Test Your Tech

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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

- For Friday, read chapter 4 of *Fluency*

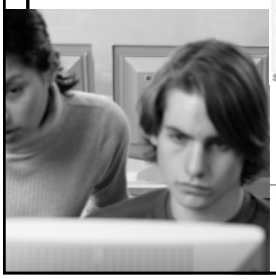
Announcements

- Slides for Monday and today are now available on the course Calendar.
- My goal
  - Post the slides the night before lecture so you can print them before lecture and not have to write everything down!

Announcements

- Pop quizzes begin in lab this week
- One every week on a day of my choice

Drop-In Labs



Office Hours, Drop-In Labs, and CLUE Tutoring

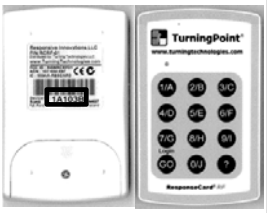
When	Where	What
Tuesdays 830-920am *New day and time!*	MGH 430	Drop-In Labs
Tuesdays 330-420pm	MGH 330J	Office Hours
Wednesdays 130-230pm	MGH 430	Drop-In Labs
Wednesdays 630-800pm *New day*	MGH 044	CLUE Tutoring
Thursdays 830-920am *New day and time!*	MGH 430	Drop-In Labs
Fridays 130-220pm	MGH 430	Drop-In Labs

Students from any lab section may go to any office hours or drop-in lab.

Labs where you can get help outside of lab or lecture

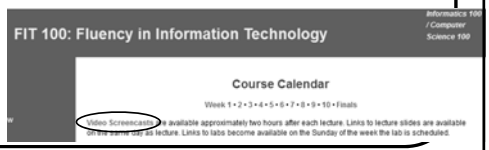
Announcements

- Register your Clickers by Thurs. night



Announcements

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



More on GUI's

- http://blog.seattlepi.com/microsoft/archives/180584.asp?from=blog_last3

More on Metaphors

- http://uweoconnect.extn.washington.edu/metaphorsdslfit7/

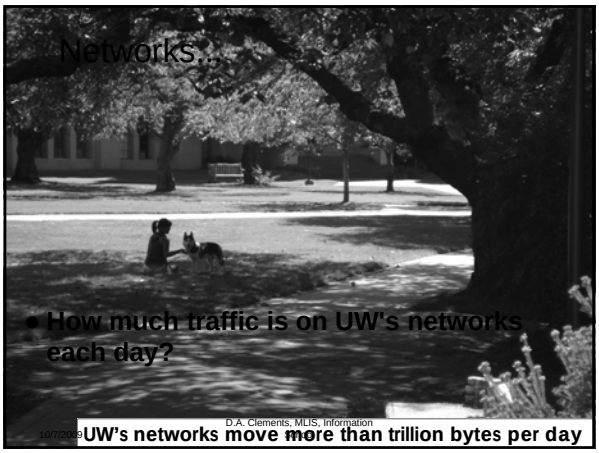
Networking

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, email



Network Structure

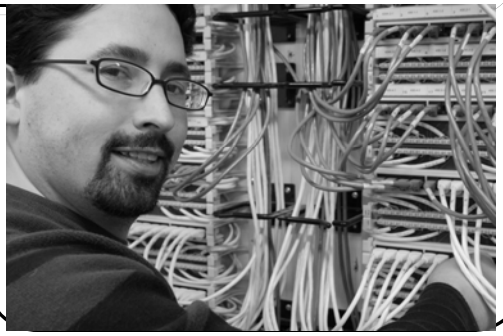
Networks are structured differently based (mostly) on distance between computers:

- Local area network (LAN)
  - Small area: room or building
- Wide area networks (WAN)
  - Large area: more than 1 km

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 • One-time capital cost (wire or fiber optics cable installation)
• **Wide Area Network (WAN)**	• Across town or across the globe •Third-party service provider (monthly $$) • More bandwidth = more expense • Connects to LANs with a router
• **Campus Network**	• One-time capital expense •Buildings in close proximity
• **Metropolitan Area Network (MAN)**	• Clusters of buildings in close proximity separated from other clusters • Third-party service provider (monthly $$)

LAN cabling at switch



Terms

- Turn to your neighbor and write definitions for
  - EtherNet
  - HTTP
  - TCP/IP
- I will call on three groups for definitions

Protocol Rules!

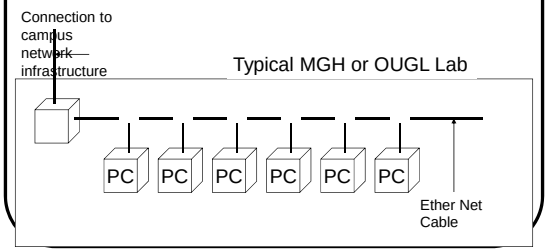
To communicate computers need to know how to set up the info to be sent and interpret the info received

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

LAN in the Lab

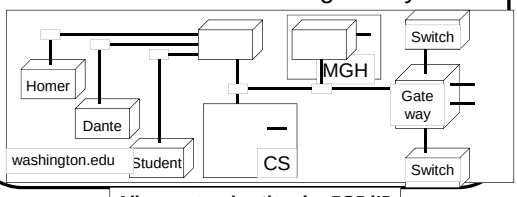
EtherNet is a popular LAN protocol

- Recall, it's a "party" protocol



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

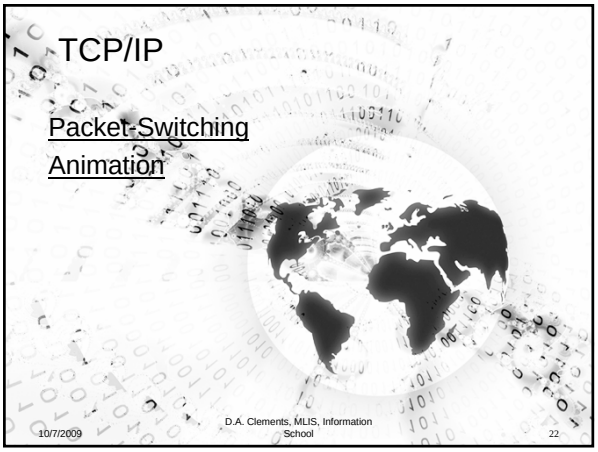
addr # data

- 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

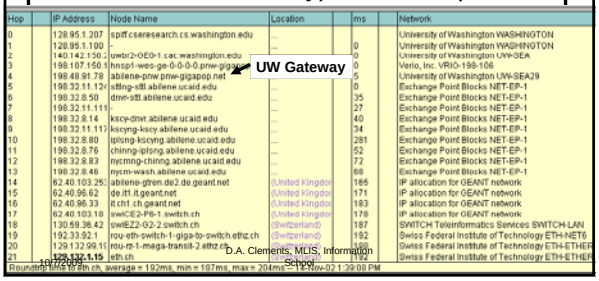
TCP/IP

Packet-Switching Animation



A Trip to Switzerland

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



Hop	IP Address	Node Name	Location	ms	Network
0	128.95.1.207	spiff.cseresearch.cs.washington.edu	...		University of Washington WASHINGTON
1	128.95.1.100	-	...	0	University of Washington WASHINGTON
2	140.142.150.2	uwbr2-OE0-1.cac.washington.edu	...	0	University of Washington UW-SEA
3	198.107.160.1	hnspl-wes-ge-0-0-0-0.pnw-gigap	...	0	Verio, Inc. VRIO-198-106
4	198.48.91.78	abilene-pnw.pnw-gigapop.net	...	5	University of Washington UW-SEA29
5	198.32.11.124	stlng-sttl.abilene.ucaid.edu	...	0	Exchange Point Blocks NET-EP-1
6	198.32.8.50	dnvr-sttl.abilene.ucaid.edu	...	35	Exchange Point Blocks NET-EP-1
7	198.32.11.111	-	...	27	Exchange Point Blocks NET-EP-1
8	198.32.8.14	kscy-dnvr.abilene.ucaid.edu	...	40	Exchange Point Blocks NET-EP-1
9	198.32.11.117	kscyng-kscy.abilene.ucaid.edu	...	34	Exchange Point Blocks NET-EP-1
10	198.32.8.80	iplsng-kscyng.abilene.ucaid.edu	...	281	Exchange Point Blocks NET-EP-1
11	198.32.8.76	chinng-iplsng.abilene.ucaid.edu	...	52	Exchange Point Blocks NET-EP-1
12	198.32.8.83	nycmng-chinng.abilene.ucaid.edu	...	72	Exchange Point Blocks NET-EP-1
13	198.32.8.46	nycm-wash.abilene.ucaid.edu	...	68	Exchange Point Blocks NET-EP-1
14	62.40.103.25	abilene-gtren.de2.de.geant.net	(United Kingdo	185	IP allocation for GEANT network
15	62.40.96.62	de.itl.it.geant.net	(United Kingdo	171	IP allocation for GEANT network
16	62.40.96.33	it.ch1.ch.geant.net	(United Kingdo	183	IP allocation for GEANT network
17	62.40.103.18	swiCE2-P6-1.switch.ch	(United Kingdo	178	IP allocation for GEANT network
18	130.59.36.42	swiEZ2-G2-2.switch.ch	(Switzerland)	187	SWITCH Teleinformatics Services SWITCH-LAN
19	192.33.92.1	rou-eth-switch-1-giga-to-switch.ethz.ch	(Switzerland)	192	Swiss Federal Institute of Technology ETH-NET6
20	129.132.99.15	rou-rz-1-mega-transit-2.ethz.ch	(Switzerland)	189	Swiss Federal Institute of Technology ETH-ETHER
21	129.132.1.15	eth.ch	(Switzerland)	1172	Swiss Federal Institute of Technology ETH-ETHER

Roundtrip time to eth.ch, average = 192ms, min = 187ms, max = 204ms - 12:48:02 1:39:08 PM

Check Internet Hops

Interested?

- From Start menu, find "Command prompt"
- Enter tracert and a URL
  - www.microsoft.com
  - 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

Networking Changes Life

The Internet is making fundamental changes in our lives

1. Nowhere is remote
2. Email
3. Too much time online could be bad
4. English becoming a universal language
5. Enhanced freedom of speech, assembly
6. No one government is in charge

Can you think of others?

Privacy and Security issues

- Sweden handled internet for its neighbors June 2008
  - New Signal Surveillance Act
- Local hub for
  - Norway
  - Finland
  - Russia

Naming Computers—Take 1

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.cs.washington.edu A CSE computer

Peers

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

Naming Computers—Take 2

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 (US)

The *Fluency* book contains the complete list—page 72

Terms

- Turn to your neighbor and write definitions for
  - Logical network
  - Physical network
- I will call on two groups for definitions

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

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

Internet vs. World Wide Web

- With your neighbor, write down definitions for
  - Internet
  - World Wide Web

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

Web: That part of the Internet that stores and serves Web pages—web servers, client computers

Summary

Networking is changing 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

Coming up….

- Submit HW1 by tonight at 10pm
- Submit clicker registration by tomorrow at 10pm
- Read chapter 4 for Friday
- Online quiz in labs today and tomorrow
  - You must attend lab to take the quiz!