CONSTRUCTOR UNIVERSITY

Web Service Architectures

Ramakrishnan & Gehrke, Chapter 7
www.w3schools.com
www.webdesign.com
…

Really everybody can design an own website

Overview

- Internet / Web Concepts
- Three-tier architectures
- Presentation layer
- Middle tier

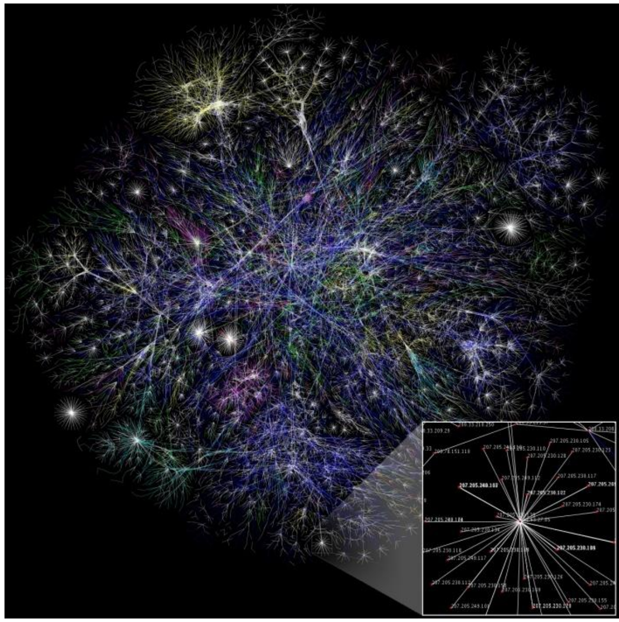
History: The Internet and the Web

- 1945 linking microfiches , by Vannevar Bush
- 1960s Internet as (D)ARPA project:
  fault-tolerant, heterogeneous WAN (cold war!)
  term "Hypertext" coined by Ted Nelson at ACM 20th National Conference
- 1976 Queen Elizabeth sends her first email. She's the first state leader to do so.
- 1980 Berners-Lee at CERN writes notebook program to link arbitrary nodes
- 1989 Berners-Lee makes a proposal on information management at CERN
- 1990 Berners-Lee's boss approves purchase of a NeXT cube
  Berners-Lee begins hypertext GUI browser+editor and dubs it "WorldWideWeb"
  First web server developed
- 1991 May 17 – general release of WWW on central CERN machines
- 1992 more browsers: Viola & Erwise released
- 1994 > 200 web servers by start of year
  Mosaic: easy to install, great support, first inline images ("much sexier")
  Andreessen & colleagues form "Mosaic Comm. Corp"; later "Netscape"

Internet & WWW

- Internet originally 4 basic services, based on TCP & IP:
  - telnet, ftp, mail, news
  - Later many more: IRC, SSL, NTP, ...
- Each computer has worldwide unique id
  - IP address: n.n.n.n (32 bit IPv4, 128 bit IPv6)
  - Domain name: subdomain.host.top-level-domain
  - DNS to resolve
- World-Wide Web just another Internet service
  - HTTP: Hypertext Transfer Protocol
  - HTML: Hypertext Markup Language
  - URIs (Uniform Resource Identifiers)

telnet, ftp, ..., http (application layer)
TCP (transport layer)
IP (network layer)



[wikipedia]

Uniform Resource Identifiers

- Uniform naming schema to identify resources on the Internet
  - resource can be anything: index.html, mysong.mp3, picture.jpg
  - Syntax: scheme ":" [authority] [path] ["?" query]
  - Ex: http://www.cs.wisc.edu/index.html, mailto:webmaster@bookstore.com, telnet:127.0.0.1
- Structure of an http URI: http://www.cs.wisc.edu/~dbbook/index.html
  - Naming scheme (http)
  - Name of host computer + optionally port# (//www.cs.wisc.edu:80) – 80 is default
  - Name of resource (~dbbook/index.html)
- URL = Uniform Resource Locator (subset of URIs; old term)
  - Identification via network "location"

Hypertext Transfer Protocol

- What is a communication protocol?
  - Set of rules that defines the structure of messages & communication process
  - Examples: TCP, IP, HTTP
- What happens if you click on www.cs.wisc.edu/~dbbook/index.html?
  - Client connects to server, transmits HTTP request to server
  - Server generates response, transmits to client
  - Both disconnect
- HTTP header describes content/action (text = ISO-8859-1), content for data
  - RFC 2616

HTTP Sample Request/Response

- Client sends:

```
GET ~dbbook/index.html HTTP/1.1
User-agent: Mozilla/4.0
Accept: text/*, image/gif, image/jpeg
```

- Server responds:

```
HTTP/1.1 200 OK
Date: Mon, 04 Mar 2002 12:00:00 GMT
Server: Apache/1.3.0 (Linux)
Last-Modified: Mon, 01 Mar 2002 09:23:24 GMT
Content-Length: 1024
Content-Type: text/html

<html> <head></head>
<body>
<h1>Burns and Nobble Internet Bookstore</h1>
Our inventory:
<h3>Science</h3>
<b>The Character of Physical Law</b>
...
</body></html>
```

Try this:

```
$ telnet google.com 80
GET / HTTP/1.1
<3x newline>
```

HTTP Request Structure

- Request line
  - Http method field (GET and POST, more later)
  - local resource field
  - HTTP version field

GET ~/index.html HTTP/1.1

- Type of client

User-agent: Mozilla/4.0

- What types of files (MIME types) the client will accept

Accept: text/*, image/gif, image/jpeg

  - MIME = Multipurpose Internet Mail (!) Extensions = file type naming system
  - MIME types other than text/*, image/jpeg, image/gif, image/png need browser plug-in or helper application

HTTP Response Structure

- Status line
  - HTTP version: HTTP/1.1
  - Status code
  - Server message, textual

```
HTTP/1.1 200 OK
```

•200 OK: Request succeeded
•400 Bad Request: Request could not be fulfilled by the server
•404 Not Found: Requested object does not exist on the server
•505 HTTP Version not supported

- Date when the object was created

```
Last-Modified: Mon, 01 Mar 2002 09:23:24 GMT
```

- Number of bytes being sent

```
Content-Length: 1024
```

- What type is the object being sent

```
Content-Type: text/html
```

- *…plus potentially many more items, such as server type, server time, etc.*
- The payload!

```
<html>…</html>
```

HTTP Doesn't Remember!

- HTTP stateless on the granularity of requests
  - No “sessions”
  - Every message completely self-contained
  - No previous interaction “remembered” by protocol
- Implication for applications:
  Any state information (shopping carts, user login information, …)
  need to be encoded in every HTTP request *and* response!
- Popular methods on how to maintain state:
  - Cookies
  - Dynamically generate unique URLs
  - Hidden form fields

Conventions

- index.html (Windows: index.htm), .php, ...
  - If local path ends with directory, this file is assumed
    - *Ex: http://www.myserver.foo/Downloads*
  - If not found: directory listing is displayed
    - *Put dummy index.html if you don't want this, or disable default in server*
- Local path *~name/path*
  - leads to ~*name*/public_html/*path* where *name* is local user name

HTML Primer

- HTML is a data exchange format
  - Unformatted ASCII
    - *Proper indentation increases readability*
  - Text interspersed with tags, some with attributes; usually start and end tag:
  - Opening tags: "<" element name ">"
  - Closing tags: "</" element name ">"
  - Tags can be nested:

```
<h1 align="center">headline</h1>
```

```
<h1><em>my</em> text</h1>
```

- Many editors automatically generate HTML directly from your document
  - But you need to know HTML too, want to generate it lateron!
  - And tool's code sometimes has bad quality, cf. Microsoft Word "Save as html"

HTML Primer (contd.)

```
<a name="top">

<h1>An important heading</h1>

<h2>A slightly less important heading</h2>

<p>This is the <em>first</em> paragraph.</p>

<img src="peter.jpg" width="150" height="200" alt="me">

My link list:
<ul>
  <li>This is a link to <a href="http://www.w3.org/">W3C</a>
  <li>This a link to <a href="peter.html">Peter's page</a>
  <li>Go to <a href="#top">top</a>
  <li><a href="/"><img src="logo.gif" alt="home page"></a>
</ul>
```

HTML Primer (contd.)

- Text structuring
  - Headlines
  - Paragraphs, text emphasis
- Links
  - External
  - Relative
  - Internal
- Images
- Text structuring (contd.)
  - Lists

```
<a name="top">

<h1>An important heading</h1>
<h2>A slightly less important heading</h2>
<p>This is the <em>first</em> paragraph.</p>
<img src="peter.jpg" width="150" height="200" alt="me">
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  <li><a href="/"><img src="logo.gif" alt="home page"></a>
</ul>
```
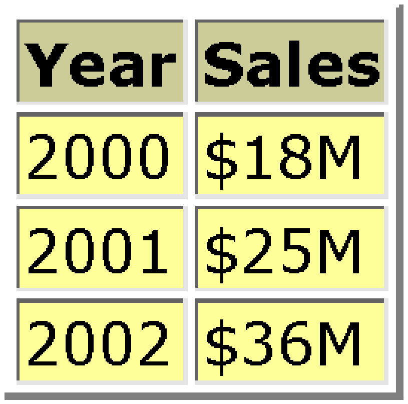

HTML Primer (contd.)

- Text structuring (contd.)
  - tables
  - row
  - column heading
  - regular column



Year	Sales
2000	$18M
2001	$25M
2002	$36M

```
<table>
    <tr>
        <th>Year</th>
        <th>Sales</th>
    </tr>
    <tr>
        <td>2000</td>
        <td>$18M</td>
    </tr>
    <tr>
        <td>2001</td>
        <td>$25M</td>
    </tr>
    <tr>
        <td>2002</td>
        <td>$36M</td>
    </tr>
</table>
```

HTML Forms

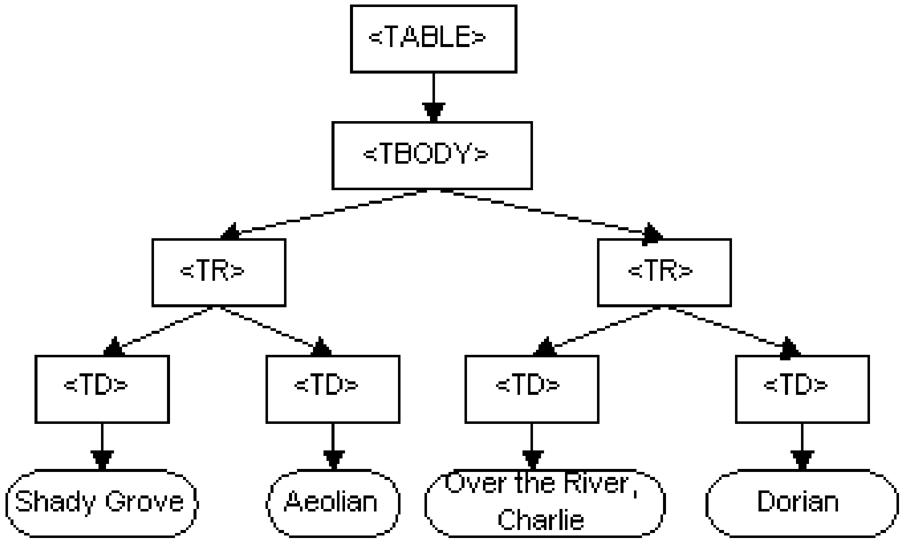
- Common way to communicate data from client to server
- General format of a form:

  -
    ```
    <form action="page.jsp" method="GET" name="loginForm">
       <input type=… value=… name=…>
    </form>
    ```
- Components of an HTML form tag:
  - action: URI that handles the content
  - method: HTTP GET or POST
  - name: Name of the form; can be used in client-side scripts to refer to the form

HTML and DOM

```
<TABLE>
   <TBODY>
      <TR>
         <TD>Shady Grove</TD>
         <TD>Aeolian</TD>
      </TR>
      <TR>
         <TD>Over the River, Charlie</TD>
         <TD>Dorian</TD>
      </TR>
   </TBODY>
</TABLE>
```

Exercise:
draw DOM tree
for some HTML snippet



Document Object Model

- HTML document actually describes a tree structure
  - ...that becomes manifest as "real" tree only within browser
- So far: how can I describe such a tree for input into rendering engine?
- Dynamic HTML: *manipulate* tree representation while being displayed
- Document Object Model (DOM) =
  platform and language neutral interface that allows programs and scripts to dynamically access and update content & structure of HTML documents
  - Intro: http://www.w3schools.com/htmldom/default.asp
  - Definition: http://www.w3.org/TR/DOM-Level-2-HTML

CSS: Cascading Style Sheets

- Idea: Separate display style from structure & contents
  - W3C recommendation = standard
- File reference to CSS, placed in HTML <head> section
  - <link rel="style sheet" type="text/css" href="books.css">
- Media specific style sheets
  - <link rel="stylesheet" type="text/css" media="screen" href="website.css">
    <link rel="stylesheet" type="text/css" media="print, embossed" href="print.css">
    <link rel="stylesheet" type="text/css" media="aural" href="speaker.css">

CSS Syntax

- CSS syntax (simplified)

```
• css-file   ::=  css-def*
• css-def    ::=  selector "{" ( prop ":" val )* "}"
• selector   ::=  tag
                 | [ tag ] "." class
                 | [ tag ] ":" pseudo
• elem       ::= STRING
• class      ::= STRING
• pseudo     ::=  "link" | "visited" | …
• prop       ::= <predefined prop names>
• val        ::=  STRING
                 | NUMBER [ "px" | "cm" | … ]
```

```
body      { font-family:Arial,sans-serif; }
a:link    { color:red }
.special  { color:green; font-size:large; }
```

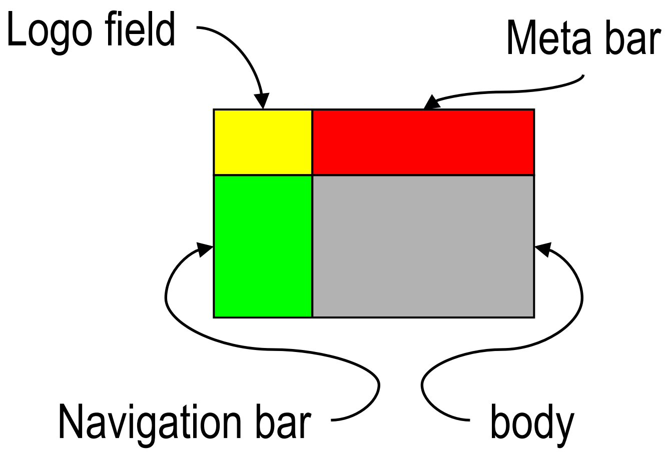
- Effect on HTML page display:
  - same effect as:
    <h1 style="font-family:Arial,sans-serif">
    but applies to all <h1>
  - Style used in a tag:
    <a href="…"> is red
    (overriding a default & a definition in CSS)
  - Style can be used with any tag:
    <p class="special">

Web Design

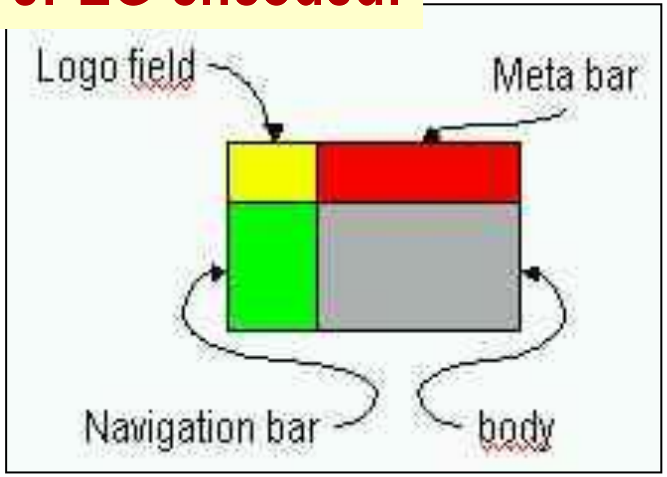
- Corporate Design (CD)
  - set of rules defining (visual) appearance of all company material
- Goal of CD
  - recognition of company across all media
  - transport & amplify message
- preferrably cooperate with a professional graphics designer!
- rules of thumb:
  - few concepts, clearly identified
  - always have in mind target group (B2B vs B2C; food vs entertainment; ...)

Web Design: Key Design Elements

- Title & key phrase & logo
  - Logo: preferrably no shades, simple symbol
- Overall look & feel
  - Describe targeted CD in one sentence
- Colors: primary / secondary / background
  - Define as RGB values, PANTONE, RAL, …; HTML!
  - Image formats: JPEG, GIF, PNG
- Fonts & typesetting
  - serif or sans-serif; max 2!
- Window subdivision
  - Scalable with window size!



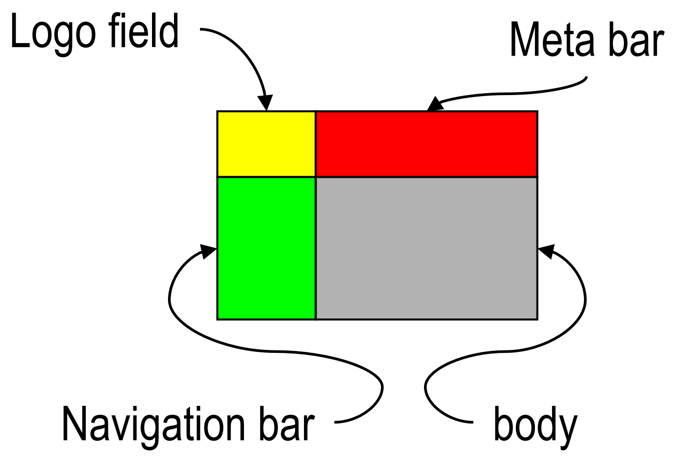
JPEG-encoded:



Web Design: Common Pages

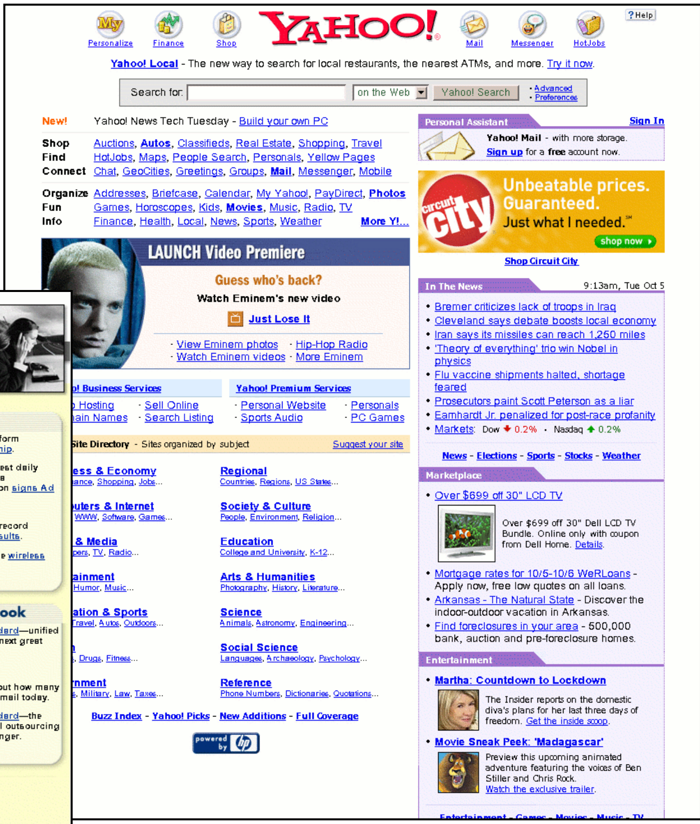
- Navigation bar:
  - News
  - About
  - The service offered
    - *Products*
    - *Solutions*
    - *Services*
  - Links to related information sources

- Meta bar:
  - Search
  - Sitemap (for larger sites)
  - Contact / webmaster
  - Imprint



Web Design: Home Page Variants

- „front door“ home page approach
  - Have nice & appealing impression first, information area later
- „information rich“ home page approach
  - Give information to client with minimal mouse clicks
- Mixed approaches



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In The News — 9:13am, Tue Oct 5

- Bremer criticizes lack of troops in Iraq
- Cleveland says debate boosts local economy
- Iran says its missiles can reach 1,250 miles
- 'Theory of everything' trio win Nobel in physics
- Flu vaccine shipments halted, shortage feared
- Prosecutors paint Scott Peterson as a liar
- Earnhardt Jr. penalized for post-race profanity
- Markets: Dow 0.2% · Nasdaq 0.2%

News - Elections - Sports - Stocks - Weather

Marketplace

- Over $699 off 30" LCD TV

  Over $699 off 30" Dell LCD TV Bundle. Online only with coupon from Dell Home. Details.
- Mortgage rates for 10/5-10/6 WeRLoans - Apply now, free low quotes on all loans.
- Arkansas - The Natural State - Discover the indoor-outdoor vacation in Arkansas.
- Find foreclosures in your area - 500,000 bank, auction and pre-foreclosure homes.

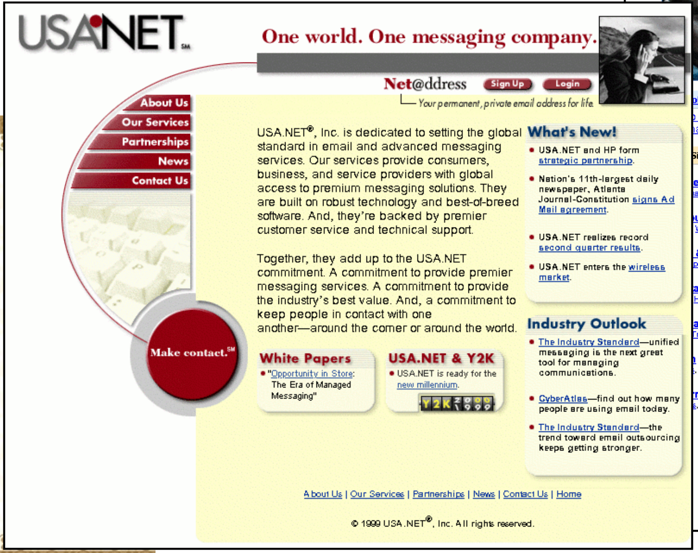
Entertainment

- Martha: Countdown to Lockdown

  The Insider reports on the domestic diva's plans for her last three days of freedom. Get the inside scoop.
- Movie Sneak Peek: 'Madagascar'

  Preview this upcoming animated adventure featuring the voices of Ben Stiller and Chris Rock. Watch the exclusive trailer.

Entertainment - Games - Movies - Music - TV



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What's New!

- USA.NET and HP form strategic partnership.
- Nation's 11th-largest daily newspaper, Atlanta Journal-Constitution signs Ad Mail agreement.
- USA.NET realizes record second quarter results.
- USA.NET enters the wireless market.

Industry Outlook

- The Industry Standard—unified messaging is the next great tool for managing communications.
- CyberAtlas—find out how many people are using email today.
- The Industry Standard—the trend toward email outsourcing keeps getting stronger.

White Papers

- "Opportunity in Store: The Era of Managed Messaging"

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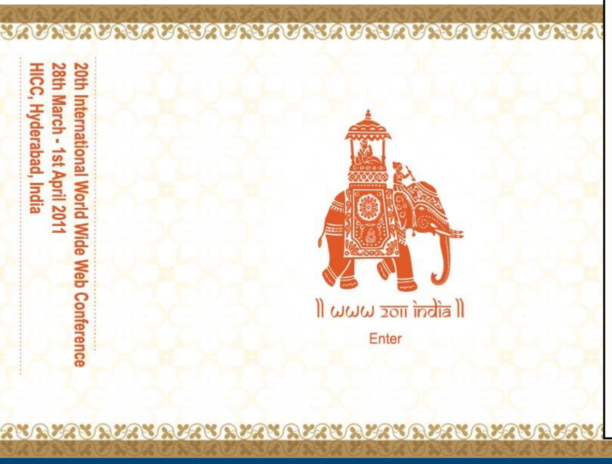
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Enter

Web Design: Good Style

- Browser independent – test it!
  - HTML checkers
  - at least Firefox & Microsoft Internet Explorer
- Suitable for handicapped clients?
- Use CSS to separate layout from contents & structure
- Use tools, such as jQuery http://jquery.com/
  and Twitter Bootstrap http://getbootstrap.com/
- ...see homework and www.webdesign.org for more links

Summary: WWW and HTML

- WWW: another Internet service,
  aimed at easily traversing interconnected documents
- Protocol: HTTP, data exchange format: HTML
  - captures document structure according to fixed schema
- Browser = program that
  - gets page address; fetches HTML (+ likely additional files); renders page for display
- CSS for tailoring layout
- Dynamic HTML for changing page while displayed