

### Test Your Tech

A local area network is:

- A. An exclusive social club.
- B. A group of computers, usually in a single building, connected by cables.
- C. Local television affiliates of the big networks.

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### Announcements

- Videocasts of the course are available within a couple hours after each lecture
  - Linked at top of Calendar on the course Web site

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### Drop-In Labs—11:30-12:20

- MGH 030
  - October: 1st, 15th, 17th, 22nd
  - December 3rd
- MGH 044
  - September: 24th, 26th, 29th
  - October: 3rd, 6th, 10th, 20th, 24th, 29th, 31st
  - November: 5th, 7th, 14th, 21st, 26th
  - December: 1st and 5th

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**Get help outside of your regular lab or lecture**

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### Drop-In Labs


- More dates and times are coming!



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# Networking

*More than just a social interaction*




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## Networks...

Computers are useful alone, but are better when connected (networked)

- Access more information and software than is stored locally
- Help users to communicate, exchange information ... changing ideas about social interaction
- Perform other services -- printing, Web,...

UW's networks move more than trillion bytes per day




## Networking Changes Life

The Internet is making fundamental changes

1. Nowhere is remote—access to info is no longer bound to a place
2. Connecting with others—email is great
3. Revised human relationships—too much time spent online could be bad
4. English becoming a universal language
5. Enhanced freedom of speech, assembly

Can you think of others?




## Network Structure

Networks are structured differently based (mostly) on how far apart the computers are

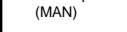
- Local area network (LAN) -- a small area such as a room or building
- Wide area networks (WAN) -- large area, e.g. distance is more than 1 Km

Internet: all of the wires, fibers, switches, routers etc. connecting named computers



## Basic Types of Networks


| Network Type                      | Differentiating Factors   |
|-----------------------------------|---|
| Peer-to-Peer                      | • No computer running server software   |
| Server-Based Networks             | • Computer running server software manages network traffic  |
| • Local Area Network (LAN)        | • Limited geographical area<br>• One-time capital cost (wire or fiber optics cable installation)  |
| • Wide Area Network (WAN)         | • Across town or across the globe<br>• Third-party service provider (monthly \$\$)<br>• More bandwidth = more expense<br>• Connects to LANs with a router |
| • Campus Network                  | • One-time capital expense<br>• Buildings in close proximity  |
| • Metropolitan Area Network (MAN) | • Clusters of buildings in close proximity separated from other clusters<br>• Third-party service provider (monthly \$\$)                                 |



## Protocol Rules!

To communicate computers need to know how to set up the info to be sent and interpret the info received

- Communication rules are a *protocol*
- Example protocols
  - EtherNet for physical connection in a LAN
  - TCP/IP—transmission control protocol / internet protocol—for Internet
  - HTTP—hypertext transfer protocol—for Web





## Naming Computers I

People name computers by a domain name -- a hierarchical scheme that groups like computers

.edu All educational computers  
 .washington.edu All computers at UW  
   dante.washington.edu A UW computer  
   .ischool.washington.edu iSchool computers  
 Peers → .cs.washington.edu CSE computers  
           june.cs.washington.edu A CSE computer

Domains begin with a "dot" and get "larger" going right

## Naming Computers II

Computers are named by IP address, four numbers in the range 0-255

cse.washington.edu: 128.95.1.4  
 ischool.washington.edu: 128.208.100.150

- Remembering IP addresses would be brutal for humans, so we use domains
- Computers find the IP address for a domain name from the *Domain Name System* -- an IP address-book computer

A computer needs to know IP address of DNS server!

## Domains

.edu .com .mil .gov .org .net domains are "top level domains" for the US

- Recently, new TLD names added
- Each country has a top level domain name: .ca (Canada), .es (Spain), .de (Germany), .au (Australia), .at (Austria), .us

The FIT book contains the complete list

## Logical vs Physical

There are 2 ways to view the Internet

- Humans see a hierarchy of domains relating computers -- logical network
- Computers see groups of four number IP addresses -- physical network
- Both are ideal for the "users" needs
- The Domain Name System (DNS) relates the logical network to the physical network by translating domains to IP addresses

## Client/Server Structure

The Internet computers rely on the client/server protocol: servers provide services, clients use them

- Sample servers: *email server, web server, ...*
- UW servers: *dante, courses, www, student, ...*
- Frequently, a "server" is actually many computers acting as one, e.g. dante is a group of more than 50 servers

Protocol: Client packages a request, and sends it to a server; Server does the service and sends a reply

## World Wide Web

World Wide Web is the collection of servers (subset of Internet computers) & the information they give access to

- Clearly, WWW ≠ Internet
- The "server" is the web site computer and the "client" is the surfer's browser
- Many Web server's domain names begin with www by tradition, but any name is OK
- Often multiple server names map to the same site: MoMA.org and www.MoMA.org

### Client/Server Interaction

For Web pages, the client requests a page, the server returns it: there's no connection, just two transmissions

Servers serve many clients; clients visit many servers

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### Dissecting a URL

Web addresses are URLs, **Uniform Resource Locator**, IP address + path

- URLs are often *redirected* to other places:  
<http://courses.washington.edu/fit100/>  
 goes to  
<http://courses.washington.edu/fit100/au08/>

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- URLs are often *redirected* to other places; e.g.  
<http://www.cs.washington.edu/100/> goes to  
<http://www.cs.washington.edu/education/courses/100/04wi/index.htm>

|                |                                |                           |
|----------------|--------------------------------|---------------------------|
| protocol       | = http://                      |                           |
| Web server     | = www                          |                           |
| domain         | = .cs.washington.edu           |                           |
| path           | = /education/courses/100/04wi/ | directories (folders)     |
| file           | = index                        |                           |
| file extension | = .htm                         | hypertext markup language |

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### Summary

Networking is changing the world  
 Internet: named computers using TCP/IP  
 WWW: servers providing access to info

- Principles
  - Logical network of domain names
  - Physical network of IP addresses
  - Protocols rule: LAN, TCP/IP, http, ...
  - Domain Name System connects the two
  - Client/Server, fleeting relationship on WWW

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