World Wide Web

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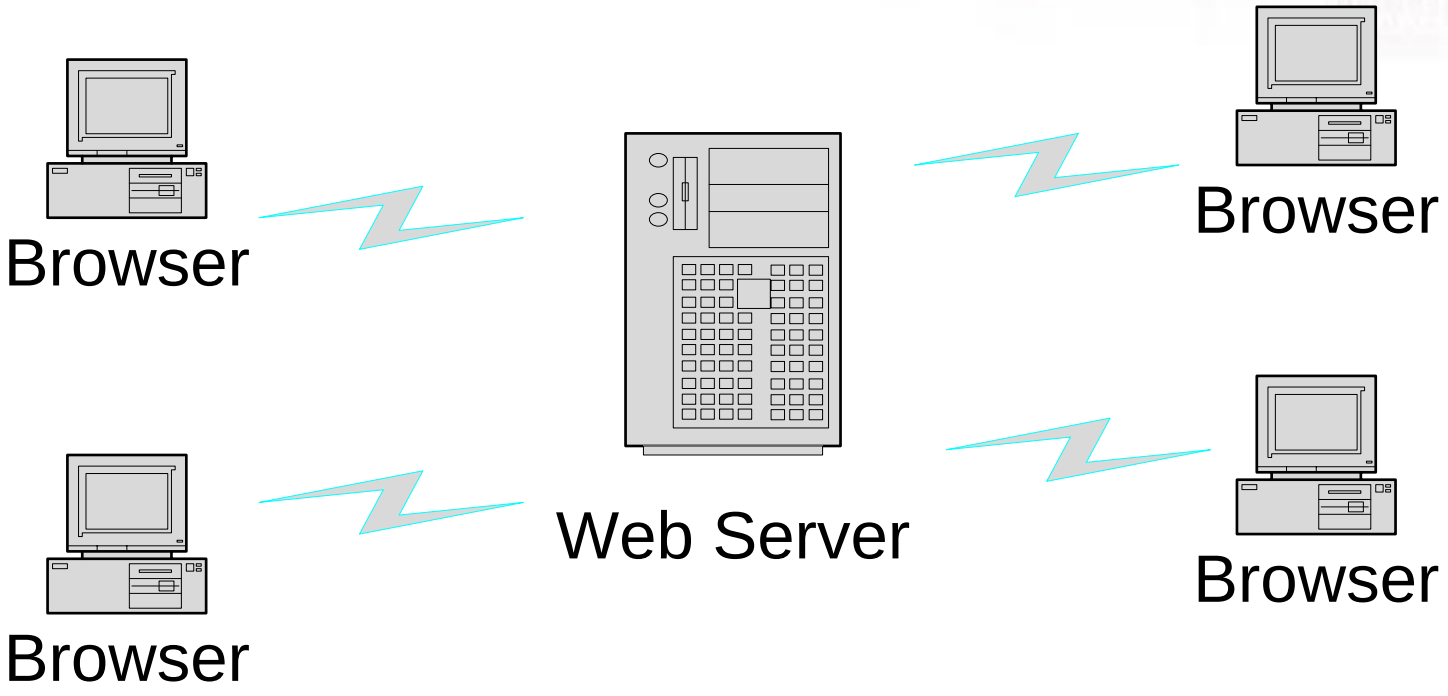
WWW Objective

- To share information across the Internet in a "Publishing" mode
  - Net user with information to share makes it available in a suitable format on a web server.
  - Other Net users who know (or can find) the location of that information (and have access permissions) can access the information

Communications Model

- Client / Server model used for WWW
  - Server program will start up on **TCP port 80** on the server's machine.
  - Clients with network access to that machine can then query the data, using a TCP connection for access to the machine, and using the WWW applications protocols

WWW Architecture



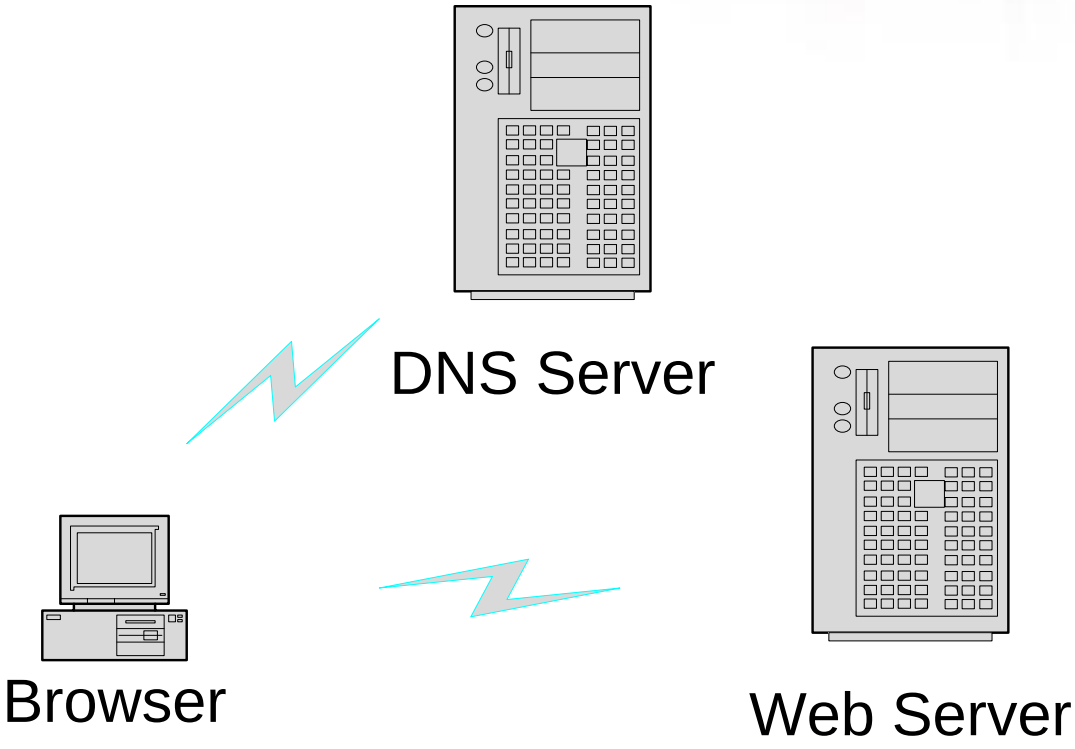
Applications Architecture

- Web Server
  - Apache (Linux), IIS (Windows), etc.
  - Intended to support multiple clients
  - Potentially heavy processing loads
- Web Client (Browser)
  - Mozilla, Netscape, Internet Explorer, etc.
  - Interprets and presents incoming data
    - Text, graphics (static, animated), audio, video, etc.

Server / Data Location

- URL: Universal Resource Locator
  - Identifies base applications protocol
  - Identifies Domain Name of Server
  - May identify port for service (if not default)
  - Identifies desired file or document requested.
- http://snac.eas.asu.edu/dhuang
  - Implies default document (index.html or home.html,) at dhuang subdirectory.
  - Not secure!

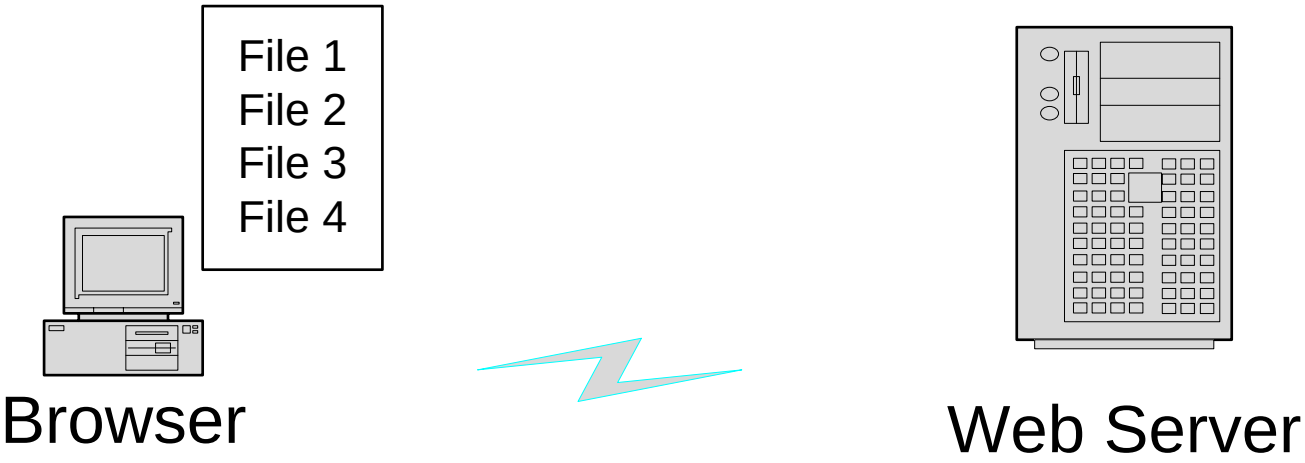
WWW Communications



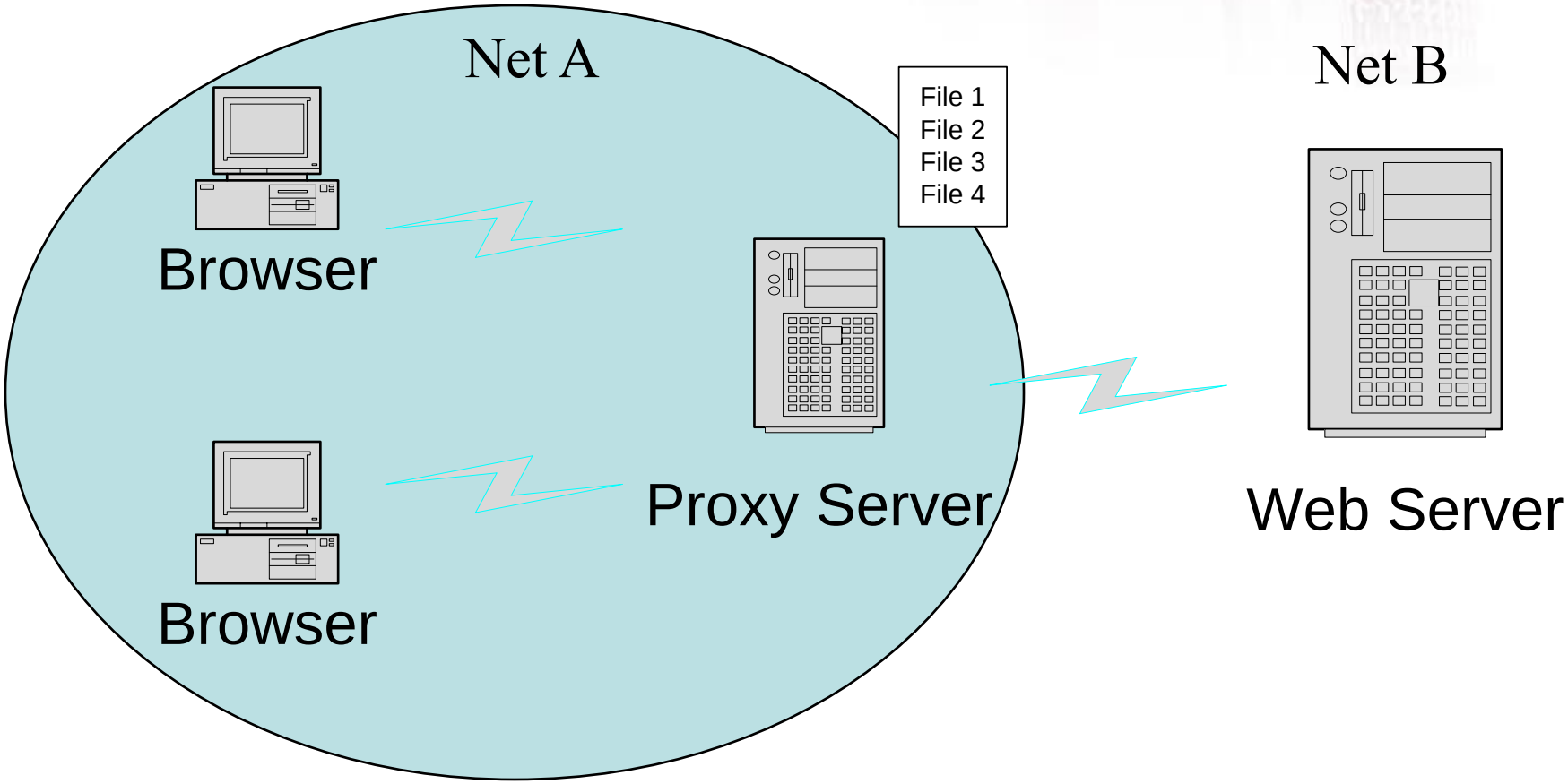
Data Caching

- Many queries are repeated (same base pages, but different lower level pages).
- Can save time by saving a copy of previously downloaded files
- Caching done at two levels
  - Local host
  - Proxy machine

Host Caching



Proxy Caching



WWW Application Protocols

- HTTP
  - Hypertext Transfer Protocol
  - HTTPS for secure communications
- FTP
  - File Transfer Protocol
- mailto
  - e-mail protocol interface
- file
  - Display local files with Web content.
- Others …

HTTP

- Language that controls display of information
  - Use tags to format: <tag>……. </tag>
- Document Structure tags
  - <html>, <head>, <body>, <title>, ...
- Formatting tags
  - <h2>, <h3>, <font>, , ...
- List tags
  - , <ul>,<li>, …
- etc.

Example HTML Code

```
<html>
<head>
  <title>cse468_2009</title>
</head>
<h2> CS468/598 Computer Network Security</h2>
<h2>Spring, 2009</h2>
<h3> <a href="cse468_sp09_syllabus.html">Syllabus</a> </h3>
<h3> <a href="cse468_sp09__lectures.html">Lectures</a> </h3>
<h3> <a href="cse468_sp09__hw.html">Assignments</a> </h3>
<h3> <a href="cse468_sp09__references_sp09.html">References</a> </h3>
<h4><a href="MAILTO:dijiang@asu.edu">e-mail: dijiang@asu.edu</a> </h4>
</body>
</html>
```

Resulting Web Page

HTML

- Advantages
  - Very simple
  - Very forgiving
- Disadvantages
  - Limited
  - Tags more focused on display than content
- Derived from SGML (Standard Generalized ML)

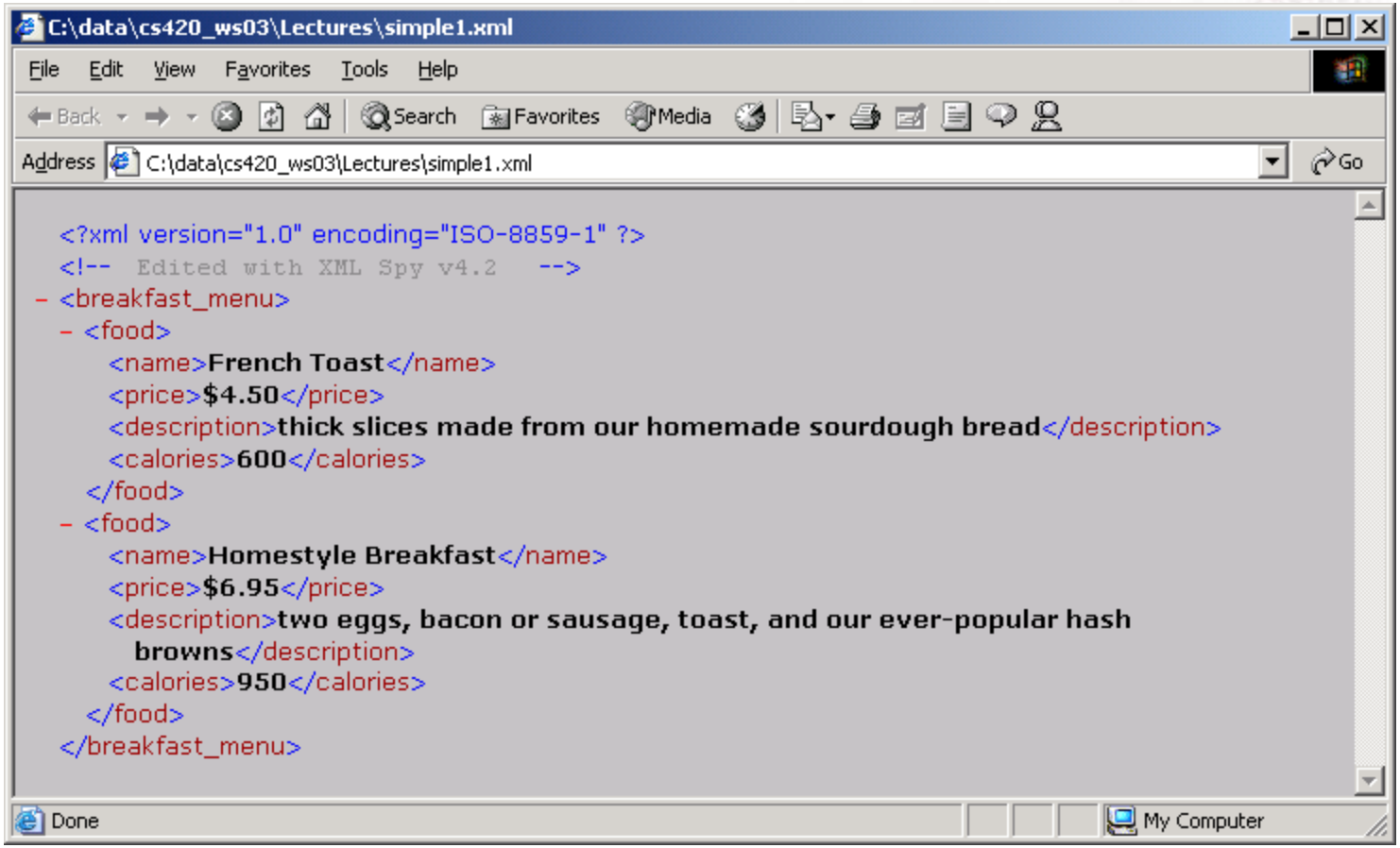
XML

- Extensible Markup Language
  - A simplified version of SGML
  - Focused on Content Description
  - Supports generation of custom XML elements
  - Requires a separate presention description

XML Example 1

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!-- Edited with XML Spy v4.2 -->
<breakfast_menu>
        <food>
                <name>French Toast</name>
                <price>$4.50</price>
                <description>thick slices made from our homemade
 sourdough bread</description>
                <calories>600</calories>
        </food>
        <food>
                <name>Homestyle Breakfast</name>
                <price>$6.95</price>
                <description>two eggs, bacon or sausage, toast,
 and our ever-popular hash browns</description>
                <calories>950</calories>
        </food>
</breakfast_menu>
```

XML Display


C:\data\cs420_ws03\Lectures\simple1.xml
File Edit View Favorites Tools Help
Back Search Favorites Media
Address C:\data\cs420_ws03\Lectures\simple1.xml
Go
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!-- Edited with XML Spy v4.2 -->
<breakfast_menu>
<food>
<name>French Toast</name>
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</food>
<food>
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<price>$6.95</price>
<description>two eggs, bacon or sausage, toast, and our ever-popular hash browns</description>
<calories>950</calories>
</food>
</breakfast_menu>
Done
My Computer

XML Stylesheet (xsl)

- XML does not use predefined tags
- Components of XSL
  - **XSLT** (a language for transforming XML documents)
  - **XPath** (a language for defining parts of an XML document)
  - **XSL Formatting Objects** (a vocabulary for formatting XML documents)
- W3C Standard

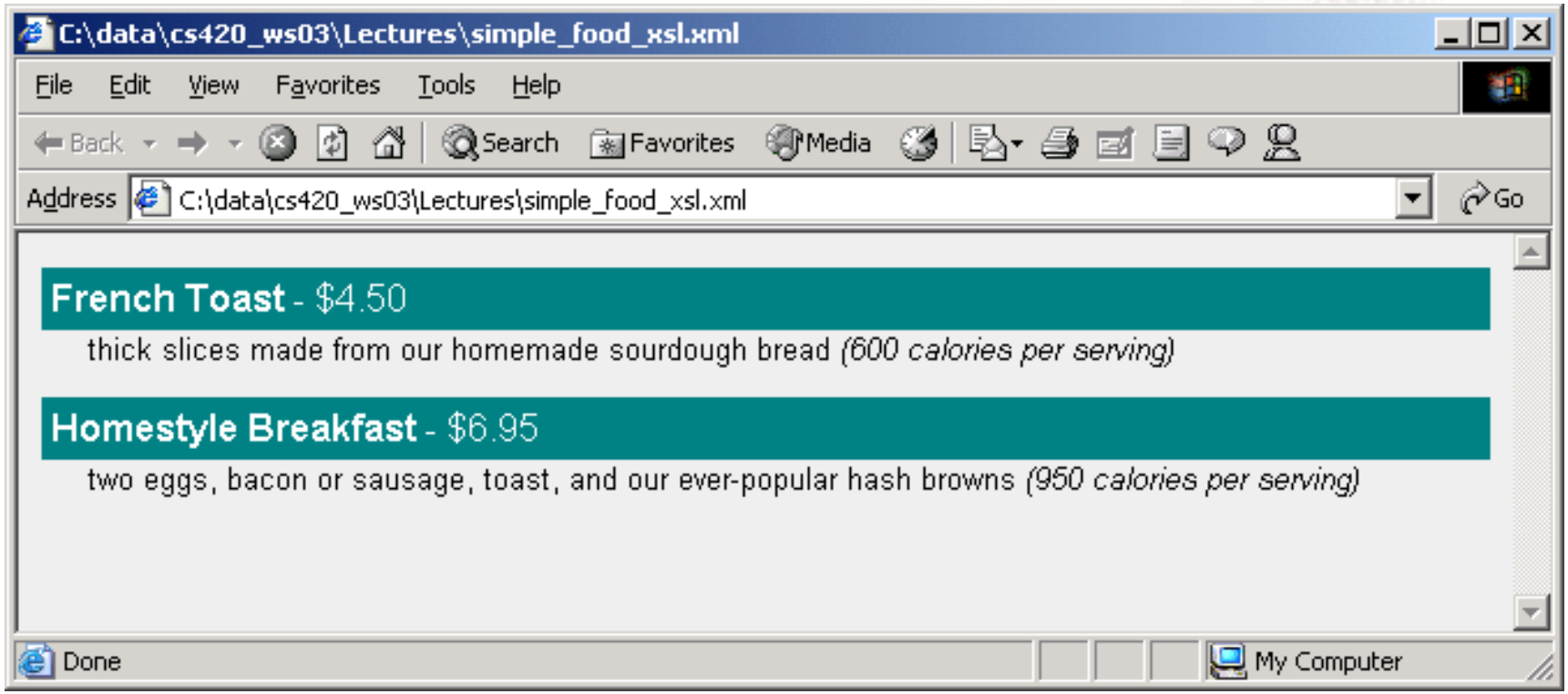
XSL: Example

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!-- Edited with XML Spy v4.2 -->
<html xsl:version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
                        xmlns="http://www.w3.org/TR/xhtml1/strict">
  <body style="font-family:Arial,helvetica,sans-serif;font-size:12pt;
        background-color:#EEEEEE">
    <xsl:for-each select="breakfast_menu/food">
      <div style="background-color:teal;color:white;padding:4px">
        <span style="font-weight:bold;color:white">
        <xsl:value-of select="name"/></span>
        - <xsl:value-of select="price"/>
      </div>
      <div style="margin-left:20px;margin-bottom:1em;font-size:10pt">
        <xsl:value-of select="description"/>
        <span style="font-style:italic">
          (<xsl:value-of select="calories"/> calories per serving)
        </span>
      </div>
    </xsl:for-each>
  </body>
</html>
```

XML with Style Sheet

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!-- Edited with XML Spy v4.2 -->
<?xml-stylesheet type="text/xsl" href="simple.xsl" ?>
<breakfast_menu>
        <food>
                <name>French Toast</name>
                <price>$4.50</price>
                <description>thick slices made from our homemade
 sourdough bread</description>
                <calories>600</calories>
        </food>
        <food>
                <name>Homestyle Breakfast</name>
                <price>$6.95</price>
                <description>two eggs, bacon or sausage, toast,
 and our ever-popular hash browns</description>
                <calories>950</calories>
        </food>
</breakfast_menu>
```

XML Display


C:\data\cs420_ws03\Lectures\simple_food_xsl.xml
File Edit View Favorites Tools Help
Back Search Favorites Media
Address C:\data\cs420_ws03\Lectures\simple_food_xsl.xml
Go
French Toast - $4.50
thick slices made from our homemade sourdough bread (600 calories per serving)
Homestyle Breakfast - $6.95
two eggs, bacon or sausage, toast, and our ever-popular hash browns (950 calories per serving)
Done
My Computer

FTP

- Protocol to support transfer of files between machines
  - Uses Browser client to connect to FTP server
  - Supports text file and binary file transfer
  - Supports authentication of users
- Two modes (http://slacksite.com/other/ftp.html)
  - Active mode
  - Passive mode

Mailto:

- Supports generation and transmission of electronic mail message.
  - Uses link on web page to trigger e-mail app.
  - Accesses local mail client to generate message
  - Accesses mail server to upload message

File://

- Supports display of local web formatted pages.
  - Used to browse local files
  - Used to test display of file before uploading to web server.
  - Based on browser security settings, may enable expanded web access capabilities.

Programming Web Servers

- File types discussed so far produce static pages.
  - Good for relatively stable information
  - Lower processing overhead at server
- Some applications might need to generate dynamic web pages
  - "run a program" to decide what to download in response to a web page request.

Dynamic Applications

- Interactive web pages
  - Forms

<input type="text" /> defines a one-line input field that a user can enter text into:

```
<form>
First name: <input type="text" name="firstname" /><br />
Last name: <input type="text" name="lastname" />
</form>
```

How the HTML code above looks in a browser:

First name: [ ]
Last name: [ ]

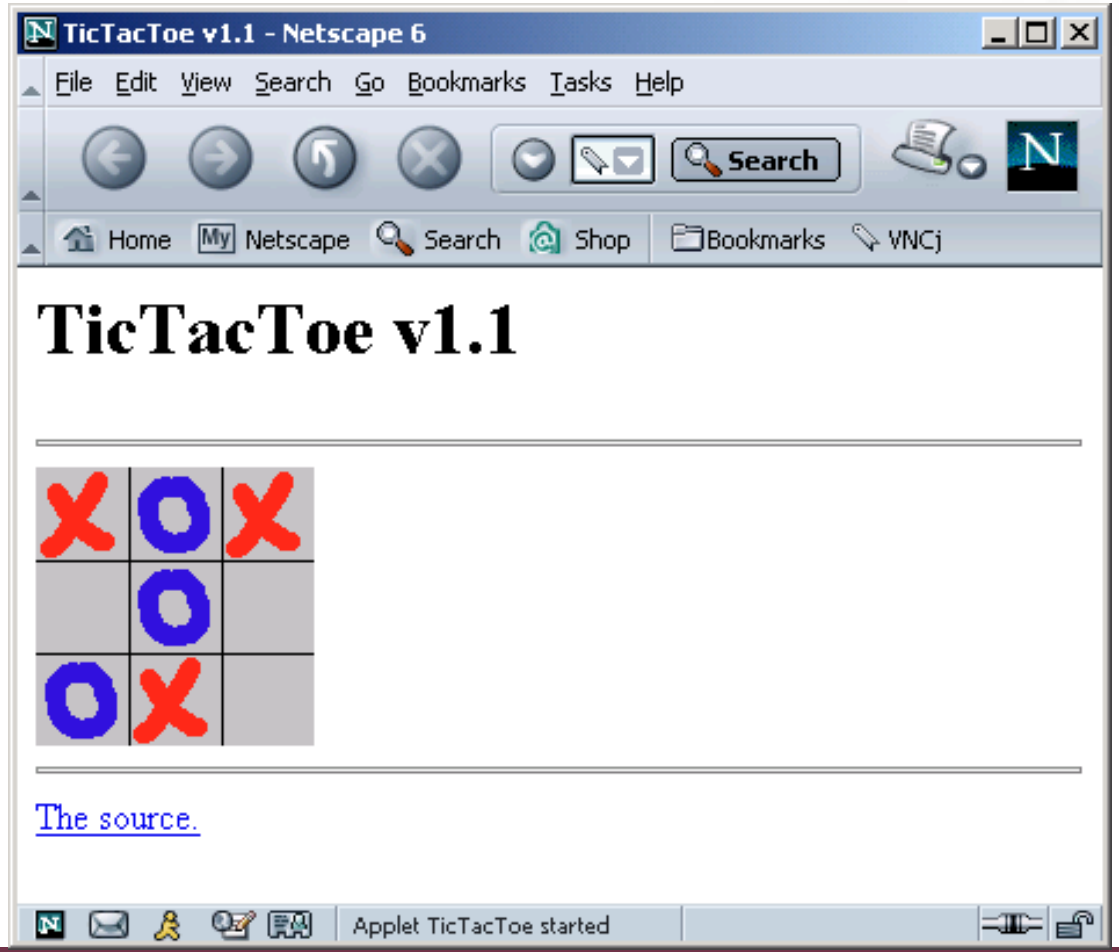
Note: The form itself is not visible. Also note that the default width of a text field is 20 characters.

- Dynamic Information
  - News, Stock quotes, Response based on requestor

Dynamic Web Pages

- Java (Applets, Servlets)
- CGI (Common Gateway Interface)
- ASP (Active Server Page)
- JSP (JavaServer Pages)
- PHP (PHP: Hypertext Preprocessor)

Sample Java Applet



Web 2.0

- **Web 2.0** describes the changing trends in the use of World Wide Web technology and web design that aim to enhance: creativity, communications, secure information sharing, collaboration and functionality of the web – Interactive web.
- **Web-based applications and desktops** – Ajax
- **How about Web 3.0 – Intelligent web.**

Summary

- Basic WWW Architecture
- Data Caching
- Web Application Protocols
- Dynamic Web Pages
- Web 2.0