# 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

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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 W W W

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 044

PC PC PC PC PC

Local Area Network (LAN)
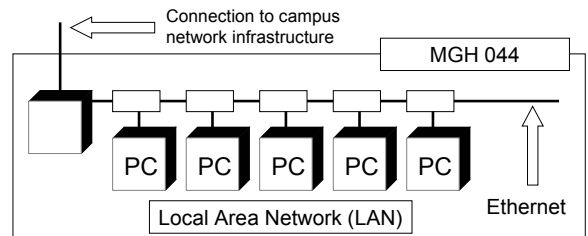
Ethernet

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)

PC PC PC PC PC   Ethernet
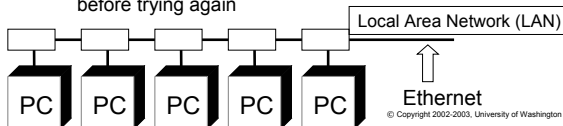
UW Networks Connect to The Internet

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

Homer
U

Dante

CS

MGH 044

Gate way

Switch
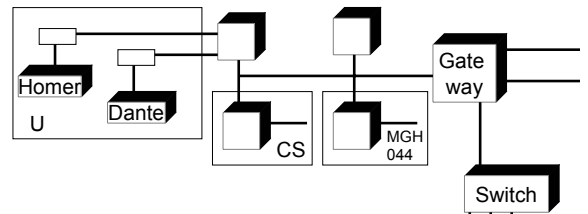
What is the Internet?

- 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
  - http://www.netsizer.com/

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:
  - W W W or web browsers (http)
  - Email (smtp, imap, pop)
  - SSH Secure File Transfer (secure ftp)
  - TeraTerm (SSH, formerly 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
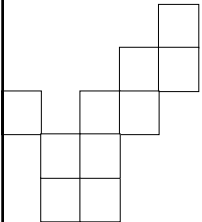
address	#	data

Class Interaction!!!!!

- I need 6 volunteers

- Who is sitting in Row J, seat 8?

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 (groups of related things)
  - 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

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

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

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

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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.

More On Logical Networks

Client / Server Model

- Client / Server is a method of **distributed computing.**
- Server computers delivers services to client computers.
  - □ Client: Any computer that requests information
  - □ Server: Any computer that provides a service
- The UW server you will access is called **Dante**
  - □ Dante is a server group made up of ~50 servers
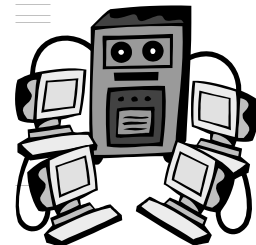
Client / Server

- What does this mean to you?
  - □ The UW Networks are on a client/server system.
  - □ Save your files to a server instead of an individual Desktop computer …
    That means access to files from any computer on the network (local or Internet)
    - As long as you have the right tools

World Wide Web

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)~

World Wide Web

- 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

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 this quarter!

- 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>
    <HEAD>
        <TITLE>Home Page for CSE/INFO 100</TITLE>
    </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>
            <P CLASS="menu">
            <A HREF="index.shtml">Home</A> </P>
    <P CLASS="menu"><A HREF="calendar.shtml">Calendar</A></P>
    <P CLASS="menu">
    </TD>
            <TD WIDTH=550>
            <P class="title"><B>
            FIT 100, Autumn 2002</B>
            </p>
                    <p class="subtitle">
                    Fluency With Information Technology
                    </P>
    </TD>
        </TR>
    ...
```

Where are YOU and your web page in this whole Network scheme?

- You have been give web page space on a web server in one of the subdomains of the University of Washington:

  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:

Protocol: Tells browser how to deal with file	Subdomain Name: Name of server where account is located	Path Name: Location of user directory on subdomain machine

http://students.washington.edu/**UWNetID**/

Deconstructing a URL

http://courses.washington.edu/fit100/au02/labs/lab3.htm

protocol	=	http:// (HyperText Transfer Protocol)
subdomain	=	courses
domain	=	.washington
TLD	=	.edu (Educational Institution)
path (folders)	=	/fit100/sp02/labs
file	=	lab3
extension	=	.htm (hypertext markup language)

For Monday

- The website reveals all!!!!

- Check the calendar for future assignments and readings
  - □ Assignment 1 (Searching) is due next Wednesday
  - □ Read Chapter 5 for Monday