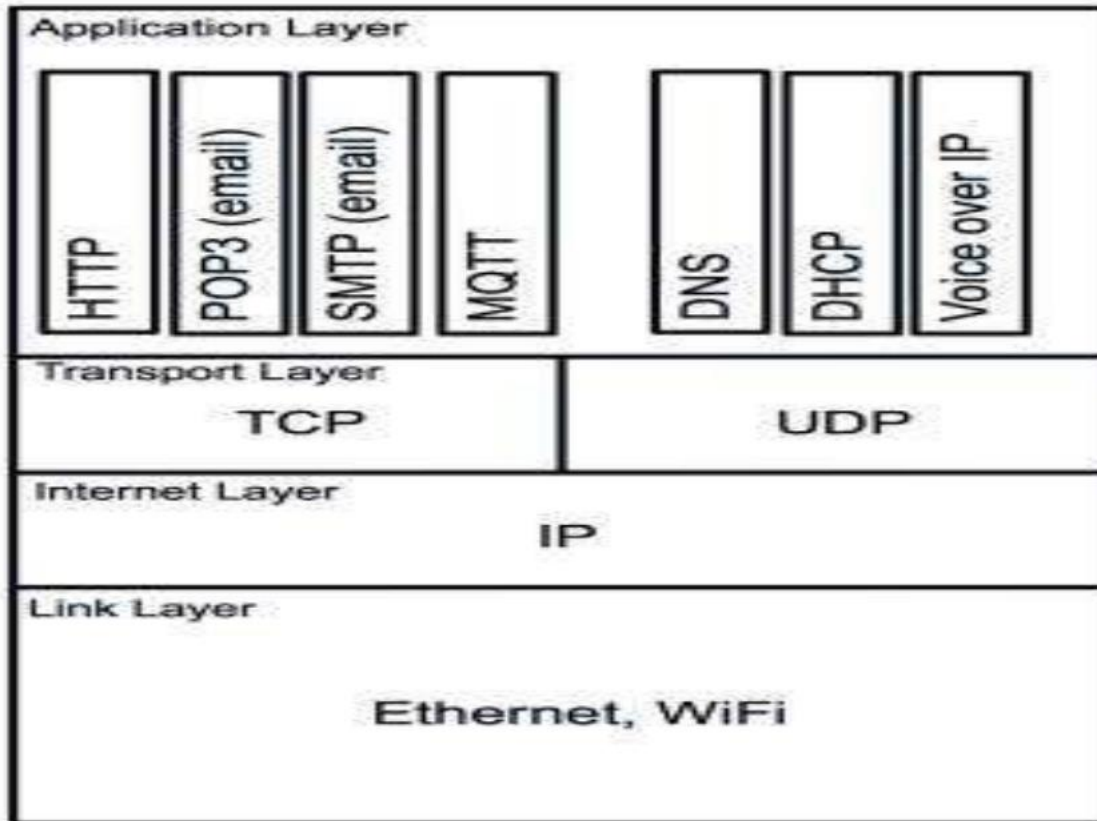| TCP	UDP
Secure	Unsecure
Connection-Oriented	Connectionless
Slow	Fast
Guaranteed Transmission	No Guarantee
Used by Critical Applications	Used by Real-Time Applications
Packet Reorder Mechanism	No Reorder Mechanism
Flow Control	No Flow Control
Advanced Error Checking	Basic Error Checking (Checksum)
20 Bytes Header	8 Bytes Header
Acknowledgement Mechanism	No Acknowledgement
Three-Way Handshake	No Handshake Mechanism
DNS, HTTPS, FTP, SHTP etc.	DNS, DHCP, TFTP, SNMP etc.

TCP Vs UDP Communication

IP Suite

Fig: The Internet Protocol suite.

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