Networking at the UW, The Internet, and the World Wide Web

Various computers in various locations will be used in this class, so a quick introduction to their arrangement and to the concept of networking is useful.

We’ll also find out the difference between the Internet and the World Wide Web.

Computers come in all shapes and sizes

- The specifics of how computers work will be covered later. For now, think of them as having many forms and many names.
  - **Embedded** – processor, ROM, channels to sensors/actuators; think of a microwave, or a newer toaster oven
  - **Laptop** – processor, RAM, floppy disk, hard disk, LCD; mobility
  - **Desk Top** – processor, RAM, floppy disk, hard disk, CD, monitor; educational and office work
  - **Server** – processors (4-32), RAM, many hard disks, CD; services
  - **Supercomputer** – processors (16-1000), RAM, hard disks; big science

Computers At the UW

- FIT 100 uses
  - **Laptops** for portability (me working at home!)
  - **Desktops** in Labs (MGH, OUGL)
  - **Server [Dante or Homer]**: holding your computer account for email, web pages, and other files

- An unconnected computer can only get to data that is stored locally on its hard disk, etc.

- The UW computers are connected (i.e. networked) together. Allows us to send email, transfer files, and access the WWW.

Networking

More than just a social interaction!
Networks connect computers – making them much more useful than just a single terminal

- Access more information and software
- Help users communicate, exchange information
  - Changing our ideas about social interaction
- Perform services for one another
  - (networked printers, etc.)

- The UW networks “exchange” more than ½ trillion bytes of data per day
  - Half of this exchanged data goes to or comes from the Internet

How are these networks arranged?

- Connection to campus network infrastructure
- Ethernet

Ethernet...Imagine a party conversation

- Ethernet technology: It's like students sitting around the dorm room telling stories...
  - Everyone listens (politely, of course) while one person talks
  - When the story is finished, there is a pause
  - A person with another story to tell starts talking, but listening at the same time
    - If no one else starts talking, the person continues
    - If others starts talking, he/she stops and waits a moment before trying again

UW Networks Connect to The Internet

- The subnetworks of campus interconnect the computers of the UW domain (.washington.edu), which is connected to the Internet via a Gateway
What is the Internet?

- A network of networks
  - A worldwide system of computer networks
  - ARPA Net (1969)
    + Advanced Research Projects Network

- Technically, the Internet is all computers using the same communication protocol so we all “speak the same language”
  - TCP/IP
    + Transmission Control Protocol/Internet Protocol

- Physically, the Internet is the totality of wires, fibers, satellite links and switches connecting named computers

Protocols Rule!

- Protocol and Application
  - Protocol - set of rules or common language
  - Application - the software or program

- The Internet could not exist in its current form without protocols determining how information is:
  - Sent
  - Processed
  - Communicated
  - …

- You may be familiar with these applications and the protocols they rely on:
  - WWW or web browsers (http)
  - Email (smtp, imap, pop)
  - SSH (sftp)
  - TeraTerm (SSH and telnet)

Rules of the Road

- How is the information sent across the Internet?
  - Information such as email, web pages, phone calls – anything sent over the Internet – is broken up into units called packets
  - Packets contain an IP address, a sequence number and some of the actual information (like part of the whole email message)
  - This process is part of the scheme called the Transmission Control Protocol and Internet Protocol, or TCP/IP
  - The packets make their way, usually by different routes, to the destination address where they are reassembled in order to reconstruct the original message

How is Information is Sent?

- Here is an analogy of how information is sent on the Internet:
  - Imagine sending a novel you just wrote from Singapore, where you live, to New York City, where your publisher lives, using only postcards

  #1 of 5500
  Call me Ishmael. Some years ago – never mind how long precisely – having little or no money in my purse, and nothing particular to interest me on shore, I thought I would sail about a little and see the watery part of the world.

  Timeless Books
  1423 28th Ave
  NYC, NY
  USA

  HK

  LA
What's in a Name?

How are Computers Named Logically (for us humans)

How are Computers Named Physically
(names for computers, by computers!)

How are Computers Named Logically?

❖ The logical way to name computers is by using domains
  ❖ All education institutions .edu
  ❖ The UW .washington.edu
  ❖ The Information School ischool.washington.edu
  ❖ WebCT webct.ischool.washington.edu

❖ Notice the scheme is hierarchical
  ❖ Easier to remember names
  ❖ Names are associated with like units
  ❖ No limit to size or organizational depth

Logical vs. Physical Network

Important Concept:
❖ In computing it is common to separate the logical idea of something - - the way you think about it, from the physical implementation - - how it is actually built.
❖ This is called a physical/logical separation
❖ In networking, the domain names make up the logical network. Domains consist of a hierarchical arrangement of names that tell us associations:
  ischool.washington.edu
❖ The computers actually use the physical addresses
❖ The DNS makes the connection between the two, so you don’t have to.

How are Computers Named Physically?

❖ The physical way to name computers is to use an Internet Protocol address, or IP address
  - webct.ischool.washington.edu 128.208.100.153
  - ischool.washington.edu 128.208.100.150
  - washington.edu (one of many) 140.142.15.163

❖ The Domain Name System (DNS) associates human readable names with the physical IP addresses for use by the computers and routers of the Internet
What is the WWW?

A general description:

❖ “All resources and users on the Internet that are using the Hypertext Transfer Protocol (HTTP)”
   ~Definition from whatis.com~

❖ “The World Wide Web is the universe of network-accessible information, an embodiment of human knowledge.”
   ~World Wide Web Consortium (W3C)~

The World Wide Web includes all computers, called web servers, that are capable of sending information to your browser.

In most domains the computer that is the web server is called “www”, e.g. www.washington.edu

However, a web server can have any name … your web pages will be served by students.washington.edu

The main protocol used to connect to these web servers is:

- Hyper-text transfer protocol, http, for web pages
- Another protocol that can be used in combination with http is: File transfer protocol, ftp, for moving copies of files

Client/Server Model

❖ Client
   - Any computer that requests information

❖ Server
   - Any computer that provides a service
What is a Web Browser?

- An application using the HTTP Protocol
- Allows people to interact and look at information on the World Wide Web
- Netscape, Internet Explorer, AOL, Opera – all offer graphical user interfaces (GUI's)

Web Pages

- Web pages are just text files containing instructions for your browser on how to lay out (format) the web page
- Web pages can be created with a text editor (like Notepad)
  - You will be using text editors
- Web pages can be created with special tools (like FrontPage or DreamWeaver)
  - You won’t be using these tools
- The instructions for the browser are written in a special language, hyper-text mark-up language, HTML
- You can always take a look at the HTML that is being used to display the web page in a browser by selecting “Source” from the View menu in your browser

HTML from FIT 100 Home Page

```html
<HTML>
<HEAD>
<TITLE>Home Page for CSE/INFO 100</TITLE>
<LINK rel=stylesheet href="fitstyles.css" type="text/css">
</HEAD>
<BODY>
  <A NAME="top"></A>
  <TABLE border=0 cellpadding=10 width=700>
    <TR>
      <TD valign=top rowspan=5 bgcolor="#336699" width=150>
        <P class="menu"><A href="#Announcements"><font color="#FF0000">ANNOUNCEMENTS</font></A></P>
      </TD>
      <TD width=550>
        <P class="title"><B>FIT 100, Spring 2002</B></P>
        <P class="subtitle">Fluency With Information Technology</P>
      </TD>
    </TR>
    <!-- More content... -->
  </TABLE>
</BODY>
</HTML>
```

Where are YOU and your web page in this scheme?

- You have been give web page space on a web server in one of the subdomains:
  - students.washington.edu
- To find YOUR page at the UW, a user would enter in the name (address) of the subdomain where your account is stored and the path to your account:

  ```
  http://students.washington.edu/UWNetID/
  ```
### Deconstructing a URL

http://courses.washington.edu/gbw/fit100sp02/labs/Lab1.htm

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>protocol</strong></td>
<td>http://</td>
<td>(HyperText Transfer Protocol)</td>
</tr>
<tr>
<td><strong>subdomain</strong></td>
<td>courses</td>
<td></td>
</tr>
<tr>
<td><strong>domain</strong></td>
<td>.washington</td>
<td>(Educational Institution)</td>
</tr>
<tr>
<td><strong>TLD</strong></td>
<td>.edu</td>
<td></td>
</tr>
<tr>
<td><strong>path (folders)</strong></td>
<td>/gbw/fit100sp02/labs</td>
<td></td>
</tr>
<tr>
<td><strong>file</strong></td>
<td>Lab1</td>
<td></td>
</tr>
<tr>
<td><strong>extension</strong></td>
<td>.htm</td>
<td>(hypertext markup language)</td>
</tr>
</tbody>
</table>

### For Monday

- The website reveals all!!!!
- Check the calendar for assignments and readings