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

FIT 100

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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FIT 100 Computers come in all shapes and sizes

- v The specifics of how computers work will be covered later. For now, think of them as having many forms and many names

  - o **Embedded** – processor, ROM, channels to sensors/actuators; think of a microwave, or a newer toaster oven

  - o **Laptop** – processor, RAM, floppy disk, hard disk, LCD; mobility

  - o **Desk Top** – processor, RAM, floppy disk, hard disk, CD, monitor; educational and office work

  - o **Server** – processors (4-32), RAM, many hard disks, CD; services

  - o **Supercomputer** – processors (16-1000), RAM, hard disks: big science

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FIT 100 Class Computers

- v FIT 100 uses
  - **Embedded** in many MGH A/V components
  - **Desktops** in Labs (MGH, OUGL)
  - **Dante Server**: holding your computer account for email, web pages, and other files

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

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

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Networking

More than just a social interaction!

FIT 100 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
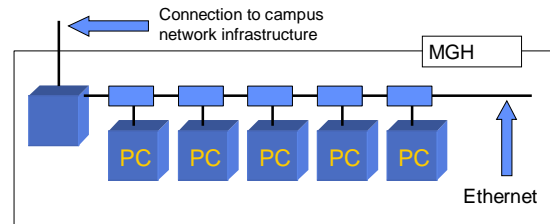 - Half of this exchanged data goes to or comes from the Internet

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FIT 100 How are these networks arranged?

Connection to campus network infrastructure

MGH

PC PC PC PC PC

Ethernet

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FIT 100 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
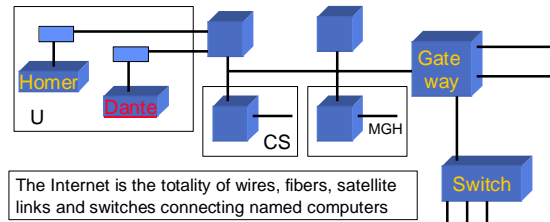   - If others starts talking, he/she stops and waits a moment before trying again

Local Area Network (LAN)

PC PC PC PC PC

Ethernet
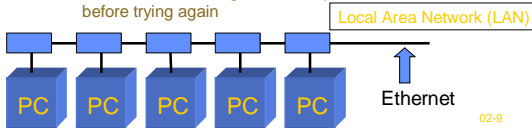
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FIT 100 UW Networks Connect to The Internet

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

Homer

Dante

U

CS

MGH

Gate way

Switch

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

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What's in a Name?

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How Computers are Named Logically (for us humans)

vs.

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

How are Computers Named Logically?

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v The logical way to name computers is by using domains

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

  o All education institutions   .edu
  o The UW   .washington.edu
  o The Information School   ischool.washington.edu
  o WebCT   webct.ischool.washington.edu

v Notice the scheme is hierarchical

  o Easier to remember names
  o Names are associated with like units
  o 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

How are Computers Named Physically?

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v 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

v 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

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Important Concept:

  o 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.

  o This is called a physical/logical separation

  o 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

  o The computers actually use the physical addresses

  o The DNS makes the connection between the two, so you don't have to.

FIT 100 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
  - ARPA Net (1969)
    - Advanced Research Projects Network

- Uses a basic communication protocol so we all "speak the same language"
  - TCP/IP
    - Transmission Control Protocol/Internet Protocol

1/10 http://www.netsizer.com/

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FIT 100 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
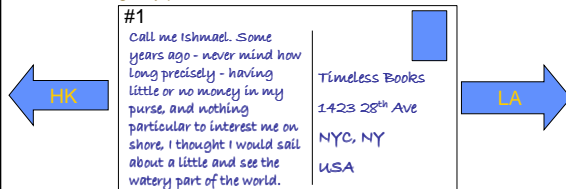
address	#	data

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FIT 100 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

HK

#1
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

LA

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FIT 100 Internet Applications

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

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

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FIT 100 — What is the World Wide Web?

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FIT 100 — 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)~

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FIT 100 — World Wide Web

▽ 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

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FIT 100 — Client/Server Model

▽ Client
    ○ Any computer that requests information

▽ Server
    ○ Any computer that provides a service

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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)
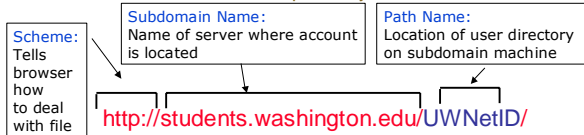
- The instructions for the browser are written in a special language, hyper-text mark-up language, HTML

- 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

HTML from UW Home page

```
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.0//EN"
"http://www.w3.org/TR/REC-html40/strict.dtd">

<HTML>
<HEAD>
<TITLE>University of Washington Home Page</TITLE>
<meta name="description" content="Official Web site of the University of
Washington, the major research university in the Pacific Northwest.">
<LINK REL="stylesheet" HREF="/home/home.css" TYPE="text/css">
<script language="Javascript" type="text/javascript">
<!--
function mIn () { return true; }
function mOut () { return true; }
function makeLayer () { return true; }
if (document.layers || document.all)
    document.write ("<script src='home/scripts/flyout.js' " +
                   "language='Javascript1.2' type='text/javascript'>" +
                   "<\/script>\n");
// -->
</script>
</HEAD>

<BODY BGCOLOR="#FFFFFF">
<TABLE BORDER="0" CELLSPACING="0" CELLPADDING="0">
<TR>
    <td colspan="5"><img src="/home/graphics/uwbanner.jpg"
       width="403" height="65" alt="University of
    Washington"></td></tr>
```

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:

Subdomain Name:
Name of server where account is located

Path Name:
Location of user directory on subdomain machine

Scheme:
Tells browser how to deal with file

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

Deconstructing a URL

FIT 100

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

FIT 100

ᵥ Check Web for reading assignment

ᵥ Make sure your Dante services have all been activated