Announcements

- Pair Programming Begins Today ... more later
Connected computers are better! How’s it done?

Networking ...

Lawrence Snyder
University of Washington, Seattle
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, email, texting, mobile, etc.

**Today’s Message:** Internet is NOT really a bunch of tubes!
Networks are structured differently based (mostly) on distance between computers:

- **Local area network (LAN)**
  - Small area: room or building
  - Either wired (Cu or fiber) or wireless

- **Wide area networks (WAN)**
  - Large area: more than 1 km
  - Fiber-optic, copper transmission lines, μ-wave, satellite

- **Metropolitan area networks (MAN)**
  - Neighborhood or several blocks of business district
  - Private service provider owns network
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—for Internet—transmission control protocol / internet protocol
  - HTTP—for Web—hypertext transfer protocol
EtherNet is a popular LAN protocol

- It uses a “party” protocol
The campus subnetworks interconnect computers of the UW domain which connects to Internet via a gateway.
Information is sent across the Internet using IP—Cerf uses postcard analogy

- Break message into fixed size units
- Form IP packets with destination address, sequence number and content
- Each makes its way separately to destination, possibly taking different routes
- Reassembled at destination forming msg

Key Point: Taking separate routes lets packets bypass congestion and out-of-service switches; packet reassembly discovers lost packets; ask for resend
Picture of Portion of I’net 2005
## A Quick Trip to Switzerland

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<th>Hop</th>
<th>Time</th>
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Wireless is a LAN technology

- As with “wired Ethernet,” all computers in range can hear the radio signals of the others.
People name computers by a domain name

- a hierarchical scheme that groups like computers
  - .edu All educational computers, a TLD
  - .washington.edu All computers at UW
  - dante.washington.edu A UW computer
  - ischool.washington.edu iSchool computers
  - cs.washington.edu CSE computers
  - spiff.cs.washington.edu A CSE computer

Domains begin with a “dot” and get “larger” going right
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!
.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 (US)

Do you know sites like:
- bit.ly
- www.nba.tv
- del.icio.us
- … they exploit TLDs
Logical vs Physical

View the Internet in two ways:

1. Humans see a hierarchy of domains relating computers—logical network
2. Computers see groups of four number IP addresses—physical network (my computer: 128.208.3.136)

Both are ideal for the “user's” needs

- The Domain Name System (DNS) relates the logical network to the physical network by translating domains to IP addresses
Finding A Picture … Opportunity

www.jpl.nasa.gov/spaceimages/details.php?…
To get to www.jpl.nasa.gov use authoritative name servers (ANS)

It knows IP-Address of ANS for every Sub Domain
Finding A Picture ... Opportunity

www.jpl.nasa.gov.root
Many people mis-use the terms “Internet” and “World Wide Web”

Let’s get them right

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

Web: That part of the Internet —web servers—that store info and serve Web pages and provide other services to client computers
The Web and much of the Internet services use the client server form of interaction.

- It’s a VERY BRIEF relationship
Client/Server Is Also Smart

- Clients and servers are not connected – they only exchange info ... “no commitment issues”
Networking changed the world

Internet: named computers using TCP/IP
WWW: servers providing Web pages

- **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
Pair Programming

- Pair programming – two people work side-by-side programming one problem together
  - It’s thought to be more productive – fewer errors, smarter code
  - It’s certainly more fun
- CSE120 Rules –
  - ALL CODING WORK ON PROJECT MUST BE DONE TOGETHER
  - Share coding duties, commenting duties
- Teams: comparable skill, compatible times