

# Introducing the web

CS 640, Lecture 5



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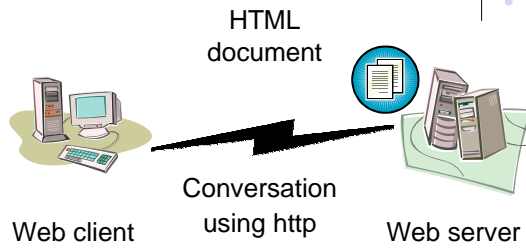
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## The web in a nutshell



Inventor of the web: Tim Berners-Lee

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## Lecture outline

- The client 
- The protocol 
- The server 
- HTML 

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## The browser



- Complex program running on client computer
- Main goal: get web pages from servers, display them and handle interaction with user
- Standards prescribe browser behavior
- Various implementations
  - Internet Explorer, Mozilla/Firefox/Netscape, Safari
  - Have inconsistent interpretation of standards, non-standard extensions
- Executes programs embedded in web pages

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## Client side programming



Feature	Scripts	Applets
Language	JavaScript	Java
Access local files	No	No
Network transfers	Limited	Limited
Graphics	Limited (HTML)	Strong
User interaction	Extensive	Limited
Typical uses	Interactive pages	Web games
Covered in class	Yes	No

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## HyperText Transfer Protocol



- RFCs: 1945 HTTP/1.0 ; 2068,2616 HTTP/1.1
- Well known port number: 80
- Fundamental http operations
  - Client opens TCP connection, requests document
  - Server sends reply to client (includes document)
  - Text-based protocol similar to SMTP, uses MIME
- http conversations also include
  - Context information (e.g. browser type)
  - Negotiation of various options

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## Uniform Resource Locators



<http://www.cs.wisc.edu/classes/spring07.html>

- URLs are used to refer to web documents
  - Browser displays URL of current page
  - URLs are part of http conversations
  - Links between documents also use URLs
  - URLs have a well-defined structure
    - Protocol used to access document (also ftp, https ...)
    - DNS name of server holding document
    - Location of file (path + file name)
    - May also have port number – <http://server:8080/dir/>

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## The web server



- Multithreaded program handling hundreds of requests in parallel
  - IIS (Microsoft), apache (open source)
- When the server receives a request
  - Static pages are read from disk and sent to client
  - For dynamic pages the server also executes some programs that build (parts of) the page
- Other functions
  - Logging accesses
  - Authenticating users

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## Server side programming



- Short history
  - CGI – separate programs launched by web server
    - They produce an HTML document as output
    - They receive arguments as input
    - Strong isolation, bad performance
  - Programs embedded inside web page (php, ASP, JSP)
    - Program executed inside web server process
- What are dynamic pages used for?
  - Personalizing based on user identity
  - Interacting with databases (e.g. on-line banking)
  - Web applications (e.g. web based email)
- Separate database keeps persistent data

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## Web applications gain ground



Feature	Web app.	Desktop app.
Graphics	Strong	Unlimited
User interaction	Strong	Unlimited
Network usage	High	Varies
Accessible from	Any computer	Where installed
Upgrade cost	Update servers	Update desktop
Data backup cost	Backup servers	Backup desktop
Popularity	Increasing	Dominant

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## HyperText Markup Language

- Standard defining how the structure and format of web documents is encoded
  - Most browsers render valid HTML consistently
- HTML documents contain text – can include images, forms and interactive elements
- HTML uses tags (e.g. **<b>bold</b>**)
- HTML documents can be rendered by clients with different constraints (e.g. window size)
- HTML allows links to other documents



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## An example of a web page

```
<TITLE>Bucky Badger's web page</TITLE>
<BODY>
<H1>Welcome to Bucky's web page</H1>
<IMG SRC="bucky.gif">
<p>I am Bucky, the mascot for University of Wisconsin athletics.
Please visit
<A HREF="http://www.uwbadgers.com/football/index.html"> the
web page of our football team</A> and
<A HREF="http://www.uwbadgers.com/basketball/index.html">
the web page of our basketball team</A>.
</BODY>
```



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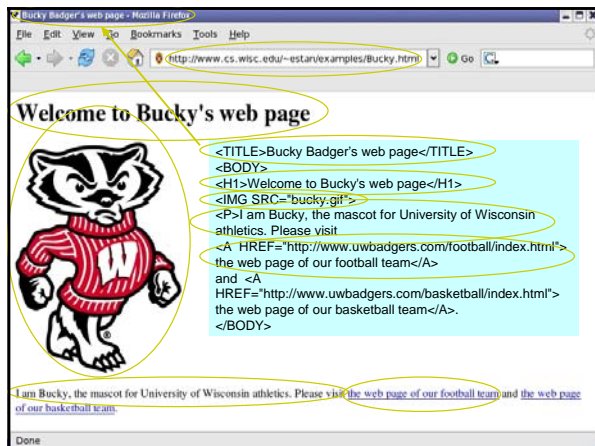
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## Web-related classes

- Goal: learn how to develop web applications using both client and server side technologies
  - Hands-on introduction to languages and tools
  - "Big picture" issues
- Things covered elsewhere
  - Full mastery of technologies – years of experience
  - Building system software – CS 537
  - Using databases – CS 364
  - Building database systems – CS 564

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## Schedule of web classes

- HTML
- Javascript
- DHTML
- http
- C#, Visual Studio
- SQL interaction, ADO.Net
- ASP.NET big picture
- ASP.Net controls
- Web services

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