

# Web and HTTP

*First, a review...*

- ❖ *web page* consists of *objects*
- ❖ object can be HTML file, JPEG image, Java applet, audio file,...
- ❖ web page consists of *base HTML-file* which includes *several referenced objects*
- ❖ each object is addressable by a *URL*, e.g.,

`www.someschool.edu/someDept/pic.gif`

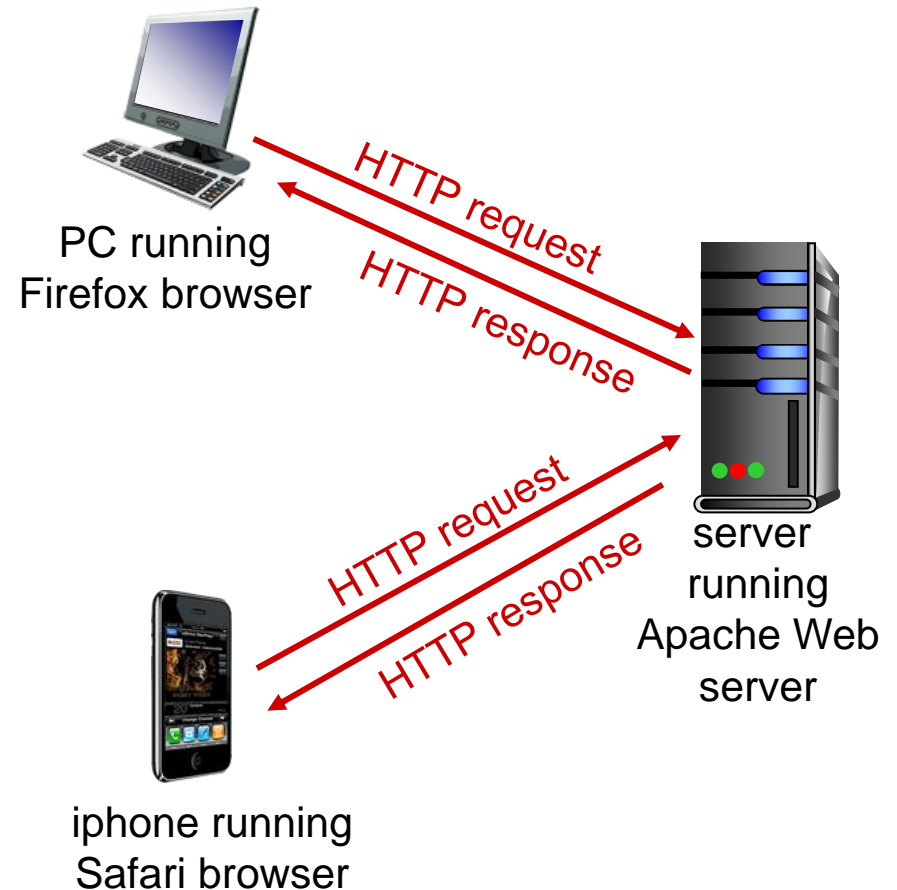
host name

path name

# HTTP overview

## HTTP: hypertext transfer protocol

- ❖ Web's application layer protocol
- ❖ client/server model
  - **client**: browser that requests, receives, (using HTTP protocol) and "displays" Web objects
  - **server**: Web server sends (using HTTP protocol) objects in response to requests



# HTTP overview (continued)

## *uses TCP:*

- ❖ client initiates TCP connection (creates socket) to server, port 80
  - Why TCP?
  - Will it work over UDP?
- ❖ server accepts TCP connection from client
- ❖ HTTP messages (application-layer protocol messages) exchanged between browser (HTTP client) and Web server (HTTP server)
- ❖ TCP connection closed

## *HTTP is “stateless”*

- ❖ server maintains no information about past client requests

### What are drawbacks of using state-full protocols?

- ❖ They are complex:
  - ❖ Need to maintain state
- ❖ If server/client crashes, their views of “state” may be inconsistent, must be reconciled
  - ❖ How does Amazon.com remember your inputs?

# HTTP connections

## *non-persistent HTTP*

- ❖ at most one object sent over TCP connection
  - connection then closed
- ❖ downloading multiple objects required multiple connections

## *persistent HTTP*

- ❖ multiple objects can be sent over single TCP connection between client, server

# Non-persistent HTTP

suppose user enters URL:

`www.someSchool.edu/someDepartment/home.index`

(contains text,  
references to 10  
jpeg images)

1a. HTTP client initiates TCP connection to HTTP server (process) at `www.someSchool.edu` on port 80

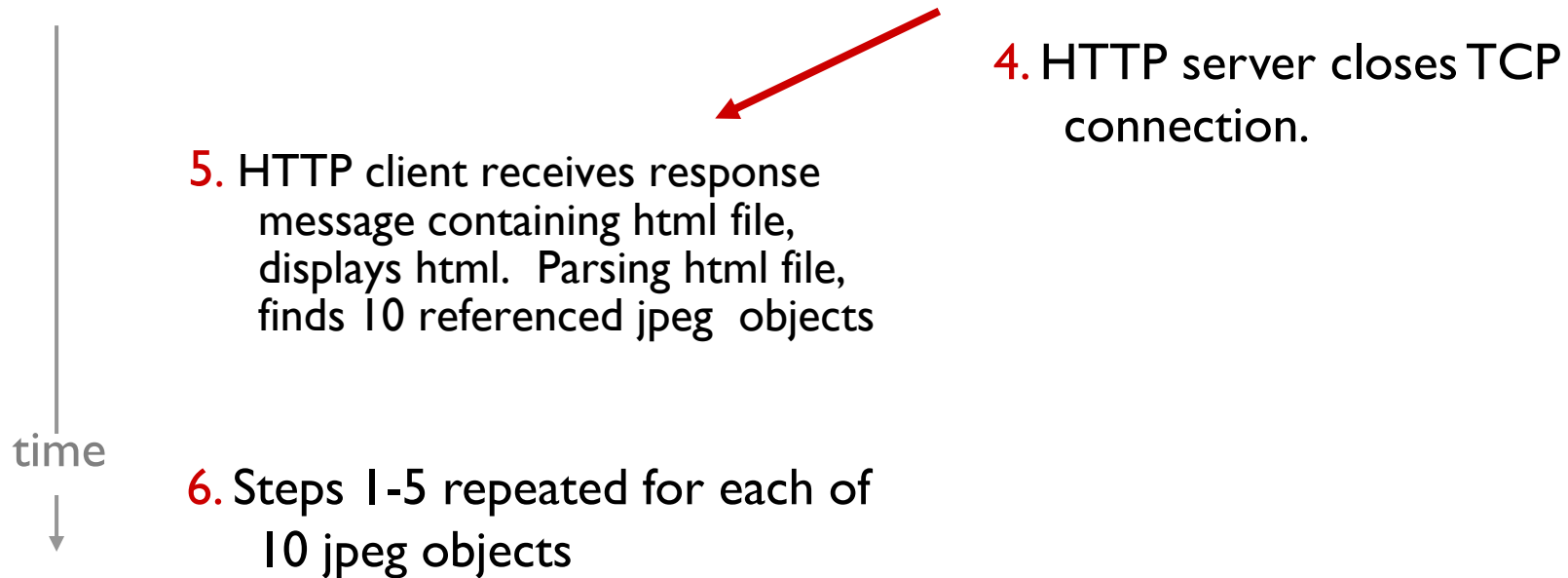
1b. HTTP server at host `www.someSchool.edu` waiting for TCP connection at port 80. “accepts” connection, notifying client

2. HTTP client sends HTTP *request message* (containing URL) into TCP connection socket. Message indicates that client wants object `someDepartment/home.index`

3. HTTP server receives request message, forms *response message* containing requested object, and sends message into its socket

time  
↓

# Non-persistent HTTP (cont.)

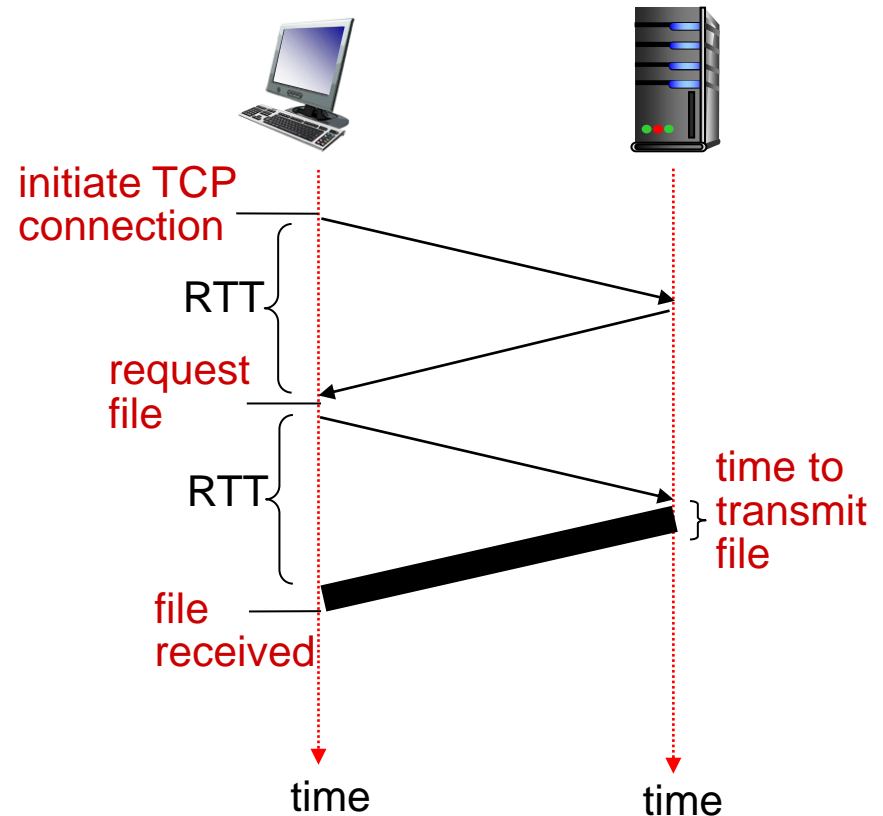


# Non-persistent HTTP: response time

**RTT (definition):** time for a small packet to travel from client to server and back

**HTTP response time:**

- ❖ one RTT to initiate TCP connection
- ❖ one RTT for HTTP request and first few bytes of HTTP response to return
- ❖ file transmission time
- ❖ non-persistent HTTP response time =  
 $2\text{RTT} + \text{file transmission time}$



# Persistent HTTP

## *non-persistent HTTP issues:*

- ❖ requires 2 RTTs per object
- ❖ OS overhead for each TCP connection
- ❖ browsers often open parallel TCP connections to fetch referenced objects

## *Advantages and Disadvantages of the two?*

## *persistent HTTP:*

- ❖ server leaves connection open after sending response
- ❖ subsequent HTTP messages between same client/server sent over open connection
- ❖ client sends requests as soon as it encounters a referenced object
- ❖ as little as one RTT for all the referenced objects



# HTTP request message

- ❖ two types of HTTP messages: *request, response*
- ❖ **HTTP request message:**
  - ASCII (human-readable format)

request line  
(GET, POST,  
HEAD commands)

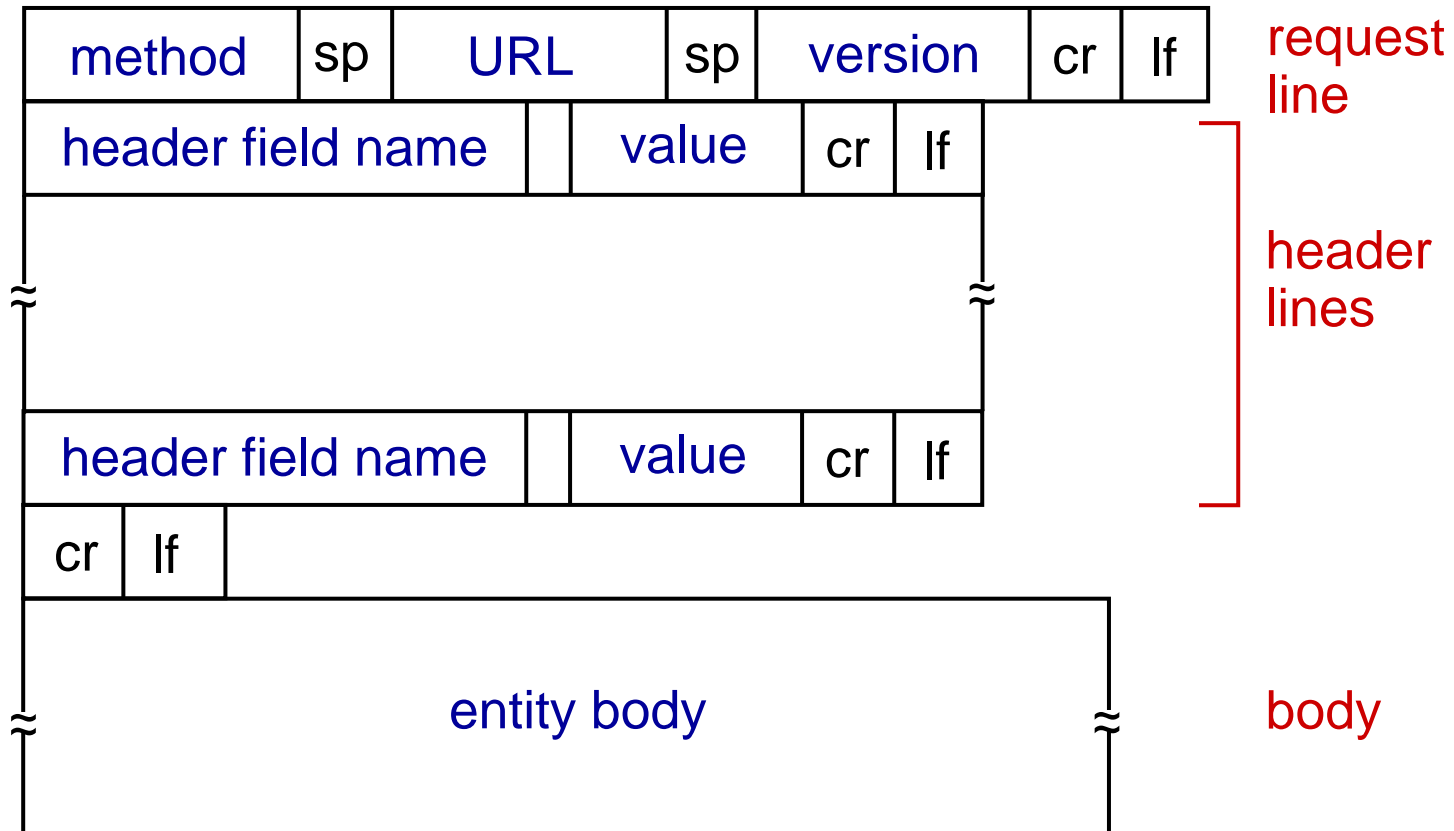
header  
lines

carriage return,  
line feed at start  
of line indicates  
end of header lines

```
GET /index.html HTTP/1.1\r\n
Host: www-net.cs.umass.edu\r\n
User-Agent: Firefox/3.6.10\r\n
Accept: text/html,application/xhtml+xml\r\n
Accept-Language: en-us,en;q=0.5\r\n
Accept-Encoding: gzip,deflate\r\n
Accept-Charset: ISO-8859-1,utf-8;q=0.7\r\n
Keep-Alive: 115\r\n
Connection: keep-alive\r\n
\r\n
```

carriage return character  
line-feed character

# HTTP request message: general format



# Uploading form input

## POST method:

- ❖ web page often includes form input
- ❖ input is uploaded to server in entity body

## URL method:

- ❖ uses GET method
- ❖ input is uploaded in URL field of request line:

`www.somesite.com/animalsearch?monkeys&banana`

# Method types

## HTTP/1.0:

- ❖ GET
- ❖ POST
- ❖ HEAD
  - asks server to leave requested object out of response

## HTTP/1.1:

- ❖ GET, POST, HEAD
- ❖ PUT
  - uploads file in entity body to path specified in URL field
- ❖ DELETE
  - deletes file specified in the URL field

# HTTP response message

status line  
(protocol  
status code  
status phrase)

header  
lines

data, e.g.,  
requested  
HTML file

```
HTTP/1.1 200 OK\r\n
Date: Sun, 26 Sep 2010 20:09:20 GMT\r\n
Server: Apache/2.0.52 (CentOS)\r\n
Last-Modified: Tue, 30 Oct 2007 17:00:02
      GMT\r\n
ETag: "17dc6-a5c-bf716880"\r\n
Accept-Ranges: bytes\r\n
Content-Length: 2652\r\n
Keep-Alive: timeout=10, max=100\r\n
Connection: Keep-Alive\r\n
Content-Type: text/html; charset=ISO-8859-
      1\r\n
\r\n
data data data data data ...
```

# HTTP response status codes

- ❖ status code appears in 1st line in server-to-client response message.
- ❖ some sample codes:

## **200 OK**

- request succeeded, requested object later in this msg

## **301 Moved Permanently**

- requested object moved, new location specified later in this msg (Location:)

## **400 Bad Request**

- request msg not understood by server

## **404 Not Found**

- requested document not found on this server

## **505 HTTP Version Not Supported**

# Trying out HTTP (client side) for yourself

1. Telnet to your favorite Web server:

```
telnet www.amazon.com 80
```

opens TCP connection to port 80  
(default HTTP server port) at www.amazon.com  
anything typed in sent  
to port 80 at www.amazon.com

2. type in a GET HTTP request:

```
GET /index.html HTTP/1.1  
Host: www.amazon.com
```

by typing this in (hit carriage  
return twice), you send  
this minimal (but complete)  
GET request to HTTP server

3. look at response message sent by HTTP server!

(or use Wireshark to look at captured HTTP request/response)