

COMPSCI 111 / 111G

*Mastering Cyberspace:
An introduction to practical computing*

Introduction to Networking and the Internet

Development of the Internet

First successful transmission of data through telephone lines

- 1940
- Dr. George Stibitz
- Dartmouth College to New York.



Data Communication Research

- Vitaly important
- Military
- Business
- Academic

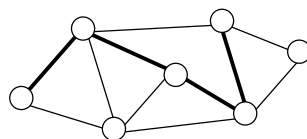
http://en.wikipedia.org/wiki/History_of_the_Internet

Traditional Networks

Circuit Switching

- Continuous connection formed
- Best for voice

1957 *Sputnik launched, ARPA formed*



An age of fear

- Cold war - real fear of nuclear attack
- Military communications/ Academic Research
- Computers were rare and expensive

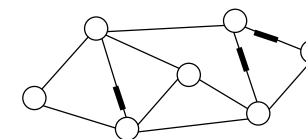
Problems

- A nuclear war would destroy parts of the network
- Central Server could always be destroyed

A new network design

Packet Switching (1960's)

- Messages broken into packets
- Each packet sent independently
- Best for data



Solution

- RAND corporation
- Assume network unreliable
- No central authority, all nodes are equal

1969 *Bolt, Beranek, Newman Inc. (BBN) designed ARPANET
4 nodes connected (UCLA, UCSB, UU, SRI)*

The Internet Evolves

- 1969 The Beginning: ARPANET with 4 nodes
- 1972 ARPANET goes international:
23 Nodes including London, Norway
- 1974 TCP/IP developed at Stanford
- 1983 ARPA requires TCP/IP for Internet (56 Kbps)
- 1984 Domain Name System
- 1989 New Zealand connects to NSFNET
- 1991 WWW created at CERN

Internet Infrastructure

Protocols

- Rules about how information is transferred

Domain Names

- Make it easy for us to use the Internet

Client / Server Systems

- Programs used to access the Internet

Hardware and Software required

- Connecting to the Internet

<http://computer.howstuffworks.com/internet-infrastructure.htm>

Protocols

These are standard methods of communicating.

On a network, both ends agree to use the same protocol to communicate.

Protocols includes a set of rules and procedures for initiating and maintaining communication.

Common Protocols

- TCP / IP
- UDP
- FTP
- HTTP
- POP3 / IMAP / SMTP

http://en.wikipedia.org/wiki/Protocol_%28computing%29

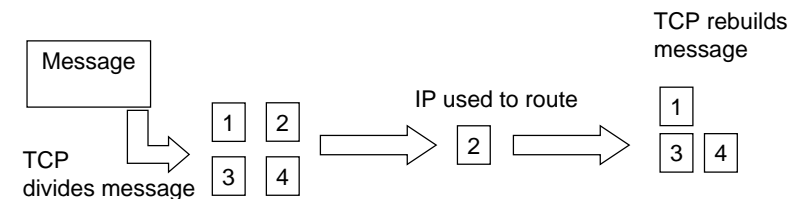
TCP/IP

Transmission Control Protocol

- Divides the message into packets
- Checks all packets arrive (error detection)
- Combines packets to reform message

Internet Protocol

- Addresses (e.g. 130.216.34.102)
- Routing information



Domain Names

DNS – Domain Name System

- (allows us to associate a “name” with our address)
- Uses a sequence of names separated by periods
- Each domain name must be registered

Example:

- amati.emba.uvm.edu (132.198.10.22)
- mary.auckland.ac.nz (130.216.35.22)
- myra.com (142.44.2.1)

http://en.wikipedia.org/wiki/Domain_name

Network Categories

Local Area Network (LAN)

- Operates within 1 km radius
- Client-Server LAN
- Peer-to-peer LAN
- Intranet (if set up like the internet)

Wide Area Network (WAN)

- Distances over 1km

An internet

- Several networks connected together

The Internet

- Network of networks that use TCP/IP

Domain Name Server

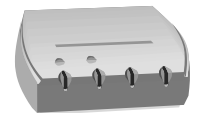
Machine that translates names into IP addresses



Networking Hardware

Modem

- Modulator / Demodulator
- Dial-up
- Broadband
- Allows communication via phone



Router / Switch

- Connects multiple cables



Network Card

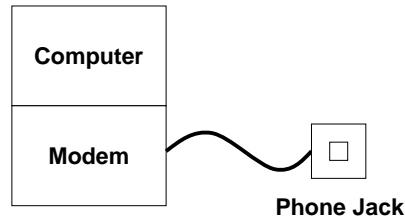
- Ethernet

http://en.wikipedia.org/wiki/Network_hardware

Connecting to the Internet

Dial-up

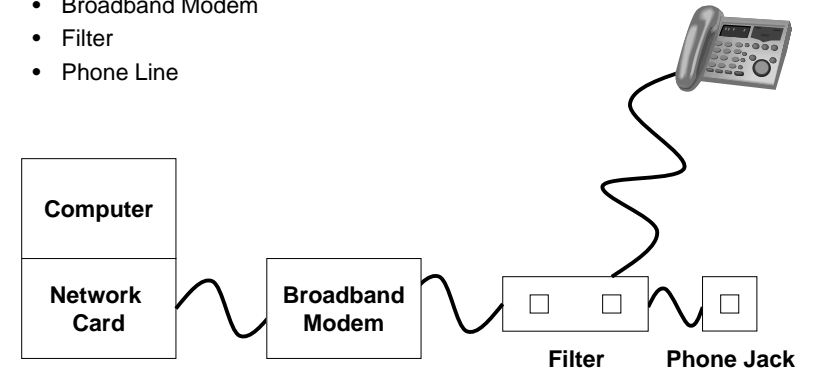
- Computer
- Modem
- Phone line



Connecting to the Internet

Broadband

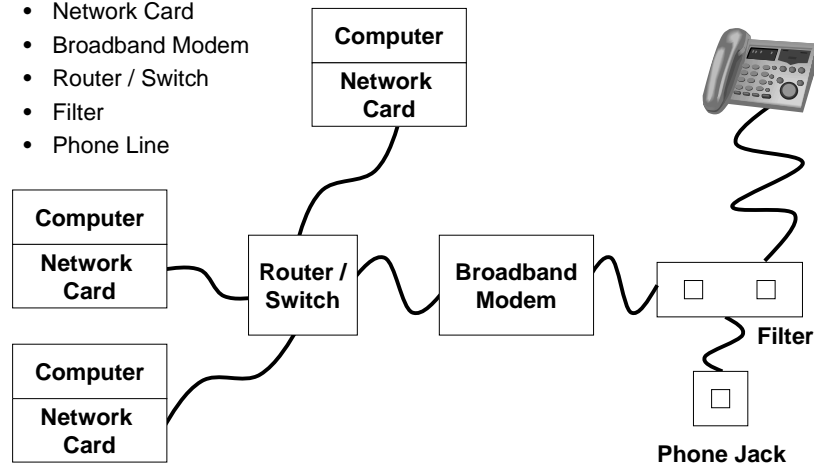
- Computer
- Network Card
- Broadband Modem
- Filter
- Phone Line



Connecting to the Internet

Home Network using Broadband

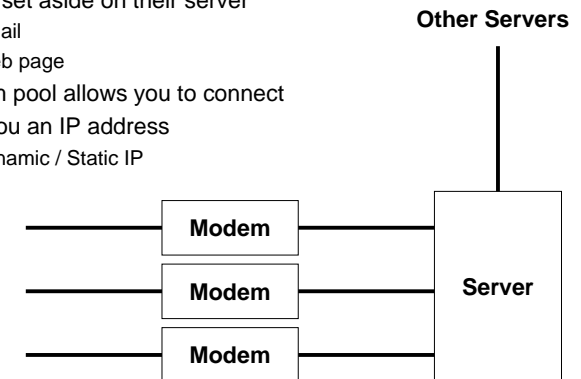
- Computer
- Network Card
- Broadband Modem
- Router / Switch
- Filter
- Phone Line



Internet Service Provider

ISP

- Set up an account for you
 - Login
 - Password
- Space set aside on their server
 - Email
 - Web page
- Modem pool allows you to connect
- Give you an IP address
 - Dynamic / Static IP

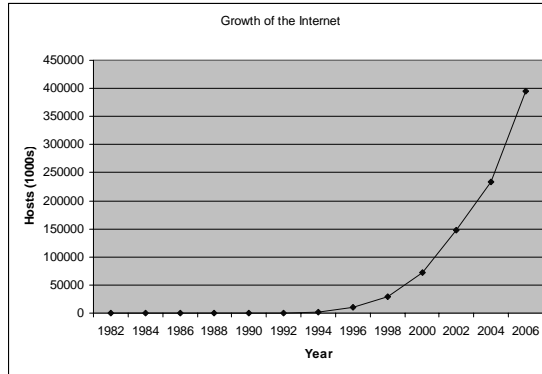


Internet Growth

Year	Hosts
1969	4
04/71	23
06/74	62
03/77	111
05/82	235
10/84	1,024
02/86	2,308
07/88	33,000
10/90	313,000
01/92	727,000
01/94	2,217,000
01/96	9,472,000
01/98	29,670,000
01/00	72,398,092
01/02	147,344,723
01/04	233,101,481
01/06	394,991,609

500,000 new web pages each day

Google : 4,285,199,774 pages
(many more not indexed)

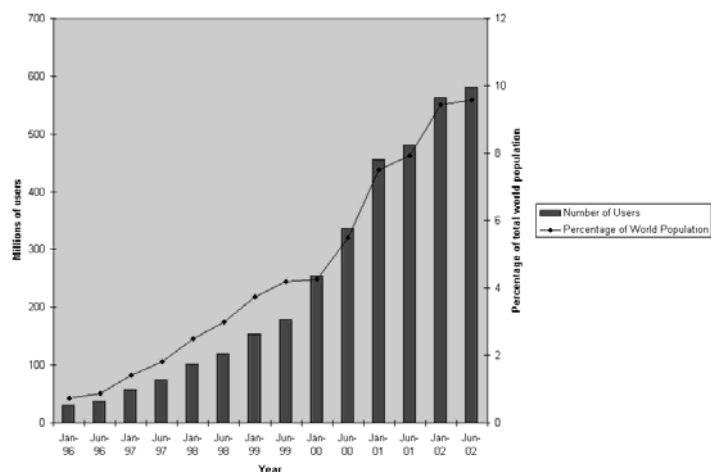


<http://www.isc.org/>

Internet Statistics

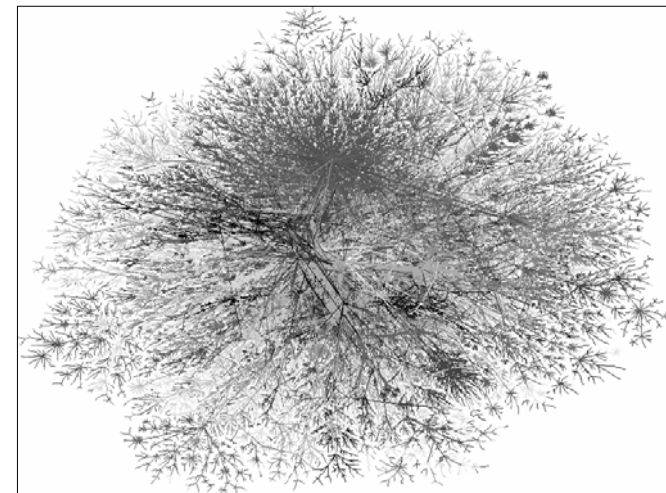
#	Country or Region	Penetration (% Population)	Internet Users Latest Data	Population (2006 Est.)	Source and Date of Latest Data
1	<u>Malta</u>	78.1 %	301,000	385,308	ITU - Sept/05
2	<u>New Zealand</u>	76.3 %	3,200,000	4,195,729	ITU - Sept/05
3	<u>Iceland</u>	75.9 %	225,600	297,072	ITU - Sept/05
4	<u>Sweden</u>	74.9 %	6,800,000	9,076,757	ITU - Oct/05
5	<u>Denmark</u>	69.4 %	3,762,500	5,425,373	ITU - Sept/05
6	<u>Hong Kong</u>	69.2 %	4,878,713	7,054,867	Nielsen/NR
7	<u>Australia</u>	68.4 %	14,189,544	20,750,052	Nielsen/NR
8	<u>United States</u>	68.1 %	203,824,428	299,093,237	Nielsen/NR
9	<u>Canada</u>	67.9 %	21,900,000	32,251,238	eTForecasts
10	<u>Norway</u>	67.8 %	3,140,000	4,632,911	C.I.Almanac

World-wide users



<http://www.internetworldstats.com/stats.htm>

The Internet



<http://research.lumeta.com/ches/map/index.html>