HTTP

CS 360 Internet Programming

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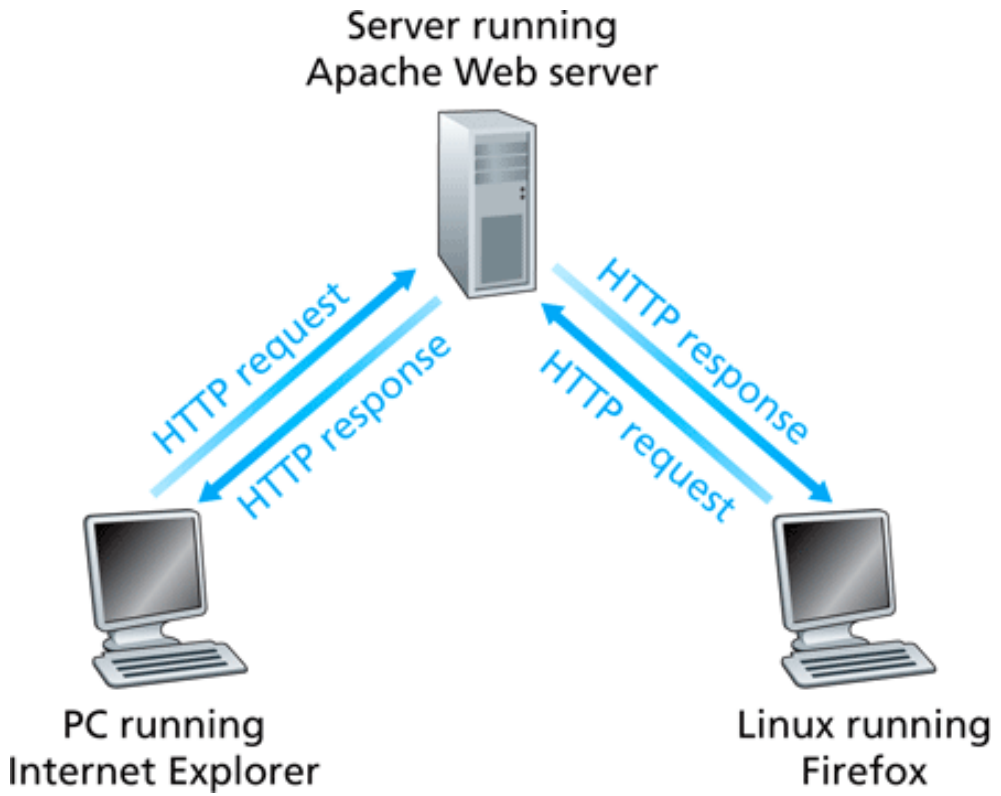
Requesting Objects

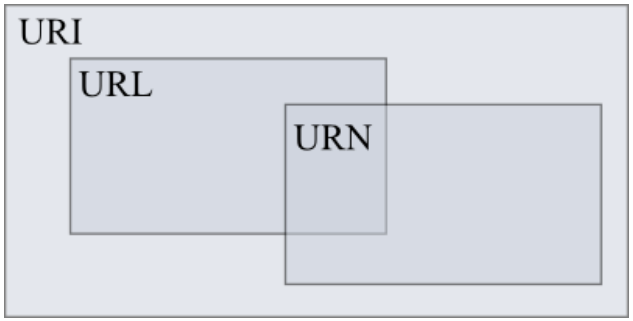
- clients request objects from servers using the HTTP protocol
  - client sends an HTTP request
  - server sends an HTTP response
- does not necessarily have a GUI
  - text based
  - a spider
  - any other program (e.g. collecting hourly reports on competitor's book prices)



Web Objects

- object names: Uniform Resource Identifier (URI)
  - a name that refers to a resource
  - a Uniform Resource Locator (URL) is one type of URI
  - popular URL schemes: http, ftp, gopher, mailto
- object delivery: Hypertext Transfer Protocol (HTTP)
  - IETF standard
  - defines message format for making requests and receiving responses
- object format: Hypertext Markup Language (HTML)
  - representation of documents in ASCII format
  - many other formats - XHTML, XML, PNG, JPG, PDF, etc.

URIs, URLs, and URNs

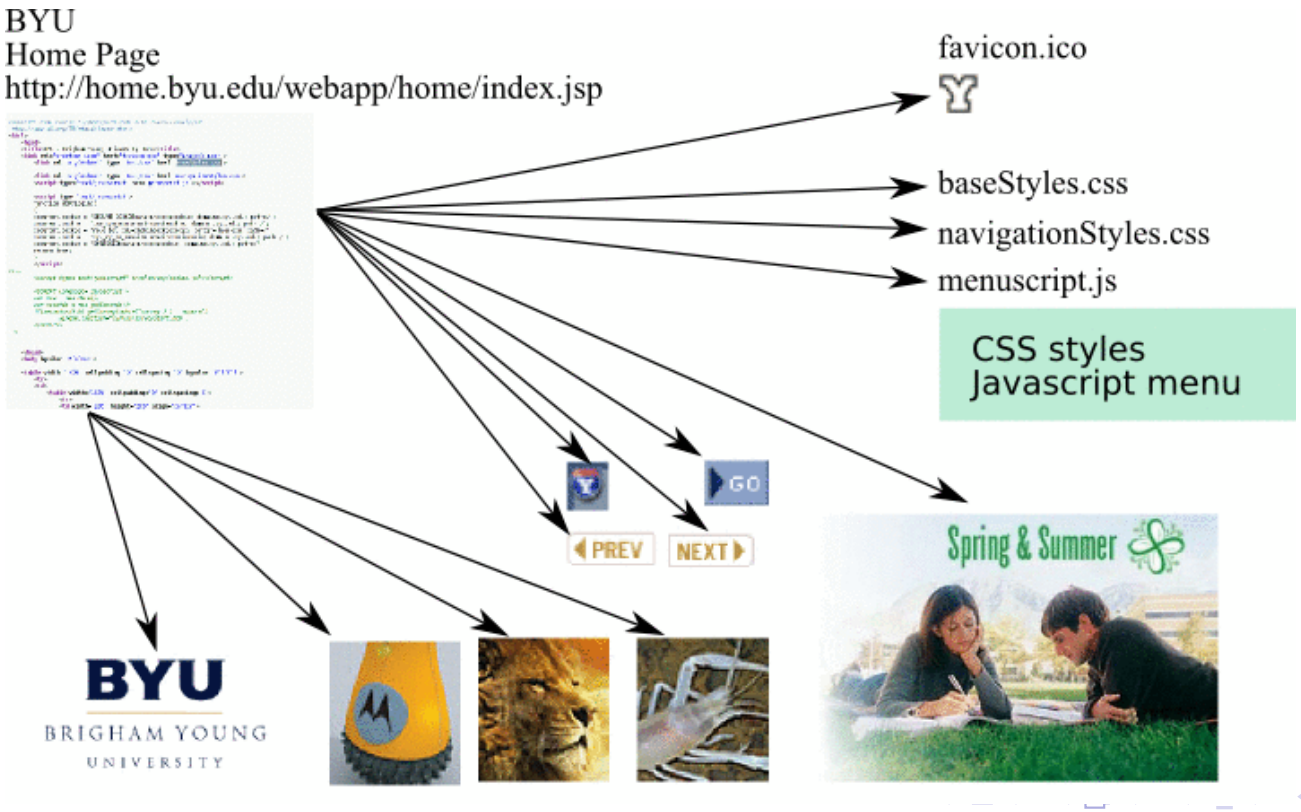


http://www.w3.org/Addressing/

- URI: Uniform Resource Identifier
  - The generic set of all names that refer to resources
- URL: Uniform Resource Locator
  - An informal term (no longer used in technical specifications) associated with popular URI schemes: http, ftp, gopher, mailto, etc.
- URN : Uniform Resource Name
  - A URI that has an institutional commitment to persistence, availability, etc. May also be a URL: see PURLs.
  - persistent, location-independent resource identifiers, urn: specified by RFC 2141

Container Objects

- a web page consists of a container object, which may link to other objects
- fetching a web page consists of requesting the container object and then requesting any linked objects



Handling Objects

- determines how responses are handled
  - appearance (fonts)
  - content transformations (language)
  - whether to accept cookies
  - whether to allow javascript, popups
  - MIME types and handlers
- see Firefox preferences
- Java versus ActiveX
  - sandbox versus trusted certificates

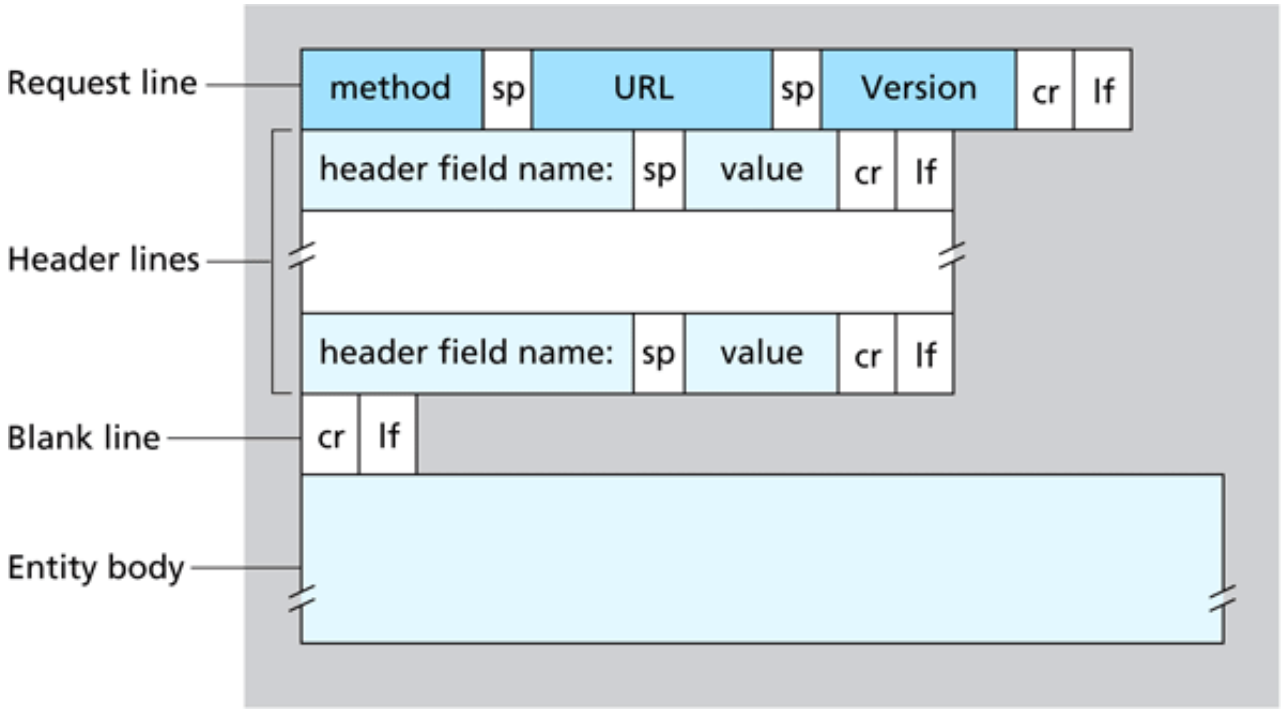
HTTP Standards

- HTTP 1.0
  - RFC 1945: http://www.ietf.org/rfc/rfc1945.txt
  - Informational: not intended to be a standard
  - very basic protocol, documenting what earliest servers and browsers used
- HTTP 1.1
  - RFC 2616: http://www.ietf.org/rfc/rfc2616.txt
  - Standards Track: either proposed standard, draft standard, or a full standard
  - backward compatibility with HTTP/1.0, plus many improvements and features
  - what all modern servers and browsers uses

Specification Language

- specification language is precise
  - MUST: absolutely essential - if you don't implement this feature you are not compliant
  - SHOULD: recommendation - you are compliant if you don't implement this feature, but you should implement it if at all possible
  - MAY: optional - not considered necessary
  - there are two obvious counterparts: MUST NOT, SHOULD NOT
- see RFC 2119

HTTP Request Format



- *request line*: method, URI, version
- *header lines*: additional method parameters, meta-data
- ends with a carriage return and line feed
- optional entity body, with a header that indicates the length of the body in bytes

Example HTTP Request

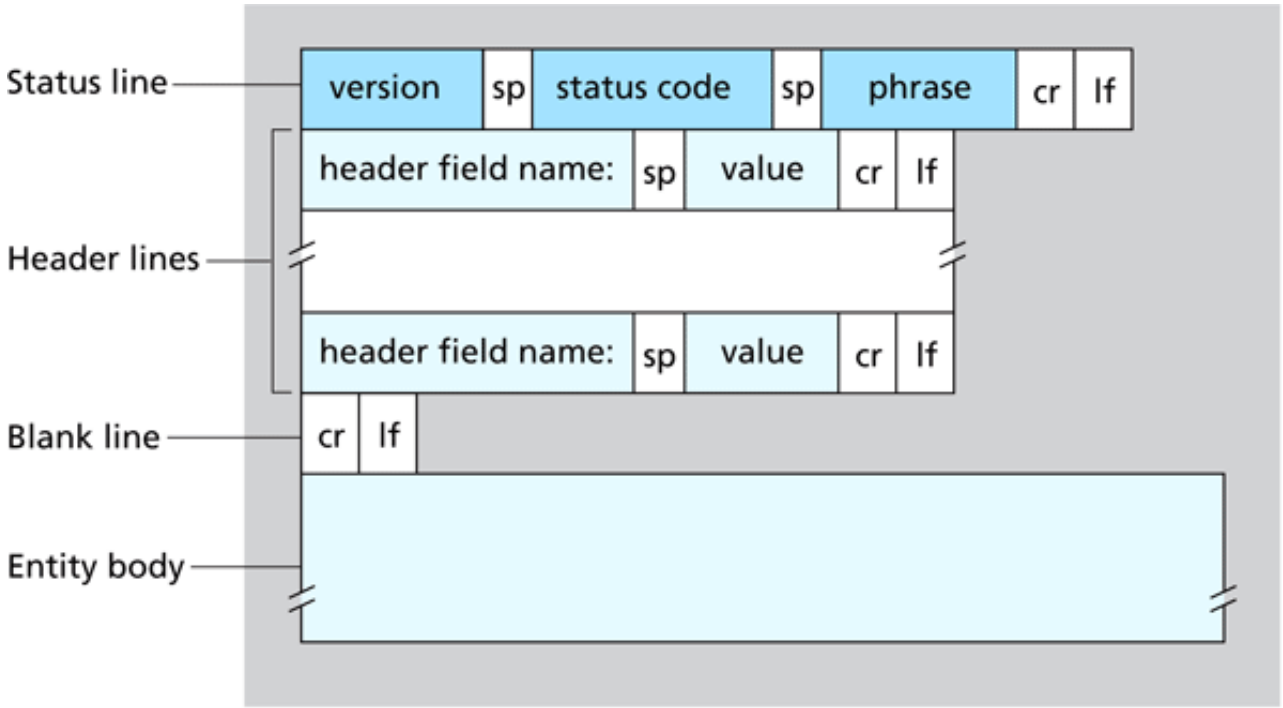
- HTTP 1.0 Request:

```
1 GET /index.html HTTP/1.0
2 User-Agent: Mozilla/5.0
```

- HTTP 1.1 Request:

```
1 GET /index.html HTTP/1.1
2 Host: ilab.cs.byu.edu
3 User-Agent: Mozilla/5.0
```

HTTP Response Format



- *response line*: version, status code, status phrase
- *header lines*
- ends with a carriage return and line feed
- optional entity body, with a header that indicates the length of the body in bytes

Example HTTP Response

- HTTP Response:

```
1        HTTP/1.1 200 OK
2        Date: Thu, 10 Jan 2008 18:36:18 GMT
3        Server: Apache
4        Last-Modified: Thu, 12 Oct 2006 21:44:06 GMT
5        ETag: "588107-b26-121f9580"
6        Accept-Ranges: bytes
7        Content-Length: 2854
8        Content-Type: text/html
9
10       <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN
11       "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
12       ...
```

- use telnet ilab.cs.byu.edu 80 to experiment

Send an HTTP Request

```
1  GET /index.html HTTP/1.1
2  Host: ilab.cs.byu.edu
3  User-Agent: Downloader/1.0
```

- Host header is required in HTTP/1.1
- User-Agent provides browser software version

Receive an HTTP Response

```
1       HTTP/1.1 200 OK
2       Date: Thu, 10 Jan 2008 18:36:18 GMT
3       Server: Apache
4       Last-Modified: Thu, 12 Oct 2006 21:44:06 GMT
5       ETag: "588107-b26-121f9580"
6       Accept-Ranges: bytes
7       Content-Length: 2854
8       Content-Type: text/
```

1. read until you receive a CRLFCRLF (`\r\n\r\n`)
2. parse HTTP headers
3. use value of Content-Length header to determine the length of the entity body
4. read the number of bytes indicated
5. parse/display the HTTP object