Details before we start

Course Web Page
http://courses.washington.edu/qbw/fit100/

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.

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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 (432), RAM, many hard disks, CD; services
  - **Supercomputer** – processors (16-1000), RAM, hard disks; big science

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What you’ve accomplished in 3 short days…!

- You understand more about your computer space on Dante, the group of computers with space for student email, files, and web pages
- You have transferred files between a local computer and your remote account storage space using SSH Secure File Transfer.
  - This is a more secure protocol than regular FTP (File Transfer Protocol)
Class Computers

- FIT 100 uses Laptop for lectures
- Desktops in Labs (MGH, OUGL)
- Dante Server: 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 …

- 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

MGH 030

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

Local Area Network (LAN)

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

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

What’s in a Name?

How Computers are Named Logically (for us humans) vs.
How Computers are 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

Country Pairs
- .ca - Canada
- .de - Germany (Deutschland)
- .fr - France
- .es - Spain (España)
- .uk - United Kingdom
- .us - United States

Top Level
- .com
- .edu
- .gov
- .org
- .mil
- .net
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.

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.

What is the Internet?

- The Internet is the totality of wires, fibers, satellite links and switches connecting named computers.
- A network of networks:
  - A worldwide system of computer networks
  - ARPANET (1969) – Advanced Research Projects Network
- Uses a basic communication protocol so we all “speak the same language”
  - TCP/IP
- http://www.netsizer.com/

The Internet Protocol

- How is the information sent?
  - 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 Sent?

Imagine sending a novel you just wrote from Singapore, where you live, to New York City, where your publisher lives, using only postcards.

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

You may be familiar with:
- WWW or web browsers (http)
- Email (smtp, imap, pop)
- SSH (sftp)
- TeraTerm (SSH and telnet)

What is the World Wide Web?

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 (Netscape, IE, etc.)

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.

There are different ways (schemes) to connect to these servers:
- Hyper-text transfer protocol, http for web pages
- File transfer protocol, ftp for moving copies of files
  - The UW now uses sftp, or Secure File Transfer Protocol

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 all the 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)
  - Web pages can be created with special tools (like FrontPage or DreamWeaver)
- 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
Where are YOU and your web page in this scheme?

- You have been given 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://www.ischool.washington.edu/research/newsletter.htm

scheme = http:// (HyperText Transfer Protocol)
host = www (World Wide Web)
subdomain = .ischool
domain = .washington
TLD = .edu (Educational Institution)
path (folder) = /research/
file = newsletter
extension = .htm (hypertext markup language)

For Friday

- Read Chapter 3 of the FIT coursepack
- Make sure you have added the course!
- Make sure your Dante services have all been activated