The World Wide Web

COMPUTER SCIENCE
ILLUMINATED

SIXTH EDITION

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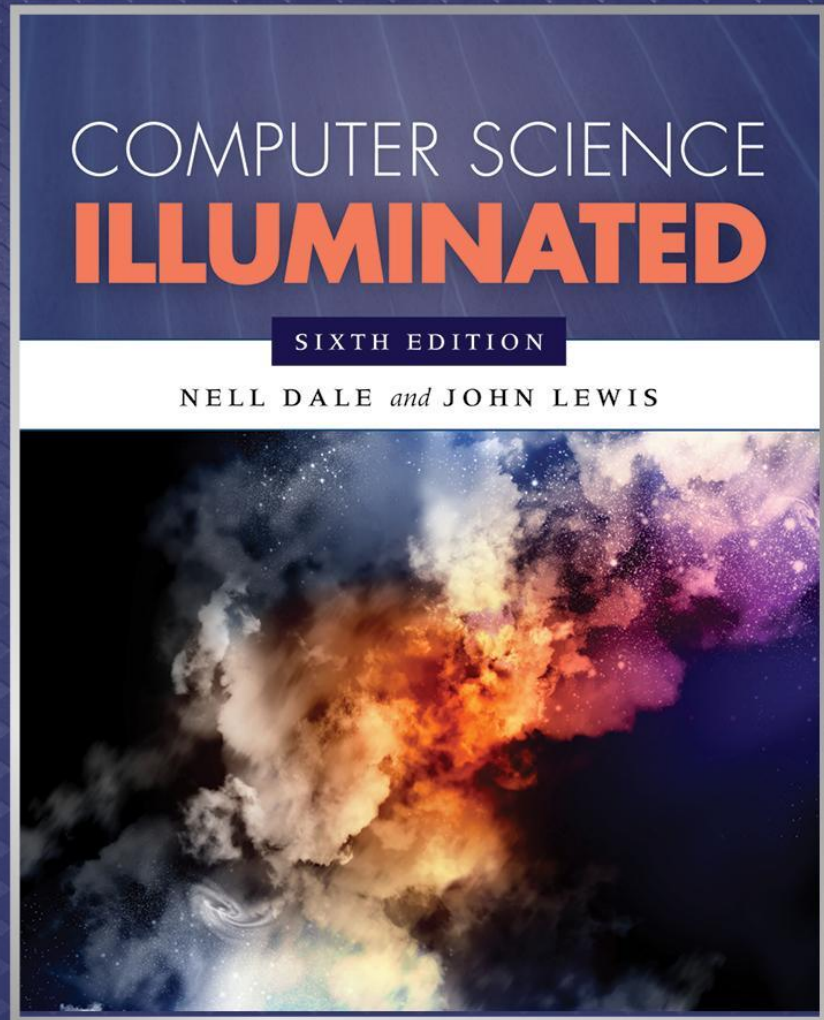
Chapter Goals

- Compare and contrast the Internet and the World Wide Web

- Describe general Web processing

- Write basic HTML documents

- Describe several specific HTML tags and their purposes

Chapter Goals

- Describe the processing of Java applets and Java server pages

- Compare and contrast HTML and XML

- Define basic XML documents and their corresponding DTDs

- Explain how XML documents are viewed

The World Wide Web

The Web

An infrastructure of information combined and the network software used to access it

Web page

A document that contains or references various kinds of data

Links A connection between one web page and another

What are the links used for?

The World Wide Web

Website

A collection of related web pages

Web browser

A software tool that retrieves and displays web pages

Web server

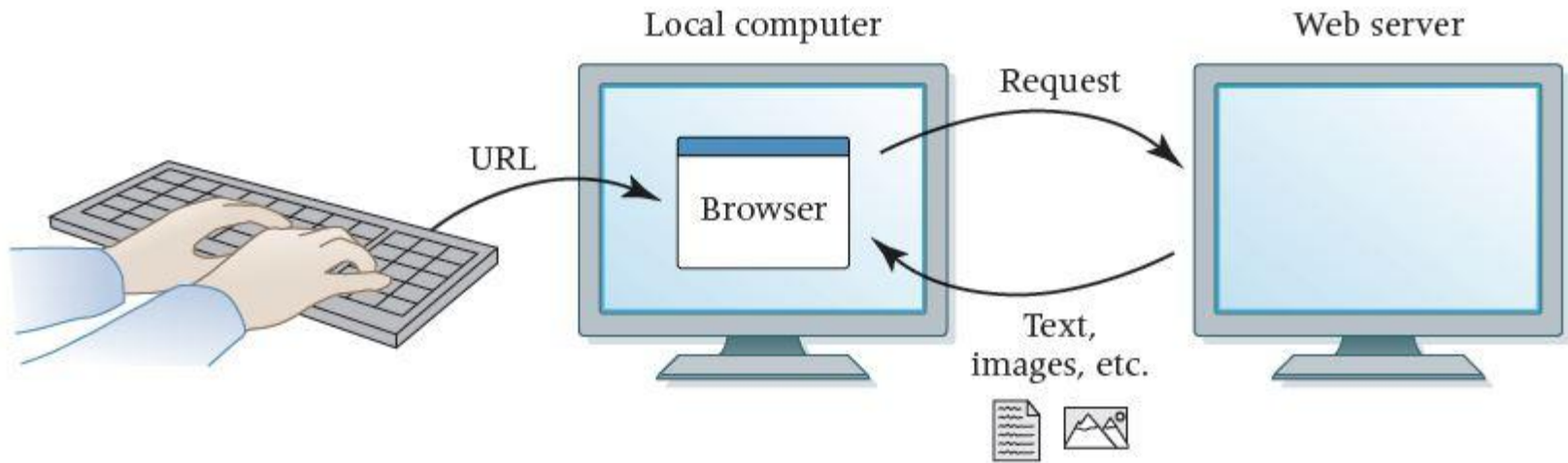A computer set up to respond to requests for web pages

The World Wide Web

Uniform Resource Locator (URL)

A standard way of specifying the location of a Web page, containing the hostname, "/", and a file

What is the relationship between the Internet and the Web?

The World Wide Web

Local computer

Web server

URL

Browser

Request

Text, images, etc.

FIGURE 16.1 A browser retrieving a web page

Why is the expression "visiting a website" confusing?

Search Engines

Search Engine

A website that helps you find other websites

Can you name at least two?

How do they work?

Instant Messaging

Instant messaging (IM)
- – Applications that allow people to send short messages
- – Similar to texting, but based on username not cellular phone number
- – Some applications allow more than two users in a chat room
- – If participants run application simultaneously, they can have an interactive conversation
- – Most applications use proprietary protocols that dictate the precise format and structure of the messages
- – Most instant messages are **not** secure

Weblogs

Blog or Weblog

An online journal or newsletter that is frequently updated and intended for public consumption

Do you have a blog?

Do you read blogs?

Cookies

Cookie

A small text file that a web server stores on your local computer's hard disk

- A cookie contains information about your visit to the site
- Cookies can be used
  - to determine number of unique visitors to the site
  - to customize the site for future visits
  - to implement shopping carts that can be maintained from visit to visit
- Cookies are **not** dangerous

Web Analytics

Web analytics

– Collection and analysis of data regarding website usage

– Typically used by website owners to track the number and behavior of users visiting their sites

– Example: Google Analytics tracks

- Where users are geographically located (based on their ISP)
- Which site referred them
- Which pages within your site they visit
- How long they spend on each page
- Which page they leave your site from
- More

HTML and CSS

Hypertext Markup Language (HTML)
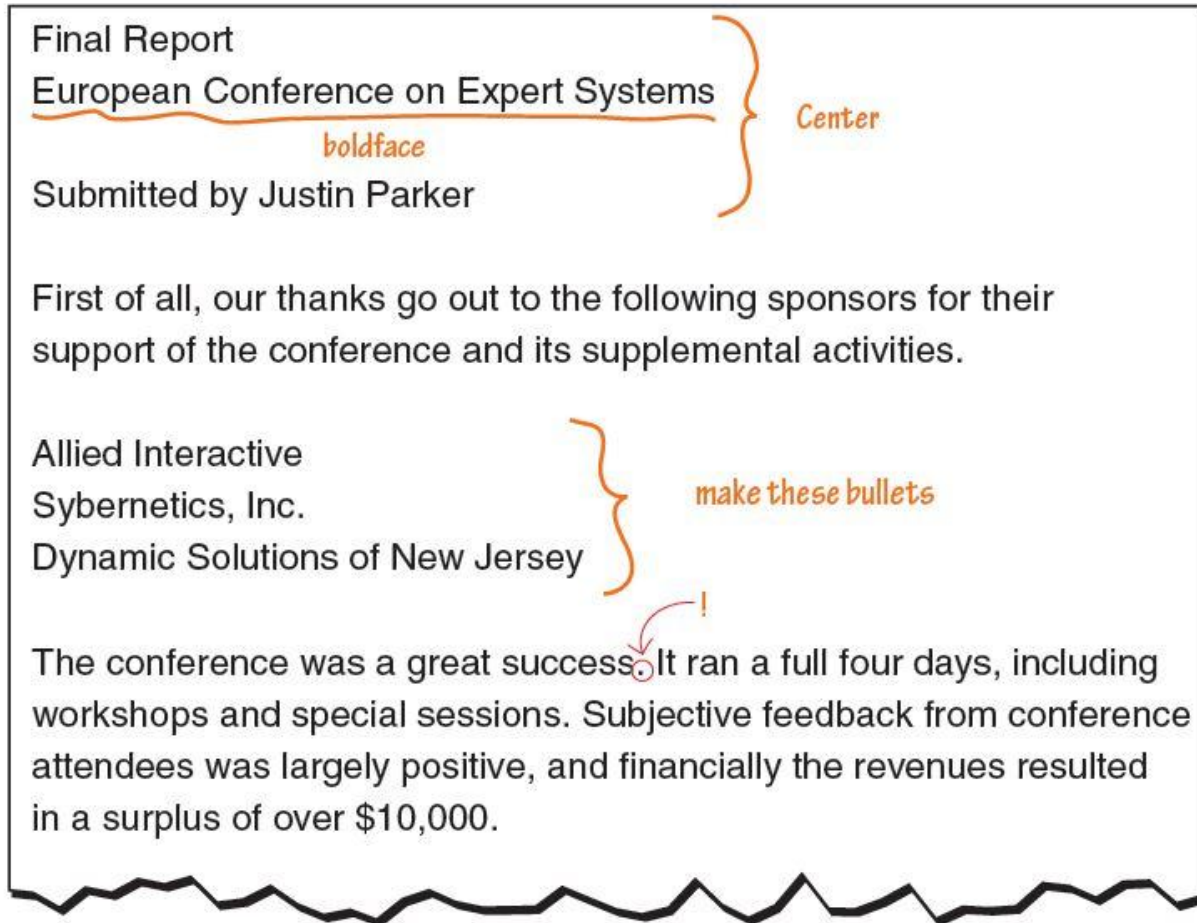
The language used to create or build a web page

Markup language

A language that uses tags to annotate the information in a document

Tag

The syntactic element in a markup language that annotate the information in a document

HTML and CSS
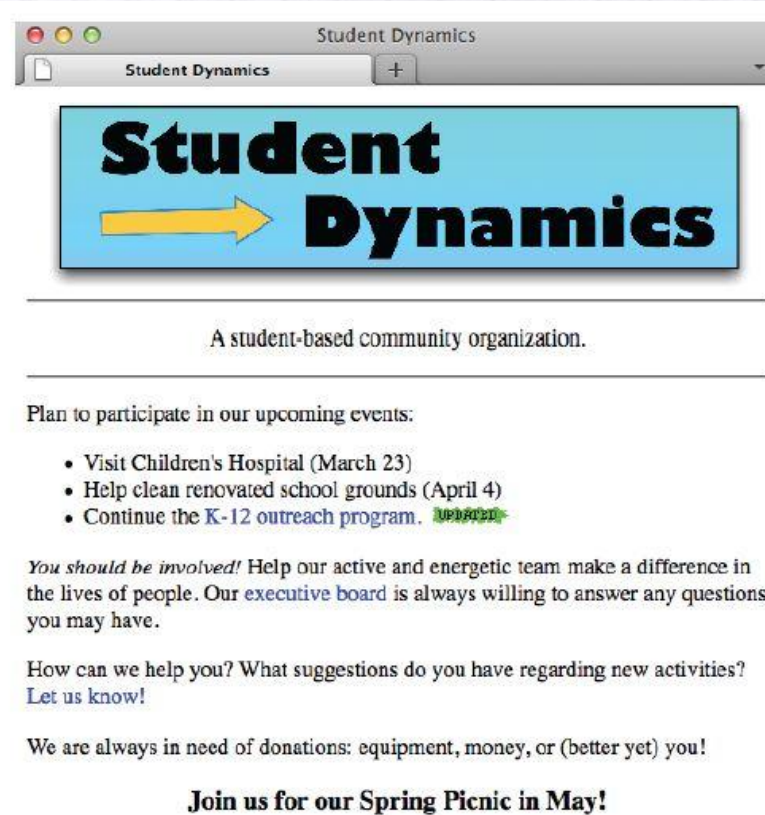

FIGURE 16.3 A marked-up document

HTML and CSS

HTML5

- Current version of the HTML standard

- Released in 2011

- Supported by all major browsers

- Doing web development? Focus on HTML5.

HTML and CSS

- HTML tags indicate what the information is
  - Paragraph
  - Image
  - List
  - Etc.

- CSS style information indicates how information should be displayed
  - Alignment
  - Borders
  - Background colors
  - Etc.

HTML and CSS

FIGURE 16.4 The Student Dynamics web page as displayed in Firefox

Courtesy of John Lewis

HTML and CSS

```html
<!DOCTYPE HTML>
<html>
<head>
    <title>Student Dynamics</title>
    <style type="text/css">
        img.banner {display:block; margin:auto;}
        a:link {color:#0000FF; text-decoration:none;}
        a:visited {color:#00FF00; text-decoration:none;}
        a:hover {color:#FF00FF; text-decoration:underline;}
    </style>
</head>
<body>
    <img class="banner" src="stuDynamics.gif"  />
    <hr />
    <p style="text-align:center;">A student-based community organization.</p>
    <hr />
    <p>Plan to participate in our upcoming events:</p>
    <ul>
        <li>Visit Children's Hospital (March 23)</li>
        <li>Help clean renovated school grounds (April 4)</li>
        <li>Continue the <a href="outreach.html">K-12 outreach program.</a>
        <img src="updated.gif" /></li>
    </ul>
    <p><em>You should be involved!</em> Help our active and energetic team make
        a difference in the lives of people. Our <a href="execBoard.html">
        executive board</a> is always willing to answer any questions you may
        have.</p>
    <p>How can we help you? What suggestions do you have regarding new
        activities? <a href="suggestions.html">Let us know!</a></p>
    <p>We are always in need of donations: equipment, money, or (better yet)
        you!</p>
    <h3 style="text-align:center;">Join us for our Spring Picnic in May!</h3>
</body>
</html>
```

FIGURE 16.5 The HTML document defining the Student Dynamics web page

HTML and CSS

Tags are enclosed in angle brackets (`<. . . >`)

Words such as `head`, `title`, and `body` are called **elements** and specify the type of the tag

Most elements consist of a start tag such as `<body>` and a corresponding end tag with a `/` before the element name, such as `</body>`

HTML and CSS

HTML Document Structure

- Entire document enclosed between `<html>` and `</html>`

- The head section (within `<head>` … `</head>`) contains information about the document itself, such as its title

- The body section (within `<body>` … `</body>`) contains the information to be displayed

HTML and CSS

- The browser
  - Uses HTML tags together with CSS style information to determine how page should be displayed
  - Ignores the way we format the HTML document using carriage returns, extra spaces, and blank lines
  - Takes into account the width and height of the browser window
  - Reformats the contents to fit your browser window

Basic HTML Elements

<p> . . . </p> text that should be treated as a separate paragraph

<hr /> horizontal rule across page

… unordered list (usually bullets)

… ordered list (e.g. numbered)

… list item

<h1>…</h1> level 1 heading

…

<h6>…</h6> level 6 heading

Tag Attributes

Attribute

Part of a tag that provides additional information about the element

Form

`attribute-name=value`

Examples

CSS style specification	`style="text-align:center"`
Image source file	`<img src="myPicture.gif" />`
Hyperlink URL	`<a href=http://google.com/>Google It!</a>`

Cascading

Styles can be specified at multiple levels and overridden at lower levels as needed:

- In an external file

```
p {color:#00FF00;}
```

- In the head section of the HTML document:

```
<head>
    …
    <style type="text/css">
        p {color:#00FF00;}
    </style>
    …
</head>
```

- As an attribute of an HTML element:

```
<p style="text-align:center">This is centered!<p>
```

More About CSS

In the Student Dynamics example, the following style tag is used in the head section of the document:

```
<style type="text/css">
    img.banner {display:block; margin:auto;}
    a:link {color:#0000FF; text-decoration:none;}
    a:visited {color:#00FF00; text-decoration:none;}
    a:hover {color:#FF00FF; text-decoration:underline;}
</style>
```

- **First rule:** applies to all img tags that have a class attribute with the value banner. Setting the margins to auto centers the image horizontally

- **Second rule:** An unvisited link is shown in blue text with no underline

- **Third rule:** A visited link is shown in green with no underline

- **Fourth rule:** When the mouse hovers over a link, the link text turns purple with an underline

HTML5

New Tags

<section> to define section of pages

<header> to define the header of a page

<footer> to define the footer of a page

<nav> to define the navigation elements on a page

<article> to define an article or primary content of a page

<aside> to define secondary content that might appear in a sidebar

<figure> to define images that annotate an article

HTML5

- Support for dynamic content (e.g. drop down menus)

- async attribute – content is loaded asynchronously to improve download speed

- Tags supporting form input (e.g. times, dates, ranges, email addresses, URLs)

Java Applets

Java applet

A Java program designed to be embedded into an HTML document, transferred over the Web, and executed in a browser

```
<P><APPLET code = "HelloWorld.class"
width=250 height=150></APPLET></P>
```

Java Applets

Example

Contents of HelloWorld.htm:

`<H1>Hello World Applet</H1>`

`<P>A simple HelloWorld</P>`

`<P><HR></P>`

`<P><APPLET code = "HelloWorld.class" width=250 height=150></APPLET></P>`

HelloWorld.class contains the Java applet

Java Applet Deprecation

Java Applets were deprecated from use in 2017 due to their inherent vulnerabilities

Replaced with various technologies, JavaScript being one of the most common.

Code is still run client-side

JavaScript Example

Define the JavaScript within the <script> tag:

<script>
    document.getElementById(var).innerHTML = value;
</script>

Can set an HTML element through the above "getElementById() method, where "var" is a string denoting the element's "id" attribute.

The client's browser will change the content of the element with the information provided. In this case it changes the content of the element to contain a Hello World string. The element should be defined first.

JavaScript Example

```
<html>
<body>

    <h2>Use JavaScript to Change Text</h2>
    <p>Writes "Hello World!" into an HTML element with id="demo":</p>

    <p id="demo"></p>

    <script>
        document.getElementById("demo").innerHTML = "Hello World!";
    </script>

</body>
</html>
```

adapted from https://www.w3schools.com/html/tryit.asp?filename=tryhtml_script

```html
<html>
<body>

<h2>Use JavaScript to Change Text</h2>
<p>Writes "Hello World!" into an HTML element with id="demo":</p>

<p id="demo"></p>

<script>
document.getElementById("demo").innerHTML = "Hello World!";
</script>

</body>
</html>
```

Use JavaScript to Change Text

Writes "Hello World!" into an HTML element with id="demo":

Hello World!

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JavaScript Example: Functions

Defining functions in the <script> tag and using them at a later point:

```
<script>
function myFunction() {
  document.getElementById("demo").innerHTML = "Hello World!";
}
</script>
```

Functions can then be called after:

```
<p id="demo"></p>
<script>
myFunction()
</script>
```

JavaScript Example: Functions

```
<html>
<body>
<h2>Use JavaScript to Change Text</h2>
<p>This example writes "Hello World!" into an element by function:</p>

<script>
function myFunction() {
  document.getElementById("demo").innerHTML = "Hello World!";
}
</script>

<p id="demo"></p>

<script> myFunction() </script>

</body>
</html>
```

```html
<html>
<body>
<h2>Use JavaScript to Change Text</h2>
<p>This example writes "Hello World!" into an element by function:</p>

<script>
function myFunction() {
  document.getElementById("demo").innerHTML = "Hello World!";
}
</script>

<p id="demo"></p>

<script> myFunction() </script>

</body>
</html>
```

Use JavaScript to Change Text

This example writes "Hello World!" into an element by function:

Hello World!

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Java Server Pages

JSP Scriptlet

A portion of code embedded in an HTML document designed to dynamically contribute to the content of the web page

Java Server Page

A web page that has a JSP scriptlet interwoven among the HTML content

Java Server Pages

A JSP scriptlet is encased in special tags beginning with <% and ending with %>

Imagine JSP scriptlets as having the expressive power of a full programming language

```
<H3>
<%
out.println ("hello there");
%>
</H3>
```

Java Server Pages

JSPs are executed on the server side where the web page resides

By the time it arrives at your computer, all active processing has taken place, producing a static (though dynamically created) web page

JSPs are particularly good for coordinating the interaction between a web page and an underlying database

Compare and contrast Java applets, JavaScript and JSP scriptlets

XML

Extensible Markup Language (XML)

A language that allows the user to describe the content of a document

- HTML describes how a document should look
- XML describes a document's meaning

Metalanguage

A language for talking about, or defining, other languages

XML is a metalanguage

XML

```
<?xml version="1.0" ?>
<!DOCTYPE books SYSTEM "books.dtd">
<books>
<book>
<title>The Hobbit</title>
<authors>
  <author>J. R. R. Tolkien</author>
</authors>
<publisher>Ballantine</publisher>
<pages>287</pages>
<isbn>0-345-27257-9</isbn>
<price currency="USD">7.95</price>
</book>
<book>
<title>A Beginner's Guide to Bass Fishing</title>
<authors>
  <author>J. T. Angler</author>
  <author>Ross G. Clearwater</author>
</authors>
<publisher>Quantas Publishing</publisher>
<pages>750</pages>
<isbn>0-781-40211-7</isbn>
<price currency="USD">24.00</price>
</book>
</books>
```

FIGURE 16.6 An XML document containing data about books

Like HTML, an XML document is made up of tagged data

XML

Document Type Definition (DTD)

A specification of the organization of the document

The structure of a particular XML document is described by its corresponding DTD document

```
<!ELEMENT books (book*)>
<!ELEMENT book (title, authors, publisher, pages, isbn, price)>
<!ELEMENT authors (author+)>
<!ELEMENT title (#PCDATA)>
<!ELEMENT author (#PCDATA)>
<!ELEMENT publisher (#PCDATA)>
<!ELEMENT pages (#PCDATA)>
<!ELEMENT isbn (#PCDATA)>
<!ELEMENT price (#PCDATA)>
<!ATTLIST price currency CDATA #REQUIRED>
```
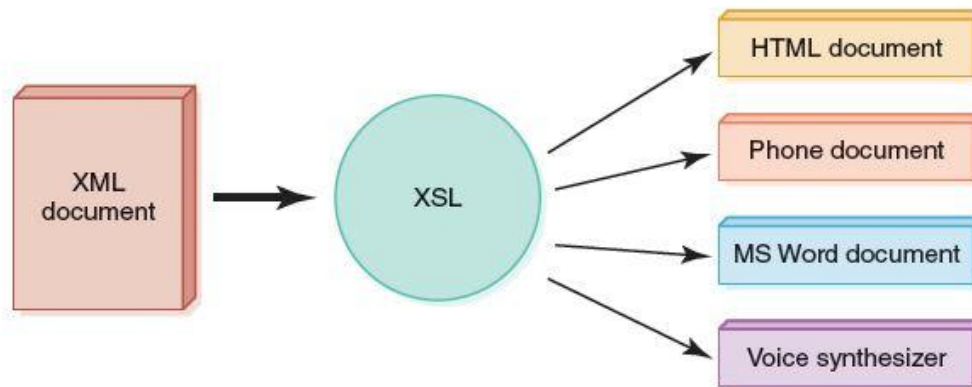
FIGURE 16.7 The DTD document corresponding to the XML books document

XML

XML represents a standard format for organizing data without tying it to any particular type of output

Extensible Stylesheet Language (or XSL)

A language for defining transformations from XML documents to other output formats

FIGURE 16.8 An XML document can be transformed into many output formats

Social Networks

Social Network

An online service that allows people with shared interest to communicate and interact

- A few of the many: Facebook, Twitter, LinkedIn, Pinterest, Google+, Tumblr, Instagram

- Pre-Facebook history of online social networks includes BBS's, Classmates.com, SixDegrees.com, MySpace, LinkedIn

- Broader social network concept: sociological model of how individuals or organizations interact
    - Network can be viewed as map of interactions
    - Research began in 1800s (e.g. to model spread of new ideas and practices, diseases, and formation of emotional clusters)
    - Stanley Milgram's study in 1967 showed the chain of social acquaintances to connect any two people to be about six steps, leading to the famous phrase

Ethical Issues

Gambling and the Internet

When did gambling explode on the Internet?

Where are most Internet gambling sites hosted?

Internet sites provide what types of gambling?

What assurances do gamblers have that sites are run honestly?

Why is Internet gambling a problem for governments (e.g. states in the USA)?

What laws apply to online gambling where you live?

Who am I?

© Hank Morgan/Science Source

Bill Gates and I have something in common. Do you know what it is?

Do you know?

?

What does the expression "dancing spiders of Google" mean?

What do computers have to do with "going green"?

Why are WiFi standards still evolving?

What change did Facebook make to its image tagging policy in 2011, and why?

Why can thinking before you tweet can save your job (or job prospects)?