HTTP;
The World Wide Web Protocol

HTTP
Web Content
Caching

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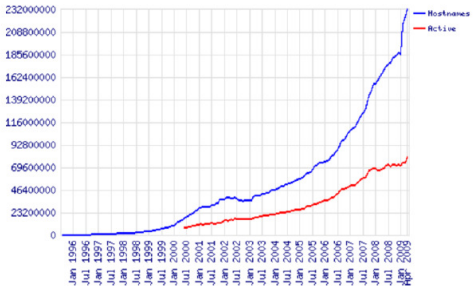
Brief History of HTTP

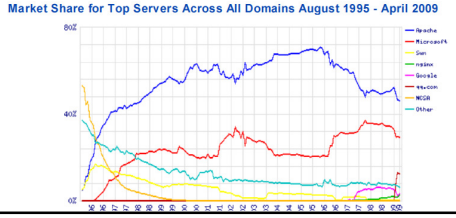
- 1990-1993: The idea of a web "browser" is contemplated – poor interfaces hinder browser use
- 1993: Marc Andreessen (then a grad student at NSCA) posts Mosaic on an ftp cite. New features include:
  - Hyperlinks
  - Embedded images
- December 1993: Mosaic growth makes the front page of New York Times
- 1994: Marc Andreessen and colleagues leave NSCA to form Mosaic Corp. (later renamed "Netscape")

Web Growth



Web Server Statistics

- Apache is the most popular web server today (freely available)
- Microsoft IIS is gaining ground



Versions of HTTP

- Early protocol is HTTP 0.9
  - read only
- More recent versions:
  - HTTP 1.0
    - read, input, delete, …
  - HTTP 1.1
    - performance optimizations

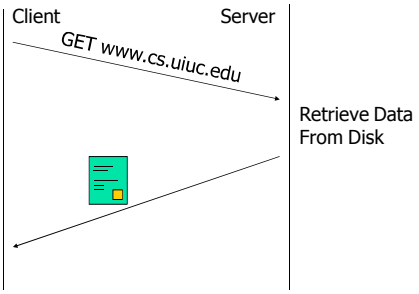
HTTP Overview

- Client (browser) sends HTTP request to server
- Request specifies affected *URL*
- Request specifies desired *operation*
- Server performs *operation* on *URL*
- Server sends response
- Request and reply headers are in pure text

Static Content and HTML

- Most static web content is written in HTML
- HTML allows
  - Text formatting commands
  - Embedded objects
  - Links to other objects
- Server need not understand or interpret HTML

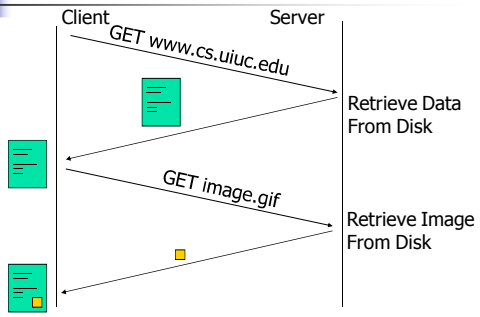
Example of an HTTP Exchange



Fetching Multiple Objects

- Most web-pages contain embedded objects (e.g., images, backgrounds, etc)
- Browser requests HTML page
- Server sends HTML file
- Browser parses file and requests embedded objects
- Server sends requested objects

Fetching Embedded Objects



HTTP Operations

- GET: retrieves URL (most widely used)
- HEAD: retrieves only response header
- POST: posts data to server
- PUT: puts page on server
- DELETE: deletes page from server

Simple HTTP Request and Reply

Request:

GET http://www.server.com/page.html HTTP/1.0

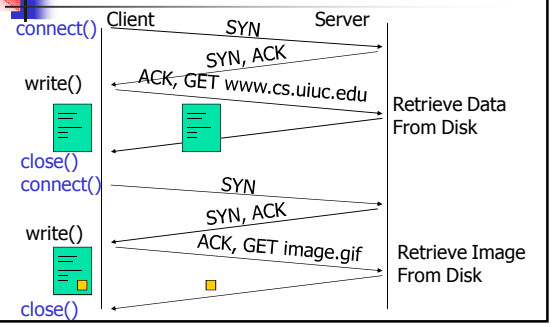
Response:

HTTP-Version: HTTP/1.0 200 OK
Content-Length: 3012
Content-Type: text/html
<body>

HTTP 1.0

- Client opens a separate TCP connection for each requested object
- Object is served and connection is closed
- Advantages
  - maximum concurrency
- Limitations
  - TCP connection setup/tear-down overhead
  - TCP slow start overhead

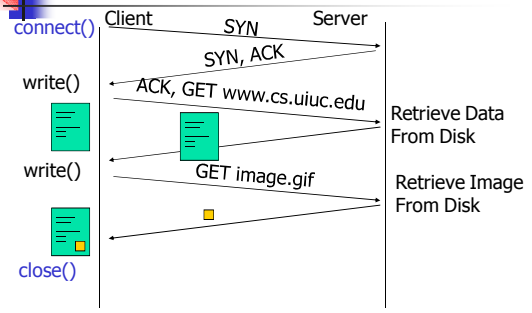
HTTP 1.0



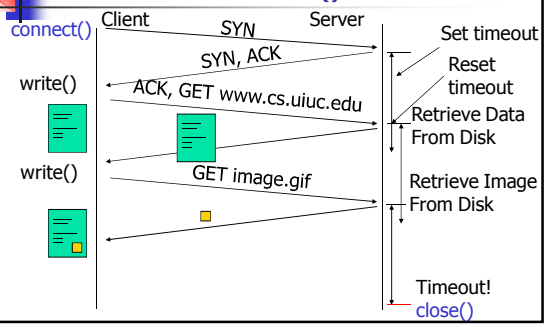
HTTP 1.1

- To avoid a connection per object model, HTTP 1.1 supports *persistent connections*
- Client opens TCP connection to server
- All requests use same connection
- Problems
  - Less concurrency
  - Server does not know when to close idle connections

HTTP 1.1



Server Side Close()



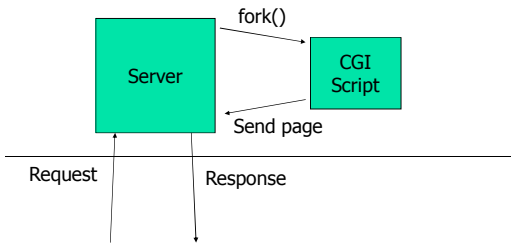
Dynamic Content

- Web pages can be created as requests arrive
- Advantages
  - Personalization (e.g., my.yahoo.com),
  - interaction with client input
  - interaction with back-end applications
- Disadvantages
  - Performance penalty
- Generating dynamic content (CGI, ASP, PHP, ColdFusion, JavaScript, Flash, …)

CGI Scripts

- CGI scripts are URLs with a .cgi extension
- The script is a program (e.g., C, JAVA, …)
- When the URL is requested, server invokes the named script, passing to it client info
- Script outputs HTML page to standard output (redirected to server)
- Server sends page to client

CGI Execution



Active Server Pages (ASPs)

- Active server pages are HTML documents with extensions for embedded program execution
- When request arrives, server fetches and parses the HTML document
- Server executes embedded executable code and plugs output into page
- Expanded page is sent to client

Quiz

- Match each call with a function this call performs.

1. accept()	a) defines the type of socket (e.g., TCP/UDP)
2. listen()	b) associates a socket with a port number
3. connect()	c) dequeues a client connection request
4. bind()	d) sends a TCP SYN packet to server
5. socket()	e) defines the length of the socket queue
	f) writes application data to the socket