Welcome

Presentation Title: **HTTP3 protocol**

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Supervised by:

Dr. Nazrul Islam
Associate Professor
Department of ICT
Mawlana Bhashani Science and Technology University

Presented by:

Name: Md. Amir Hamza
ID: IT22046
Department: ICT
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Mawlana Bhashani Science and Technology University

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Introduction:

❑ What is HTTP?

HTTP stands for **Hyper Text Transfer Protocol**. It's an **application layer protocol** in the internet protocol stack that defines how messages are formatted, transmitted, and what actions web servers and browsers should take in response.

❑ Why is HTTP?

Problem: Before HTTP, there wasn't a standardized way for web clients (like browsers) to fetch content from servers.

The goal: Making it easy to request and deliver documents, images, and other resources.

Solution: In the late 80s and early 90s, the web was emerging, and Tim Berners-Lee designed HTTP to allow **hypertext documents** (web pages) to be accessed over the internet

❑ Before HTTP:

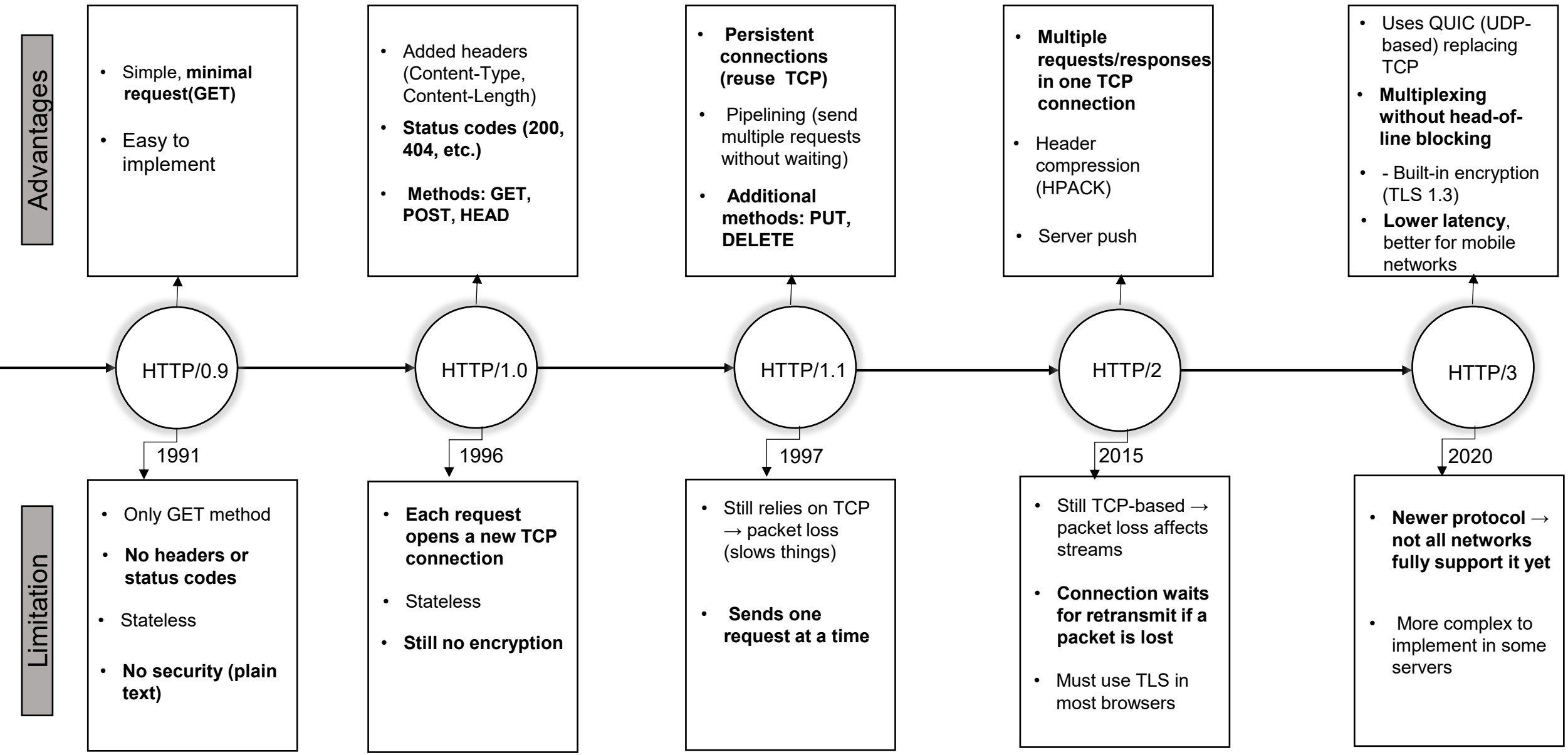
You wanted a document or file:

- Had to know the **exact FTP server and path**.
- Example*: ftp://ftp.university.edu/pub/notes.txt*
- No images, no linking, mostly text.
- Browsing was **non-graphical** (Telnet, Gopher menus).

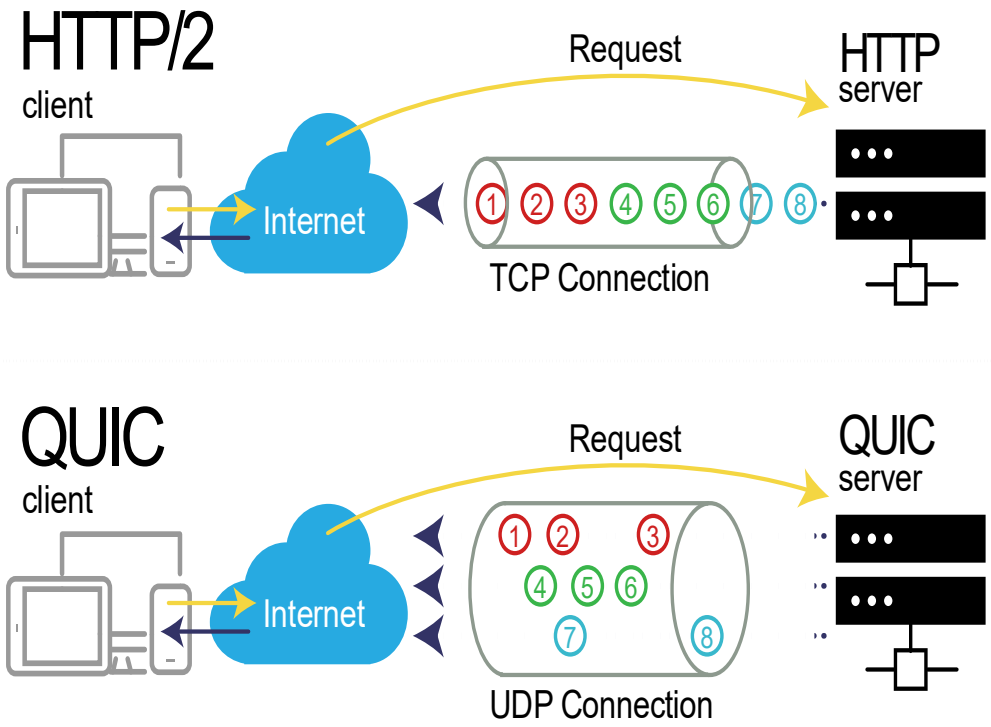
❑ After HTTP:

- You just **type a URL in a browser** and get a fully formatted page:
  Example: *http://www.mbstu.ac.bd/*
- **Hyperlinks** let you **jump between pages instantly**.
- Multimedia support: images, videos, interactive forms.
- Everything happens **without knowing exact server paths**

Timeline of Versions of HTTP:

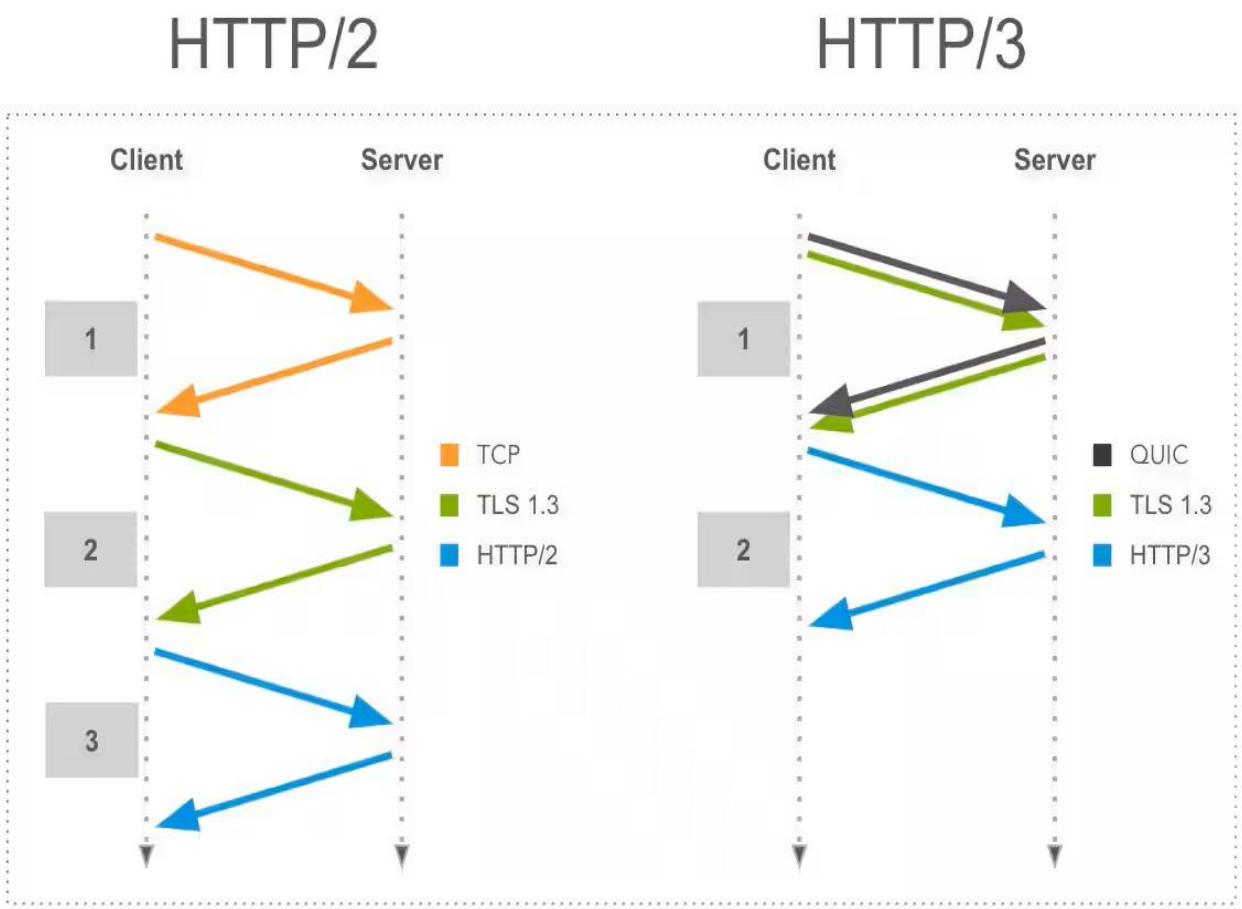


HTTP/3:



- In HTTP/2 protocol packet are sent sequentially one by one. If one packet is missed the whole process waits for retransmission of that packet.
- But in HTTP/3 protocol also known as **QUICK**(Quick UDP Internet Connections) every stream is independent meaning if one stream faces any issues other can still transmit which makes the transmission efficient

HTTP/3 Continue.



❑ HTTP/2 (TCP + TLS)

- **TCP 3-way handshake**
  SYN → SYN-ACK → ACK
- **TLS handshake**
  Client and server exchange encryption keys
- **Data transfer starts**
  After both handshakes are complete

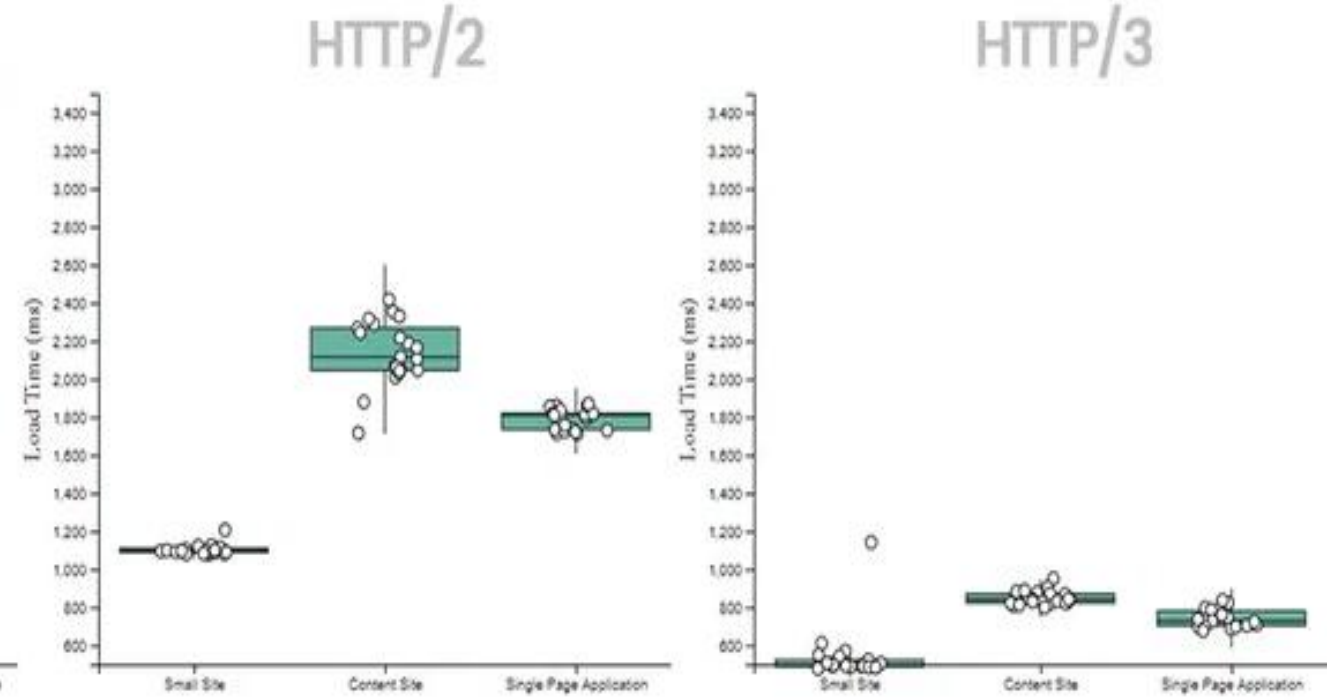
Key Point:
- Takes 2–3 round trips before actual data can be sent
- Latency increases on high-latency or unreliable networks

❑ HTTP/3 (QUIC over UDP)

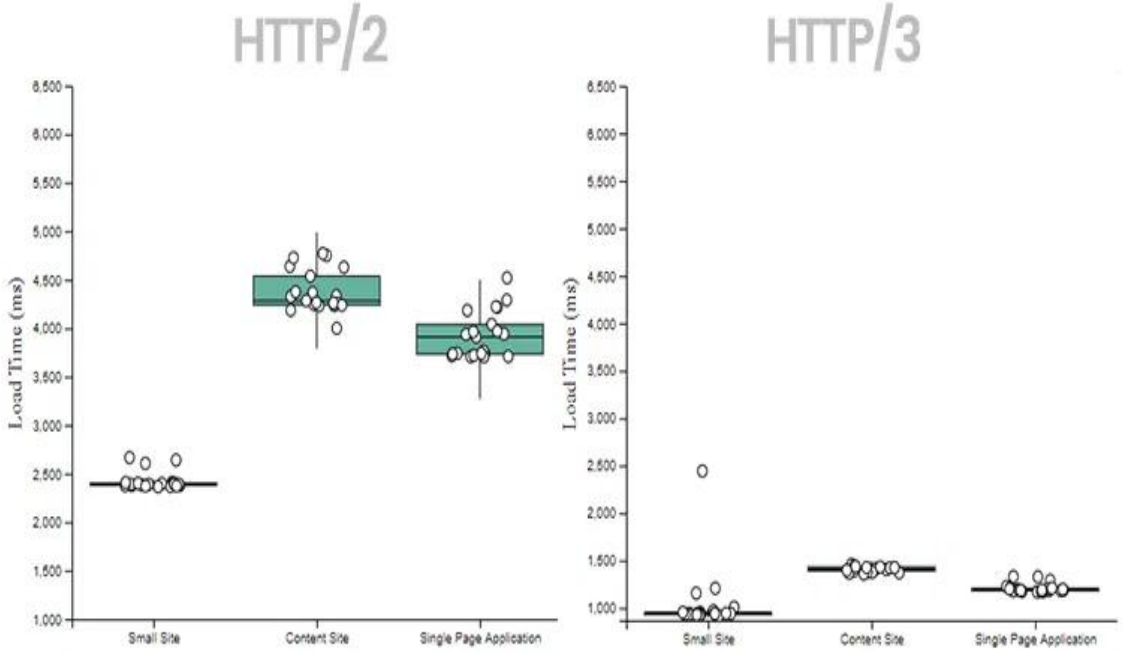
- **QUIC handshake**
  Client sends first packet with encryption info and server responds with its keys
- **Data transfer starts immediately**
  No separate TCP or TLS handshakes
- **0-RTT (optional)**
  For repeat connections, data can be sent without any round trip

Key Point:
- Only 1 round trip (or 0 for reconnections)
- Faster setup and more reliable over mobile/unreliable networks

Benchmark:



[USA – London, England]



[USA - Bangalore, India]

Source: https://requestmetrics.com/web-performance/http3-is-fast/

Limitation:

1. **New Protocol** – Not all servers, routers, or firewalls fully support it yet.
2. **UDP-based** – Some networks **block or limit UDP traffic**, so connections can fail
3. **Overhead for small sites** – For very simple sites, the benefits may be negligible.
4. **Complex Implementation** – Harder for developers to implement than HTTP/2.
5. **Debugging is harder** – Tools and logs for QUIC/HTTP3 are less mature.

Summury:

1. The **web needed a standard way to communicate**, which led to the birth of HTTP.
2. **Each version of HTTP** improved how efficiently data moved between client and server.
3. **HTTP/2** introduced multiplexing but still suffered from TCP's limitations.
4. **HTTP/3** uses **QUIC over UDP** to solve latency and connection problems.
5. It brings **faster, more secure, and reliable** browsing experiences.
6. Though still growing, **HTTP/3 is the future direction** of web communication.

Thank You!