Web Applications:
Different Ways to Build Software Systems

Examples of Web Applications:

• **Services:** Online Library Systems, Amazon Web Services, CSU CampusNet

• **Google Search Systems:** Google Search, Google Map

• **Social Network Systems:** Facebook, Twitter, LinkedIn

• **Innovation:** IPhone, Smart Phone Apps

• **Computer Applications:** Computer Games

CIS 408 Internet Computing - Sunnie Chung
Search Engine Systems : Google Map
Social Network System: Facebook
Web Service System:
Class Search of CSU CampusNet

CIS 408 Internet Computing - Sunnie Chung
Amazon Webserver

Today's Deals

New deals. Every day. Shop our Deal of the Day, Lightning Deals and more daily deals and limited-time sales.
Database System
Mobile Phone, Tablet Applications
Multi Media and CGI in Movie
HyperMedia, WWW, and Internet

• A hypertext system: meant to be read nonlinearly, by following links that point to other parts of the document, or to other documents

• HyperMedia: not constrained to be text-based, can include other media, e.g., graphics, images, and especially the continuous media, sound and video.

  - The World Wide Web (WWW) — the best example of a hypermedia application.

• Multimedia means that computer information can be represented through audio, graphics, images, video, and animation in addition to traditional media.
"Hot spots"

Fig 1.1: Hypertext is nonlinear
World Wide Web

• History of the WWW

• 1960s - Charles Goldfarb et al. developed the Generalized Markup Language (GML) for IBM.

• 1986 - The ISO released a final version of the Standard Generalized Markup Language (SGML).

• 1990 - Tim Berners-Lee invented the HyperText Markup Language (HTML), and the HyperText Transfer Protocol (HTTP)
HTTP (HyperText Transfer Protocol)

- **HTTP**: a protocol that was originally designed for transmitting hypermedia, but can also support the transmission of any file type.
- HTTP is a **stateless** request/response protocol: no information carried over for the next request.
- The basic request format:
  - Method URI Version
  - Additional-Headers:
  - Message-body
- The **URI** (Uniform Resource Identifier): an identifier for the resource accessed, e.g. the host name, always preceded by the token `http://`.
HTTP

- Two popular methods: **GET** and **POST**.
- The basic response format:
  - Version Status-Code Status-Phrase
  - Additional-Headers
  - Message-body
- Two commonly seen **status codes**:
  - 1. **200 OK** - the request was processed successfully.
  - 2. **404 Not Found** - the URI does not exist.
HTML (HyperText Markup Language)

• HTML: a language for publishing Hypermedia on the World Wide Web | defined using SGML:
  • HTML uses ASCII, it is portable to all different (possibly binary incompatible) computer hardware.
  • The next generation of HTML is XHTML - a reformulation of HTML using XML.

• HTML uses **tags** to describe document elements:
  • `<token params>` | defining a starting point,
  • `</token>` | the ending point of the element.
  • Some elements have no ending tags.
Creating a Webpage

<code>
<DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
<head>
<title>SS Chung's Classes</title>
</head>
<body background="/cwrubg.gif">
<img align="left" height="168" width="208" hspace="5"
src="/VLDSDNCBop_SummitChung.jpg" border="2" alt="photo">

<h2>
<p>Welcome to Sunnie S. Chung's World !</p>
</h2>

<h3>
<p>Electrical Engineering and Computer Science Dept.</p>
</h3>
<h3>
<p>Cleveland State University</p>
</h3>

<p>
<i>
webpage: <a href="http://grail.csuohio.edu/~sschung/">http://grail.csuohio.edu/~sschung/</a><br>
Email: s.chung@csuohio.edu<br>
Email: sschung.cs4@gmail.com</i>
</p>
</body>
</html>
</code>
• A very simple HTML page is as follows:

```html
<html>
<head>
    <title>
        A sample web page.
    </title>
    <meta name="Author" content="Cranky Professor">
</head>
<body>
    <p>
        We can put any text we like here, since this is a paragraph element.
    </p>
</body>
</html>
```

• Naturally, HTML has more complex structures and can be mixed in with other standards.
**XML (Extensible Markup Language)**

- XML is a newer markup language with a couple of very important features
  - It is extensible
    - Users can create special purpose languages by defining new DTDs (Document Type Definition)
  - It separates data from formatting (unlike HTML)
    - Presentation style defined using stylesheets
XML (Extensible Markup Language)

- XML is more strict than HTML
  - All tags must be terminated
  - Tags must be properly nested
  - Can also validate the document against a DTD
- HTML has been redefined as an XML language (XHTML)
- An existing multimedia markup language (SMIL) has been redefined as an XML language as well
XML (Extensible Markup Language)

- **XML**: a markup language for the WWW in which there is modularity of data, structure and view so that user or application can be able to define the tags (structure).

- Example of using XML to retrieve stock information from a database according to a user query:
  1. First use a global Document Type Definition (DTD) that is already defined.
  2. The server side script will abide by the DTD rules to generate an XML document according to the query using data from your database.
  3. Finally send user the *XML Style Sheet* (XSL) depending on the type of device used to display the information.
• In addition to XML specifications, the following XML-related specifications are standardized:

  • **XML Protocol.** Used to exchange XML information between processes. It is meant to supersede HTTP and extend it as well as to allow interprocess communications across networks.

  • **XML Schema.** A more structured and powerful language for defining XML data types (tags). Unlike a DTD, XML Schema uses XML tags for type definitions.

  • **XSL.** This is basically CSS for XML. On the other hand, XSL is much more complex, having three parts: XSL Transformations (XSLT), XML Path Language (XPath), and XSL Formatting Objects.
• An example of an XML document structure — the definition for a small XHTML document:

```xml
<?xml version="1.0" encoding="iso-8859-1"?>
<!DOCTYPE html PUBLIC "- //W3C//DTD XHTML 1.0" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
    ... [html that follows the above mentioned XML rules]
</html>
```
Multimedia and Hypermedia

- 1999: **Napster P2P** file sharing network
- 2000: **Mobile phones** takeoff
- 2003: **iTunes Store** launches
- 2003: **Digital Camera** sales exceed film camera sales for the first time
- 2004: **Flickr** image sharing site launched
- 2005: **YouTube** video sharing site launched
- 2009: End of the transition to **Digital Television** broadcasting in the USA
Multimedia in the New Millennium

- **2001** The first peer-to-peer file sharing system, Napster, was shut down by court order. Coolstreaming was the first large-scale peer-to-peer streaming system, attracting over 1 million users by 2004. First commercial 3G wireless network.

- **2003** Skype: free peer-to-peer voice over the Internet.

- **2004** Web 2.0 promotes user collaboration and interaction. Examples include social networking, blogs, wikis.
  - Facebook founded.
  - Flickr founded.

- **2005** YouTube created.
  Google launched online maps.
• **2006** Twitter created: 500 million users in 2012, 340 million tweets per day.
  - Amazon launched its cloud computing platform.
  - Nintendo introduced the Wii home video game console -- can detect movement in three dimensions.

• **2007** - Apple launched iPhone, running the iOS mobile operating system.
  - Google launched Android mobile operating system.

• **2009** - The first LTE (Long Term Evolution) network was set, an important step toward 4G wireless networking.
  - James Cameron’s film, Avatar, created a surge on the interest in 3D video.
• **2010** - Netflix migrated its infrastructure to the Amazon’s cloud computing platform.
  - Microsoft introduced Kinect, a horizontal bar with full-body 3D motion capture, facial recognition and voice recognition capabilities, for its game console Xbox 360.

• **2012** - HTML5 subsumes the previous version, HTML4. HTML5 is a W3C “Candidate Recommendation”; it is able to run on low powered devices such as smartphones and tablets.

• **2013** - Twitter offered Vine, a mobile app that enables its users to create and post short video clips.
  - Sony released its PlayStation 4 a video game console, which is to be integrated with Gaikai, a cloud-based gaming service that offers streaming video game content.
  - 4K resolution TV started to be available in the consumer market.
Netflix on Cloud Computing
Amazon Fire TV / Apple TV
YouTube
Virtual Reality
Augmented Reality
IoT (Internet of Things)