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.

Announcements

• Homework 1
  • Grading link
    • We are the first class on campus that will have grading linked to MyUW
      • Check MyUW for current status on points for the course
      • Will be set up in the next couple weeks

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

Announcements

• Lab sections have pretty much settled
• Labs are pretty full
• Opportunity for more help, smaller class size
  • Lab AE on W-F mornings at 8am
  • Only 9 students are registered

Announcements

• Maps to our offices for office hours
  • On course Web site’s Home page
Networking

More than just a social interaction

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

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

LAN in the Lab

EtherNet is a popular LAN protocol
- Recall, it's a "party" protocol
- Connection to campus network infrastructure

Typical MGH or OUGL Lab

Ether Net
Cable

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

Can you think of others?

Networking Changes Life

The Internet is making fundamental changes... The FIT text gives 5 ways
- Nowhere is remote -- access to info is no longer bound to a place
- Connecting with others -- email is great
- Revised human relationships -- too much time spent online could be bad
- English becoming a universal language
- Enhanced freedom of speech, assembly

Can you think of others?
Campus & The World

The campus subnetworks interconnect computers of the UW domain which connects to Internet via a gateway.

All communication by TCP/IP

IP -- Like Using Postcards

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

Taking separate routes lets packets by-pass congestion and out-of-service switches

A Trip to Switzerland

A packet sent from UW to ETH (Swiss Fed. Tech. University) took 21 hops

TCP/IP

Packet-Switching Animation

Check Internet Hops

Interested?
- Find software called Visual Routes (personal evaluation copies are free) at http://www.visualroute.com
- Download a copy of the software
- Install software and type in foreign URLs
  - Switzerland  eth.ch
  - Australia www.usyd.edu.au
  - Japan kyoto-u.ac.jp
  - South Africa  www.uct.ac.za
- Use Google to find foreign computers

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
- .cs.washington.edu   CSE computers
- june.c.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
Dissecting a URL

Web addresses are URLs, uniform resource locator, an IP address+path

- URLs are often redirected to other places;

<table>
<thead>
<tr>
<th>protocol</th>
<th>= http://</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web server</td>
<td>= www</td>
</tr>
<tr>
<td>domain</td>
<td>= cs.washington.edu</td>
</tr>
<tr>
<td>path</td>
<td>= education/courses/100/04wi/ directories (folders)</td>
</tr>
<tr>
<td>file</td>
<td>= index</td>
</tr>
<tr>
<td>file extension</td>
<td>= .htm hypertext markup language</td>
</tr>
</tbody>
</table>

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