

Protocols and Standards in Computer Networks

1 Introduction

In computer networking, communication between devices must follow well-defined rules to ensure interoperability. These rules are divided into:

- **Protocols** – the *rules of communication*.
 - **Standards** – the *agreed guidelines set by organizations*.
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2 Protocols

Definition

A **protocol** is a set of rules that define how data is transmitted, received, and interpreted in a network.

Analogy

Protocols are like **languages** in human communication. If two people speak English, they understand each other; if not, communication fails.

Key Characteristics

- **Syntax:** The format of data (like grammar in language).
- **Semantics:** The meaning of data.
- **Timing:** When data should be sent and how fast.

Examples

- **HTTP/HTTPS:** Web communication.
 - **TCP/IP:** Core of the Internet.
 - **SMTP:** Email transmission.
 - **FTP:** File transfer.
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3 Standards

Definition

Standards are formal agreements developed by recognized organizations to ensure global compatibility of devices and software.

Analogy

Standards are like **traffic rules**. Everyone agrees to drive on the same side of the road, use the same traffic signals, etc. Without standards, driving (or networking) would be chaotic.

Organizations Defining Standards

- **IEEE (Institute of Electrical and Electronics Engineers)** – e.g., IEEE 802.11 (Wi-Fi).
- **IETF (Internet Engineering Task Force)** – defines TCP/IP.
- **ISO (International Organization for Standardization)** – e.g., OSI Model.
- **ITU (International Telecommunication Union)** – global telecom standards.

4 Internet Standards

Definition

Internet standards are technical specifications that ensure the Internet works reliably across billions of devices worldwide. They are primarily developed by the **IETF**, documented as **RFCs (Request for Comments)**.

Key Point

Every major Internet protocol (TCP, IP, HTTP, DNS) is defined in an **RFC**, published and maintained by the IETF.

Examples of Important Internet Standards

- **RFC 791:** Internet Protocol (IP).
- **RFC 793:** Transmission Control Protocol (TCP).
- **RFC 2616 / RFC 7230–7235:** HTTP/1.1.
- **RFC 8446:** TLS 1.3 (security).
- **RFC 1034 & 1035:** DNS (Domain Name System).

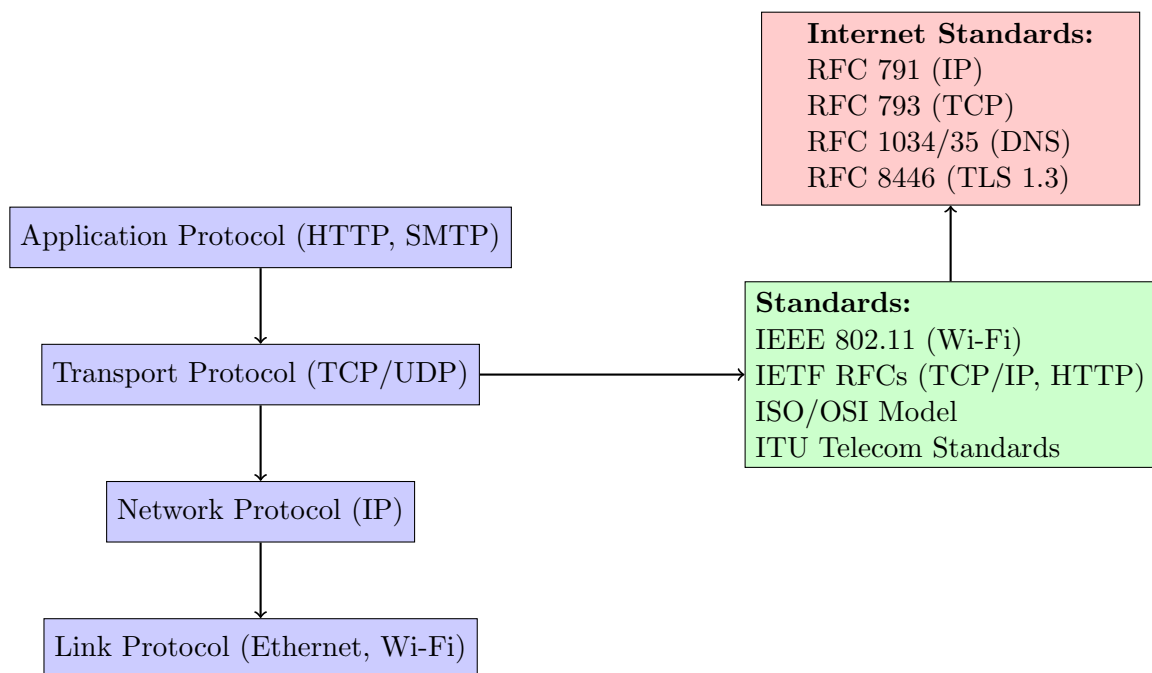
Governing Organizations

- **IETF:** Publishes RFCs.
- **IAB (Internet Architecture Board):** Oversees IETF work.
- **ICANN:** Manages domain names and IP address allocation.

5 Protocols vs. Standards

Aspect	Protocol	Standard
Definition	Rules for communication	Agreed guidelines for compatibility
Scope	Focused on specific tasks (e.g., HTTP, TCP)	Broad frameworks (e.g., IEEE 802.11, OSI model)
Authority	Designed by groups/organizations	Formalized by standards bodies (IEEE, IETF, ISO)
Analogy	Language (English, Bangla, etc.)	Traffic rules

6 Visualization



7 Conclusion

- **Protocols** define the *rules of communication*.
- **Standards** ensure devices and systems are globally compatible.
- **Internet Standards (RFCs)** guarantee the Internet functions reliably across billions of devices.
- Together, they make worldwide communication seamless.