

The World Wide Web: Web-based Applications and Web Forms

Introduction to the World Wide Web and HTML

- **HTML: HyperText Markup Language**
 - Language used to specify hypertext document content and how it is to be displayed in a browser
- **Hypertext**
 - Non-sequential reading and writing
 - Text contains embedded hot words that are links to other documents
 - **Hypermedia**
 - Links can be references to non-textual information

World Wide Web (WWW)

- Created at CERN (Switzerland high energy particle physics lab) by Tim Berners-Lee (1991)
- Hypertext-based system for finding and accessing internet resources on many networked computers
- A set of specifications for exchange of hypertext documents

Some WWW Acronyms

- URL (Uniform Resource Locator)
 - The web “address” of a document (page)
- HTTP (HyperText Transfer Protocol)
 - Access Protocol that specifies how a WWW document is transferred
 - Defines how web browsers and web servers communicate with each other over a TCP/IP connection

URL Format

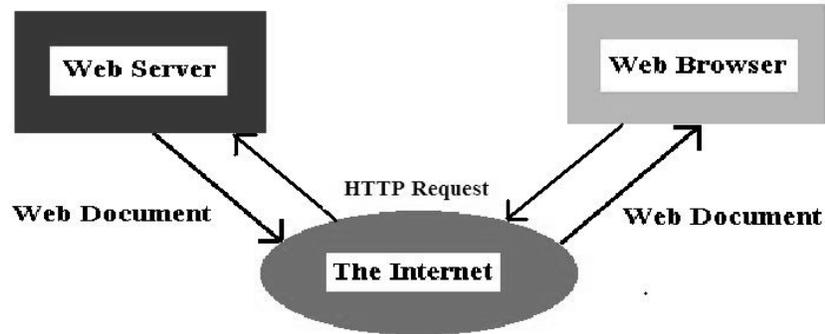
access protocol //: domain address / directory path / filename
(type of object) (computer) (virt. directory) (file name)

- Example:
 - <http://cs.binghamton.edu/~reckert/360/topics.html>

Web Applications, Web Servers and Web Browsers

- Windows applications (Windows Forms) One program runs on one computer
- Web applications require two programs
 - Usually run on two different computers connected over the internet
- Web Server
 - Program that provides web documents (pages) to client applications running on other machines on the Internet
 - Pages written in HTML and stored on the Web Server computer
- Web Browser
 - Client program that interprets the HTML of a page provided by a Web Server and displays it
 - Common ones: Internet Explorer, Netscape Navigator, Mozilla FireFox
 - Pages may also contain programming logic in the form of a script that's executed on the client machine (VBScript, JavaScript, etc.)

Web Servers and Browsers



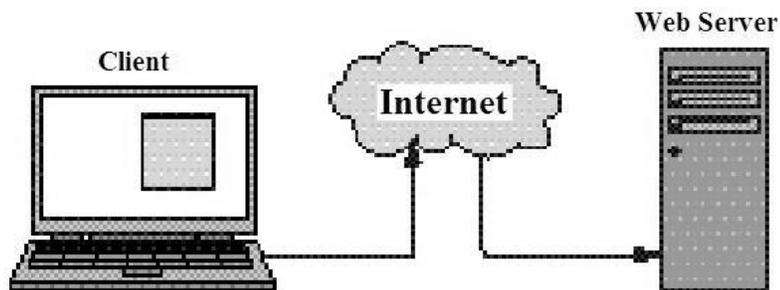
Brief Introduction to JavaScript

- Similar to Java, but it's not a true programming language
- Used in a web browser
- How it works:
 - Browser loads the page from the server
 - Browser detects JavaScript `<script>` tag
 - Browser passes the script to the JavaScript Interpreter
 - Interpreter evaluates and performs the script
 - Interpreter passes HTML back to Browser
 - Browser displays the page
- Note that this is client-side processing

What Happens when a Web Page is Started

- When user starts a web page, the browser sends an HTTP request to the Server
- Server responds by sending the page
 - May be a preformatted HTML file
 - Or the program running on the Server may dynamically generate the HTML
 - This is server-side processing
- Viewing a page requires a round trip to the server that stores the page

A Simple HTTP Transaction (1)



1. The client sends a **GET** request to the Web Server

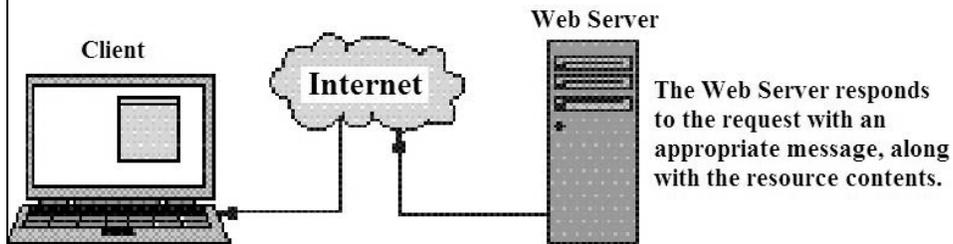
2. After the Web server receives the request, it searches through its system for the resource

Client interacting with Web server.

Step 1: The **GET** request

```
GET /books/downloads.htm HTTP/1.1.
```

A Simple HTTP Transaction (2)



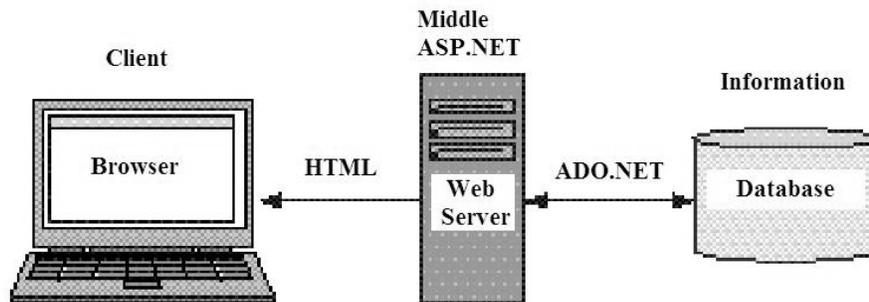
Client interacting with Web server.
Step 2: The HTTP response
HTTP/1.1 200 OK.

Distributed System Architecture on the Web

– Multi-tier Applications

- Web-based applications (n-tier applications)
- Tiers are logical groupings of functionality
- Can be on the same computer, but usually on different ones
- Information Tier (data tier or bottom tier)
 - Maintains data pertaining to the applications
 - Usually stores data in a database management system on a separate computer
- Middle Tier (business logic)
 - Acts as an intermediary between data in the information tier and the application's clients
 - Processes client requests and retrieves and processes data from the Information Tier
 - Typically a Web Server or Web Application
- Client Tier (top tier)
 - Application's user interface
 - Typically a browser

Distributed System Architecture



Web Application Development

- Different ways of developing web pages/sites in the Microsoft Windows world:
 - Write them in HTML
 - “First generation” programming model (early 90s)
 - Good for static pages: No user data input or client/server processing
 - Dynamic pages: client or server side processing required
 - HTML Can be used with CGI scripts for dynamic pages
 - Usable on any platform, but slow with CGI
 - Use ASP (Active Server Pages)
 - “Second generation” programming model (late 90s)
 - More powerful and easier to use for dynamic pages
 - Relatively slow: interpreted
 - ASP.NET
 - “Third generation” programming model (21st century)
 - Powerful, flexible, and easy to use for dynamic pages
 - Object-oriented, controls, event-driven
 - Same paradigm as Windows Forms
 - Fast: compiled

ASP.NET and Web Forms

- ASP.NET
 - Provides libraries, controls, & programming support to write Web applications that interact with the user, render controls, display data, and generate appropriate HTML
 - Using C# and ASP.NET we can create object-oriented, event-driven Web applications
- Web Forms
 - Unlike Windows Forms, Web Form applications run on a server on a different computer
 - Web pages are built around controls and event handlers
 - ASP.NET Extends the ideas of Windows Forms to distributed computing over the Web

C# and ASP.NET

- An ASP.NET Web Form has two pieces:
 - HTML needed to render the page
 - A file with .aspx extension
 - Code that contains program logic to:
 - Interact with user, respond to events, render controls, display data, generate appropriate HTML
 - In C#, a file with .aspx.cs extension
 - The “code-behind” file
 - Notice the separation of page content and processing

ASP.NET Web Application Development with Visual Studio 2005/2008

Host computer must have a “Web Server” program running

- Microsoft’s Internet Information Services (IIS) is usually the Web server in the Microsoft Windows environment
 - It’s part of Windows 2000, XP Professional, Vista, Server 2003
 - When running IIS on a local machine you are hosting a Web server that must be secured
 - Must have administrative rights to create IIS-served Web applications
 - By default, the web page files are stored in c:\inetpub\wwwroot
- An alternative is a File System Web site
 - Stores Web pages and associated files in a folder on the local machine
 - Pages are tested using the new Visual Studio Web Server program
 - But cannot be served to browsers running on other computers
 - VS Web Server doesn’t expose the computer to security vulnerabilities and doesn’t require administrative rights
 - Can run on Windows XP Home or Vista Home
 - VS Web Server web applications can be ported to IIS

First, Look at Web Application Development using HTML

- See Appendices F and G of your Deitel text
- Markup language for preparing WWW hypertext documents
- Specifies what is to be displayed and how it is to be displayed
- Subset of SGML
 - Standard Generalized Markup Language
- Result--just a text file (a script)
 - extension .html or .htm
- Used to set up static web pages

Main Tasks in HTML

- Define Tags
 - Basic element of HTML
 - Specify what is to be displayed and how it is to be displayed
- Define hypertext Anchors and Links
 - For navigating nonsequentially (hypertext)
- Format the document
 - In general terms (details handled by browser)

Preparing HTML Scripts

- Can use a text editor to type in the HTML tags
 - The most basic way to go
- But there are many HTML editors
 - All generate HTML text files
 - Dreamweaver is a popular one (not free)
 - Easy to use GUI environment
 - Very powerful
 - Netscape Composer
 - From Netscape Navigator Browser: “File” | “Edit Page”
 - Or for a new page: “File” | “New” | “Composer Page”
 - Microsoft Word
 - “File” | “Save As” | “Web Page”
 - » Result can be kind of “quirky”
 - Microsoft Internet Explorer
 - “File” | “Edit with ...”
 - Microsoft FrontPage

HTML Basic Components

- **Tags**
 - Inform browser to perform some action (display, format, link to, etc.)
 - E.g., <h1>A Simple Home Page</h1> <! Header 1>
 - Not case sensitive; often nested
- **Attributes**
 - Provide more information related to the tag
 - Like variables--you give their values
 - E.g.,
- **URLs**
 - Attribute values often specify links to other documents
 - For these, the document's URL is the value of the attribute
 - Example (including an inline graphic image): tag:

 ^ ^ ^
 | | |
tag attribute value is a URL

Other Document “Information” Tags

- Give other information to Browser
 - Don't affect document content
- Document HTML Tag:
 - <HTML> .. entire document script .. </HTML>
 - Specifies it's an HTML document
- Document HEAD Tag:
 - <HEAD> ... Header Info ... </HEAD>
 - Usually Contains Document Title
- Document TITLE Tag:
 - <TITLE> ... Document Title ... </TITLE>
- Document BODY Tag:
 - <BODY> ... Body of Document ... </BODY>

XHTML Skeleton Script

```
<HTML>
  <HEAD>
    <TITLE> Doc Title </TITLE>
  </HEAD>
  <BODY>
    ....
    ....
  </BODY>
</HTML>
```

Links and Anchors

- Establish how user is guided through a body of hypertext information
- Use the HREF attribute of the A tag

 some-text

|
|
|
Link to
this place

|
|
|
Make this
text an anchor;
Will be highlighted &
underlined in document

Example of Links & Anchors

click here for xxx

----> Click here for xxx

- Here file xxx.html is on same computer and in same directory as active page
- When user clicks on underlined text in the browser, the file is displayed
- To link to another server--give URL as linked item:

 R. Eckert's Home Page

----> R. Eckert's Home Page

- When user clicks on underlined text, linked page is displayed

More on HTML

- Lots of references and books available
 - Appendices F and G of Deitel Text Book
- Some of many Web Sites:
 - <http://www.deitel.com/XHTML>
 - <http://www.htmlprimer.com/htmlprimer/html-primer>
 - <http://www.w3schools.com/html/default.asp>
 - <http://www.davesite.com/webstation/html/>
 - <http://www.htmlcodetutorial.com/>
 - <http://www.htmlgoodies.com/primers/html/>
 - <http://www.echoecho.com/html.htm>
- Also see BU's Information Technology Services "Instructional Web Pages"
 - <http://computing.binghamton.edu/web/bingweb>

MyPage0.html

A Very Simple HTML document

```
<html>
  <head>
    <title> My First Home Page </title>
  </head>
  <body>
    My name is RE and this is my first home page
  </body>
</html>
```

<http://cs.binghamton.edu/~reckert/330/mypage0.html>

- A more complicated one with hypermedia links:
<http://cs.binghamton.edu/~reckert/330/TestPage08.html>

What Happens when a URL such as www.whatever.com/fn.html is Typed into a Browser

- Browser uses the DNS to convert the URL into an IP address
- Then opens a socket connection to the server on port 80 and transmits an HTTP request:
GET /fn.html HTTP/1.1
8 more lines of message header containing information about the request
[Blank line]
- Start line: GET is a method requesting the desired resource
- Blank line (CR/LF) marks end of header and end of request

Web Server Response to GET Command

- If fn.html is a valid resource identifier and security settings don't prevent it from being returned:

- Server transmits an HTTP response like:

- HTTP/1.1 200 OK

- 7 lines of header information

- [blank line]

- <html>

- <body>

- Hello, world

- </body>

- </html>

{ This is the HTML of the returned page }

- The browser then parses the returned HTML and displays the Web Page