

R&D Document: Working of TCP & UDP Protocols, and working of HTTP, HTTPS & ICMP Protocols

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Abstract

This document talks about some important protocols used in computer networks. **TCP** and **UDP** help send data from one device to another. TCP makes sure the data arrives safely and in order, while UDP sends data faster but without checking if it arrived correctly. **HTTP** and **HTTPS** are used when we browse websites, with HTTPS making the connection safe and private.

Another important protocol is **ICMP**, which helps computers check the health of the network and send messages when something goes wrong. These protocols work together to make sure data moves quickly, safely, and correctly over the internet and other networks. Understanding those helps to know how the internet works every day.

1. Introduction

In today's world, computers and devices need to communicate with each other over networks to share information. This communication is made possible by special rules called protocols. TCP and UDP are two such protocols that help data travel from one device to another. TCP is careful and makes sure all data arrives safely, while UDP sends data quickly without checking for errors.

HTTP and HTTPS are protocols used mainly for websites. When you open a web page, your browser uses HTTP to get the information from the server. HTTPS is the safer version that protects your data from being seen by others.

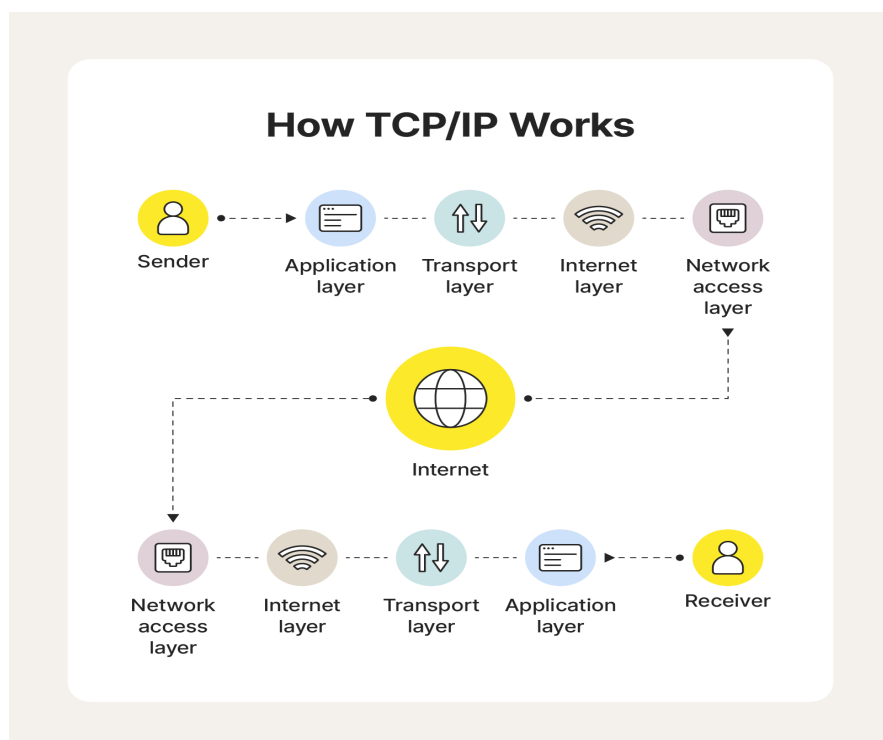
Another important protocol, ICMP, helps manage the network by sending messages about errors or checking if devices are reachable. These protocols work together to keep the internet running smoothly and safely.

TCP/IP model	Protocols and services	OSI model
Application	HTTP, FTP, Telnet, NTP, DHCP, PING	Application
		Presentation
		Session
Transport	TCP, UDP	Transport
Network	IP, ARP, ICMP, IGMP	Network
Network Interface	Ethernet	Data Link
		Physical

2. Objective

The main goal of this document is to explain how important network protocols work to send and receive data between computers and devices. We will focus on **TCP** and **UDP**, which help move data across networks, and on **HTTP** and **HTTPS**, which let us browse the web safely. We will also look at **ICMP**, which helps manage networks and find problems.

These objectives will help us understand how data travels fast and safely over the internet. By learning how these protocols work, we can better understand how websites load, how online games run smoothly, and how the internet stays secure and reliable for everyone.



3. Working of TCP, UDP, HTTP & HTTPS and ICMP Protocols

TCP (Transmission Control Protocol)

- TCP is a protocol that makes sure data sent between two devices arrives safely and in the correct order.
- Before sending data, TCP creates a connection between the sender and receiver.
- It breaks data into small parts called segments and numbers them. When the receiver gets the segments, it sends back a message (acknowledgment) to confirm they arrived.
- If any segment is lost or damaged, TCP will resend it. This makes TCP reliable but a bit slower.

UDP (User Datagram Protocol)

- UDP is a simpler protocol that sends data without making a connection first.
- It sends small packets called datagrams quickly but does not check if they arrive or are in order. Because of this, UDP is faster but less reliable than TCP.
- It is used when speed is more important than perfect delivery, like in live video streaming, online games, or voice calls.

HTTP (Hypertext Transfer Protocol)

HTTP is a basic protocol that lets web browsers and servers share information. When you open a website, your browser sends a request to the server, and the server replies with the web page content. It uses TCP (usually port 80) but does not keep the data private, as it is not encrypted.

HTTPS (Hypertext Transfer Protocol Secure)

HTTPS is a safer version of HTTP. It protects data by encrypting it, so others can't easily see or change the information. This is important for secure sites like online banking or login pages. HTTPS uses TCP (port 443) and adds security using SSL or TLS.

ICMP (Internet Control Message Protocol)

ICMP helps check and report problems in a network. It does not send normal data but sends messages when something goes wrong like if a device is not reachable or data cannot be delivered.

For example, when you use the ping command, ICMP sends a message to another device. If that device replies, it means it is online. ICMP is useful for testing connections and finding errors in the network.

5. Significance of these protocols

TCP, UDP, HTTP, HTTPS, and ICMP play a big role in how the internet and networks work today. Without them, devices could not share data properly, web pages wouldn't load, and users would not have a smooth or safe online experience.

Each protocol has its own special use. **TCP** is important for sending data correctly and in order. **UDP** is useful when fast delivery matters more than accuracy. **HTTP** and **HTTPS** allow us to visit websites and do online activities like shopping or reading news. HTTPS adds safety by protecting personal data. **ICMP** helps check the health of the network and tells us if there is any problem. Together, these protocols keep communication fast, reliable, and secure.

6. Conclusion

In today's digital world, smooth and safe communication between devices is possible only because of well-designed network protocols. **TCP** and **UDP** help in sending data between computers, each in its own way, one focusing on reliability and the other on speed. **HTTP** and **HTTPS** make browsing and using websites possible, while HTTPS adds extra protection for private and sensitive data. **ICMP** works quietly in the background, checking network health and reporting issues.

Each of these protocols plays a different but important role. They help websites load, messages deliver, videos stream, and errors get fixed quickly. Without them, everyday online activities like chatting, gaming, or attending online classes would not work properly. These protocols form the base of how the internet works.

By learning how these protocols function, we understand how devices talk to each other and how the internet stays fast, safe, and reliable. This knowledge is useful not just for technical people, but for anyone who uses the internet and wants to know how it really works.

References

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