Curriculum Development Centers Program

Awardee of The Office of the National Coordinator for Health Information Technology

Component 4: Introduction to Information and Computer Science

Unit 2: Internet and the World Wide Web

Lecture 1

This material was developed by Oregon Health & Science University, funded by the Department of Health and Human Services, Office of the National Coordinator for Health Information Technology under Award Number IU24OC000015.

Unit Objectives

- Definition of the Internet and World Wide Web.
- Connecting to the Internet.
- Searching the Internet, filtering results and evaluating credibility of results.
- Internet security and privacy concerns.
- Ethical considerations of the Internet.
- Online healthcare applications and associated security and privacy issues (including HIPAA).

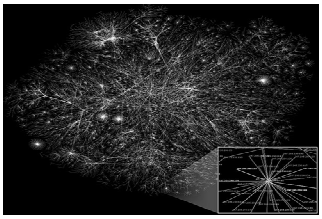
What is the Internet?

- According to Wikipedia:
  - ✓ "The Internet is a global system of interconnected computer networks that use the standard Internet Protocol Suite (TCP/IP) to serve billions of users worldwide."
- The hardware that makes up the Internet is cabling, routers, switches, servers, and computers that host documents, audio, video, etc.

What is the Internet (cont'd)

- In other words, the Internet is a large network made up of many smaller networks.
  - ✓ Computers connect to the Internet via an ISP (Internet Service Provider) such as AT&T, Bell South, Qwest, etc.

Visualization of the various routes through a portion of the Internet. From 'The Opte Project.'



The Origins of the Internet

- The Internet has its roots in the US Government's desire to still be able to communicate, even in the event of a nuclear strike.
  - ✓ This network was named ARPANET, an acronym for Advanced Research Projects Agency Network.
- Original Internet consisted of four computer (servers) operating at UCLA, UC-SB, Stanford (SRI International), and the Univ. of Utah in 1969.

The Internet Today

- The world quickly saw its benefits and the Internet continued to grow, especially in the mid 1990s.
  - ✓ In 1995, it is estimated that 16 million people were using the Internet.
  - ✓ Today it is estimated that more than 1.8 billion people use the Internet.

The Internet Spawns the World Wide Web

- They are not the same thing!
- According to Wikipedia:
  - ✓ "The Web is one of the services that runs on the Internet. It is a collection of interconnected documents and other resources, linked by hyperlinks and URLs."
- A URL (uniform resource locator) is an address you type into your browser's address line, such as www.whitehouse.gov.
- The WWW is often referred to as the "Web".

Who Created the Web?

- British scientist Tim Berners-Lee created the WWW in 1989 by introducing a Web browser and Web page coding.

Tim Berners-Lee on 18 November 2005

How Does the Web Work?

- A browser is a software program that lets the user interact with the Web by facilitating connection to other Web servers over the Internet.
- The browser uses HTTP to communicate with Web servers to get Web page content.
- The Web server sends HTML coding back to the browser, which translates the HTML coding for display on a monitor.

HTML - The Language of the Web

- Web pages are text files written in the HTML programming language.
- HTML example for a simple Web page:

HTML Code:

```
<html>

<head>
<H1>This is the Web Page's Header</H1>
</head>

<body>
<P>This is the Web page's text area</P>
</body>

</html>
```

HTML tags

Web Page:

This is the Web Page's Header

This is the Web page's text area

The World's First Web Server

- This NeXT Computer was used by Sir Tim Berners-Lee at CERN and became the world's first Web server.

Who Owns the Web?

- No entity owns the Internet but people and organizations own the devices that connect to the Internet and form the WWW.
  - ✓ However, the Google vs. China saga clearly illustrates how a country can repress what its citizens read.

Standardized Communications

- Internet Protocols are a global standard, ensuring interoperability between hardware and software devices.
  - ✓ Protocols such as HTTP allow any browser to talk to any Web server.
  - ✓ TCP/IP transports HTTP across the Internet for delivery to its destination.

Internet Addressing Basics

- All Internet communication utilizes IP addressing.
- The Internet expects each communicating device (known as a host) to possess an Internet Protocol (IP) address and subnet mask, which is a group of numbers in the format of:
  - ✓ IP address: 192.168.10.1
  - ✓ Subnet mask: 255.255.255.0

Internet Addressing Basics (cont'd)

- Means that this host is in the 192.168.10.x network.
- This network can legally have addresses in the range of 192.168.10.1 through 192.168.10.254.
- Networking devices and software use 192.168.10.0 and 192.168.10.255 for routing and communication.
- Valid numbers are in the range of 0-255.

How to Obtain an IP Address…

- Some IP addresses can be purchased (or leased) and used by the owner of that IP address or IP address range.
  - ✓ These are referred to as public IP addresses.
  - ✓ Most IP addresses are public addresses.
- Other IP address can be used by anyone.
  - These are referred to as private IP addresses.
  - ✓ Examples include 10.0.0.0, 172.16.31.0, and 192.168.0.0.
  - ✓ IP addressing is beyond the scope of this unit.

Introducing Domain Names

- The Internet supports the use of domain names.
  - ✓ Imagine trying to navigate the Internet using IP addresses and not names!
- Since people remember names better than numbers, the domain naming system (DNS) was created.

DNS & IP Work Well Together

- DNS maps an IP address to a domain name.
- When you visit http://www.whitehouse.gov, your computer must first figure out this Web site's IP address.
  - ✓ One IP address for this site is 65.126.84.121. This Web site is probably associated with many IP addresses.
- Domain name resolution is accomplished through the use of DNS servers, which are located throughout the world.

DNS & IP Work Well Together (cont'd)

- All domain names are mapped to an IP address and stored on global and privately-owned DNS servers.
- Global DNS servers are known as "root servers" and work together to map the globe's names to their IP addresses.
- When your browser learns the destination site's IP address from the DNS server, communication begins!

What is a Domain Name?

- People and organizations can purchase a domain name from ICANN.
- According to Wikipedia:
  - "A domain name is an identification label that defines a realm of administrative autonomy, authority, or control on the Internet, based on the Domain Name System (DNS)."
- Domain names are made up of three pieces:
  - The domain name www.whitehouse.gov indicates a government site with the purchased domain name of "whitehouse", which is found on the WWW.

Connecting to the Internet

- Devices commonly connect to the Internet via dial-up, broadband, Wi-Fi, satellite, and 3G.
  - ✓ Dial-up – copper phone lines to connect to an ISP's modem. Limited to a speed of 56 Kbps.
    - ➢ The slowest connection type!
  - ✓ Broadband – higher quality copper phone lines, coaxial cable, or fiber optic connection type.
    - ➢ Faster than dialup and in the approximate range of 768 Kbps and higher.

Connecting to the Internet (cont'd)

- Wi-Fi – wireless (radio frequency) connection type.
  - ✓ Wi-Fi refers to the IEEE 802.11 standard governing wireless technologies.
  - ✓ Typically used to connect laptops to WAPs. The WAP is connected to the wired network to gain access to the Internet.
  - ✓ Also used extensively by hotels and airports.
  - ✓ Wireless speeds range from 1 Mbps to 200+ Mbps, depending on a variety of factors.

Connecting to the Internet (cont'd)

- Satellite – Connection to a ground satellite dish (antennae) and the satellite relays signals to a satellite orbiting the earth. Then the orbiting satellite relays the signal to another ground satellite dish.
  - ✓ Can be somewhat slow because of the time it takes to make a round trip. The loss of speed is known as "latency."
- 3G – The 3rd Generation of standards governing mobile telecommunications.
  - ✓ Speed ranges from 2 Mbps – 5 Mbps, depending on plan and location.