COMPUTER COMMUNICATION NETWORKS (UE22EC351A)

Department of Electronics and Communication Engineering

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UNIT 1: INTERNET ARCHITECTURE AND APPLICATIONS –

Class 13 – Web & HTTP : Overview, Non-persistent & Persistent

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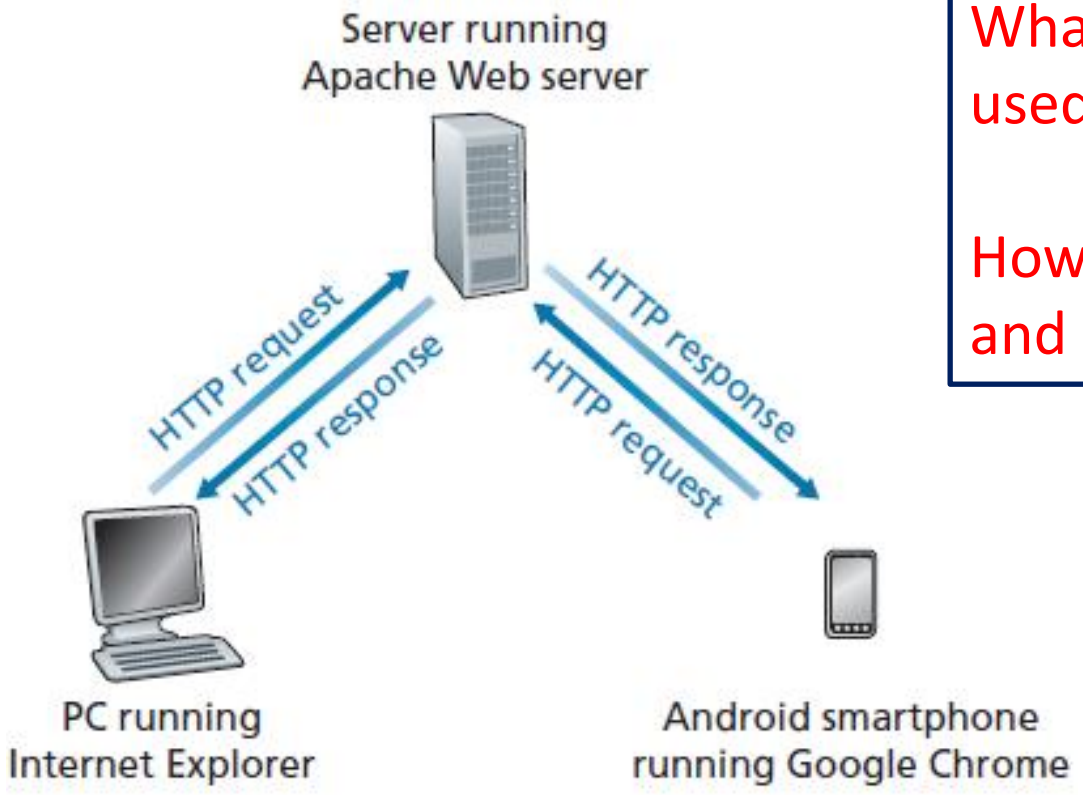
Unit 1 – Class 13 - Web and HTTP: Overview

- Web servers store objects embedded in HTML (Hyper Text Markup Language) pages
  - The primary object (i.e., HTML page) is called webpage
- Web applications communicate using the HTTP (Hyper Text Transfer Protocol)
- Client fetches a webpage using a web browser (also known as client process)
  - Client process sends a HTTP request message specifying the object requested (also known as Uniform Resource Locator)
  - Web server process sends a HTTP response message which may contain the requested object
  - Web browser: Microsoft Edge, Google Chrome, etc.
  - Web server: Apache, Microsoft Internet Information Server, etc.
- HTTP is a stateless protocol

Unit 1 – Class 13 - Web and HTTP: Overview

- HTTP request-response behaviour



What transport layer protocol is used?

How many ways can the request and response happen?

1. Persistent TCP
2. Non-persistent TCP

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http://www.someSchool.edu/someDepartment/picture.gif
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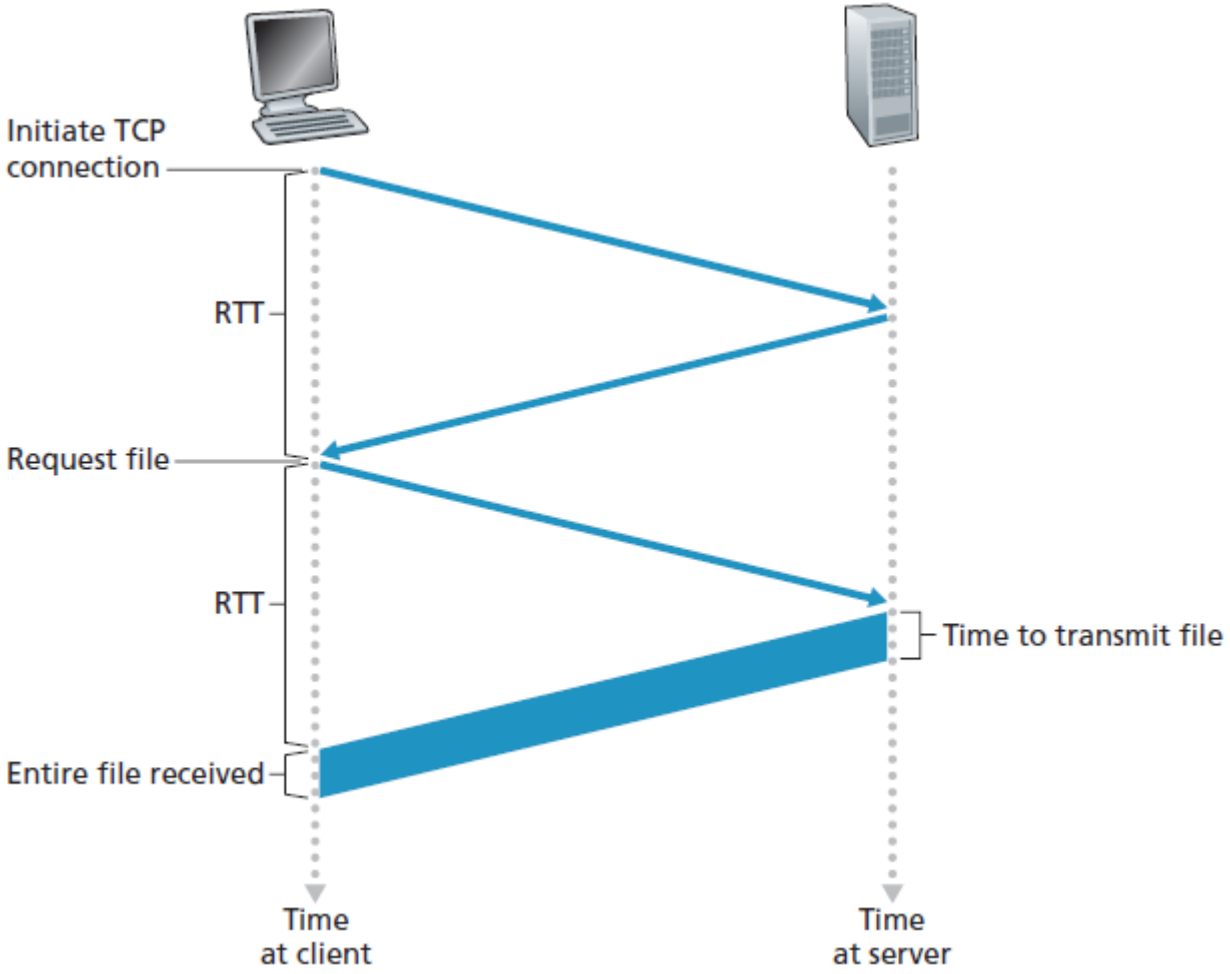
Unit 1 – Class 13 - Web and HTTP: Non-persistent



Separate TCP connection to fetch each object (including base webpage)

Assume negligible size for HTTP request message

Total access delay per object = Transmission delay at the server + 2 × RTT (RTT – Round Trip Time)

Socket number of web server is 80

Used in HTTP/1.0

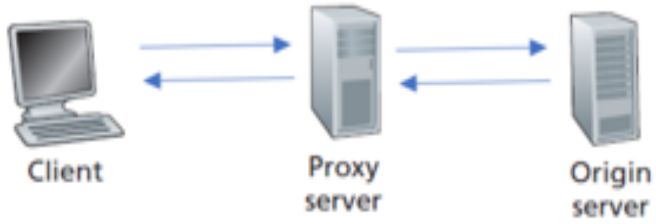
Unit 1 – Class 13 - Web and HTTP: Persistent

- Compared to non-persistent connections, in persistent HTTP we save total access time and the efforts in establishing TCP connections
- For each of these connections, TCP buffers must be allocated and TCP variables must be kept in both the client and server.
- In persistent HTTP connection, only one TCP connection is established (for base webpage) and all objects are fetched back-to-back
- Server closes connection after some specified time of inactivity
- Used in HTTP/1.1 (allows up to 6 parallel TCP connections)
- Used in HTTP/2 (includes multiplexing, message prioritization and server pushing)

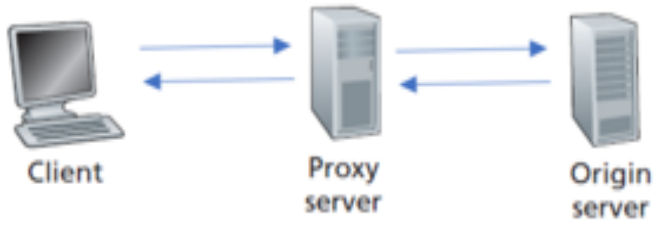
- Numerical #7: Consider accessing the webpage ww.someSchool.edu/someDepartment/Schoolpage.html which contains two embedded objects. Suppose the Web server and client are connected by a long link of rate R. Let RTT denote the two way propagation delay. Suppose the length (bits) of the webpage and two objects are L_1, L_2 and L_3 respectively. Suppose the HTTP request message is of negligible length and can be piggybacked with acknowledgements. Calculate separately, the total access delay under a persistent TCP connection and non-persistent TCP connections. Show the timing diagram.

- Numerical #7 – Solution –
- i) For persistent connection and serial downloading of embedded objects, access delay = 4 RTT + $(L_1+L_2+L_3)/R$
- ii) For persistent connection and parallel downloading of embedded objects, access delay = 3 RTT + L_1/R + max(L_2/R , L_3/R)
- iii) For non-persistent connection and serial downloading of embedded objects, access delay = 6 RTT + $(L_1+L_2+L_3)/R$
- iv) For non-persistent connection and parallel downloading of embedded objects, access delay = 4 RTT + L_1/R + max(L_2/R , L_3/R)

- Numerical #8
- i) Suppose a webpage containing one embedded object has to be fetched by the client using persistent connection. Assume all objects have a size of L bits. Assume the HTTP requests are negligible in size. Let R denote the mean throughput of the connection. Denote the round trip time between the client & proxy server as RTT1. Denote the round trip time between the proxy server and the origin server as RTT2.
- Answer the following questions
- 1) How much time would the client take to access and fetch the webpage if the objects are cached at the proxy server?
- 2) How much time would the client take to access and fetch the webpage if the objects are not cached at the proxy server?



- Numerical #8 – Solution
- i) Case 1 – Cached at the proxy server
- Access delay = 3*RTT1+2*L/R --- 1 RTT for TCP handshake,1 RTT for base HTML & 1 RTT for embedded object; one L/R each for embedded object & HTML page
- ii) Case 2 – Not cached at the proxy server
- Access delay = 3*RTT1+3*RTT2+4*L/R – Same as above plus client has to wait for the object to be downloaded by the proxy server from the origin server. Note that proxy server performs store & forward operation (i.e acts as a relay)



THANK YOU

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