

History of the Internet

1836

-- **Telegraph**. Cooke and Wheatstone patent it. Why is this relevant?

- Revolutionized human telecommunications.
- Morse Code a series of dots and dashes used to communicate between humans. This is not a million miles away from how computers communicate via (binary 0/1) data today. Although it is much slower!!

1858-1866

-- **Transatlantic cable**. Allowed direct instantaneous communication across the Atlantic. Why is this relevant?

- Today, cables connect all continents and are still a main hub of telecommunications.

1876

-- **Telephone**. Alexander Graham Bell Exhibits.

Why is this relevant?

- Telephones exchanges provide the backbone of Internet connections today.
- Modems provide Digital to Audio conversions to allow computers to connect over the telephone network.

1957

-- **USSR launches Sputnik**, first artificial earth satellite. Why is this relevant?

- The start of global telecommunications. Satellites play an important role in transmitting all sorts of data today.
- In response, US forms the Advanced Research Projects Agency (ARPA) within the Department of Defense (DoD) to establish US lead in science and technology applicable to the military.

1962 - 1968

-- **Packet-switching (PS) networks developed** Why is this relevant?

- As we will see later the Internet relies on packets to transfer data.
- The origin is military : for utmost security in transferring information of networks (*no single outage point*).
- Data is split into tiny packets that may take different routes to a destination.
- Hard to eavesdrop on messages.
- More than one route available -- if one route goes down another may be followed.
- Networks can withstand large scale destruction (Nuclear attack - This was the time of the Cold War).

1969

-- Birth of Internet

ARPANET commissioned by DoD for research into networking. Why is this relevant?

- First node at UCLA (Los Angeles) closely followed by nodes at Stanford Research Institute, UCSB (Santa Barbara) and U of Utah (4 Nodes).

1971

-- People communicate over a network

- 15 nodes (23 hosts) on ARPANET.
- E-mail invented -- a program to send messages across a distributed network. Why is this relevant?
 - E-mail is still the main way of inter-person communication on the Internet today.
 - You will make extensive use of E-mail for the rest of your life.

1972

-- Computers can connect more freely and easily

- First public demonstration of ARPANET between 40 machines.
- Internetworking Working Group (INWG) created to address need for establishing agreed upon protocols.

Why is this relevant?

- Telnet specification
- Telnet is still a relevant means of inter-machine connection today.

1973

-- Global Networking becomes a reality

- First international connections to the ARPANET: University College of London (England) and Royal Radar Establishment (Norway)
- Ethernet outlined -- this how local networks are basically connected today.
- Internet ideas started.
- Gateway architecture sketched on back of envelope in hotel lobby in San Francisco. Gateways define how large networks (maybe of different architecture) can be connected together.
- File Transfer protocol specified -- how computers send and receive data.

1974

-- Packets become mode of transfer

- Transmission Control Program (TCP) specified. Packet network Intercommunication -- the basis of Internet Communication.

- Telnet, a commercial version of ARPANET, opened -- the first public packet data service.

1976

-- Networking comes to many

- Queen Elizabeth sends out an e-mail.
- UUCP (Unix-to-Unix CoPy) developed at AT&T Bell Labs and distributed with UNIX.

Why is this relevant?

- UNIX was and still is the main operating system used by universities and research establishments.
- These machines could now "talk" over a network.
- Networking exposed to many users worldwide.

1977

-- E-mail takes off, Internet becomes a reality

- Number of hosts breaks 100.
- THEORYNET provides electronic mail to over 100 researchers in computer science (using a locally developed E-mail system and TELNET for access to server).
- Mail specification
- First demonstration of ARPANET/Packet Radio Net/SATNET operation of Internet protocols over gateways.

1979

-- News Groups born

- Computer Science Department research computer network established in USA.
- USENET established using UUCP.

Why is this relevant?

- USENET still thrives today.
- A collection of discussions groups, *news groups*.
- 3 news groups established by the end of the year
- Almost any topic now has a discussion group.

1979 (Cont)

- First MUD (Multiuser Dungeon) -- interactive multiuser sites. Interactive adventure games, board games, rich and detailed databases.
- ARPA establishes the Internet Configuration Control Board (ICCB).

- Packet Radio Network (PRNET) experiment starts with ARPA funding. Most communications take place between mobile vans.

1981

-- Things start to come together

- BITNET, the "Because It's Time NETwork" Started as a cooperative network at the City University of New York, with the first connection to Yale
 - Provides electronic mail and listserv servers to distribute information, as well as file transfers
- CSNET (Computer Science NETwork) established to provide networking services (specially E-mail) to university scientists with no access to ARPANET. CSNET later becomes known as the Computer and Science Network.

1982

-- TCP/IP defines future communication

- DCA and ARPA establishes the Transmission Control Protocol (TCP) and Internet Protocol (IP), as the protocol suite, commonly known as TCP/IP, for ARPANET.

Why is this relevant?

- Leads to one of the first definitions of an *internet* as a connected set of networks, specifically those using TCP/IP, and *Internet* as connected TCP/IP internets.

1982 (Cont)

- EUnet (European UNIX Network) is created by EUUG to provide E-mail and USENET services. Original connections between the Netherlands, Denmark, Sweden, and UK
- External Gateway Protocol specification -- EGP is used for gateways between (different architecture) networks.

1983

-- Internet gets bigger

- Name server developed.

Why is this relevant?

- Large number of nodes.
- Hard to remember exact paths
- Use meaningful names instead.
- Desktop workstations come into being.

Why is this relevant?

- Many with Berkeley UNIX which includes IP networking software.
- Need switches from having a single, large time sharing computer connected to Internet per site, to connection of an entire local network.

1983 (Cont)

- Internet Activities Board (IAB) established, replacing ICCB
- Berkeley releases new version of UNIX 4.2BSD incorporating TCP/IP.
- EARN (European Academic and Research Network) established on similar lines to BITNET

1984

-- Growth of Internet Continues

- Number of hosts breaks 1,000.
- Domain Name Server (DNS) introduced.
 - instead of 123.456.789.10
 - it is easier to remember something like

www.myuniversity.mydept.mynetwork.mycountry

(e.g. www.cs.cf.ac.uk).

- JANET (Joint Academic Network) established in the UK
- Moderated newsgroups introduced on USENET.

1986

-- Power of Internet Realised

- 5, 000 Hosts. 241 News groups.
- NSFNET created (backbone speed of 56 Kbps)
- NSF establishes 5 super-computing centers to provide high-computing power for all -- This allows an explosion of connections, especially from universities.
- Network News Transfer Protocol (NNTP) designed to enhance Usenet news performance over TCP/IP.

1987

-- Commercialization of Internet Born

- Number of hosts 28,000.
- UUNET is founded with Usenix funds to provide commercial UUCP and Usenet access.

1988

- 2 November - [Internet worm](#) burrows through the Net, affecting ~6,000 of the 60,000 hosts on the Internet
- [CERT](#) (Computer Emergency Response Team) formed by DARPA in response to the needs exhibited during the Morris worm incident. The worm is the only advisory issued this year.
 - NSFNET backbone upgraded to T1 (1.544 Mbps)
 - Internet Relay Chat (IRC) developed

1989

-- Large growth in Internet

- Number of hosts breaks 100,000
- First relays between a commercial electronic mail carrier and the Internet
- Internet Engineering Task Force (IETF) and Internet Research Task Force (IRTF) comes into existence under the IAB

1990

-- Expansion of Internet continues

- [Electronic Frontier Foundation \(EFF\)](#) is founded by Mitch Kapor
- 300,000 Hosts. 1,000 News groups
- ARPANET ceases to exist
- Archie released files can be searched and retrieved (FTP) by name.
- The World comes on-line (world.std.com), becoming the first commercial provider of Internet dial-up access.

1991

-- Modernization Begins

- Commercial Internet eXchange (CIX) Association, Inc. formed after NSF lifts restrictions on the commercial use of the Net.
- PGP (Pretty Good Privacy) released by Philip Zimmerman
- US High Performance Computing Act (Gore 1) establishes the National Research and Education Network (NREN)
- Wide Area Information Servers (WAIS) Why is relevant?
 - Provides a mechanism for indexing and accessing information on the Internet.
 - Large bodies of knowledge available: E-mail messages, text, electronic books, Usenet articles, computer code, image, graphics, sound files, databases *etc.*
 - These form the basis of the index of information we see on WWW today.
 - Powerful search techniques implemented. Keyword search.

1991 (cont)

-- Friendly User Interface to WWW established

- Gopher released by Paul Lindner and Mark P. McCahill from the U of Minnesota. Why is relevant?
 - Text based, menu-driven interface to access internet resources.
 - No need to remember or even know complex computer command. User Friendly Interface (?).
 - Largely superseded by WWW, these days.

1991 (cont)

-- Most Important development to date

- World-Wide Web (WWW) released by CERN; Tim Berners-Lee developer. Why is relevant?
 - Originally developed to provide a distributed hypermedia system.
 - Easy access to any form of information anywhere in the world.
 - Initially non-graphic (this came later, MOSAIC, 1993).
 - Revolutionized modern communications and even our, way of life (?).
- NSFNET backbone upgraded to T3 (44.736 Mbps). NSFNET traffic passes 1 trillion bytes/month and 10 billion packets/month
- Start of JANET IP Service (JIPS) using TCP/IP within the UK academic network.

1992

- Multimedia changes the face of the Internet

- Number of hosts breaks 1 Million. News groups 4,000
- Internet Society (ISOC) is chartered.
- First MBONE audio multicast (March) and video multicast (November).
- The term "Surfing the Internet" is coined by Jean Armour Polly.

1993

-- The WWW Revolution truly begins

- Number of Hosts 2 Million. 600 WWW sites.
- InterNIC created by NSF to provide specific Internet services
 - directory and database services
 - registration services
 - information services
- Business and Media really take notice of the Internet.
- US White House and United Nations (UN) comes on-line.
- Mosaic takes the Internet by storm. Why is this relevant?
 - User Friendly Graphical Front End to the World Wide Web.
 - Develops into Netscape -- most popular WWW browser to date.

1994

-- Commercialization begins

- Number of Hosts 3 Million. 10,000 WWW sites. 10,000 News groups.
- ARPANET/Internet celebrates 25th anniversary
- Local communities begin to be wired up directly to the Internet (Lexington and Cambridge, Mass., USA)
- US Senate and House provide information servers
- Shopping malls, banks arrive on the Internet
 - A new way of life
 - You can now order pizza from the Hut online in the US.
 - First Virtual, the first cyberbank, open up for business
- NSFNET traffic passes 10 trillion bytes/month
- WWW edges out telnet to become 2nd most popular service on the Net (behind ftp-data) based on % of packets and bytes traffic distribution on NSFNET
- UK's HM Treasury on-line (<http://www.hm-treasury.gov.uk/>)
- First cyberstation, RT-FM, broadcasts from Interop in Las Vegas
- Arizona law firm of [Canter & Siegel](#) "spams" the Internet with email advertising green card lottery services; Net citizens flame back

1995

-- Commercialization continues

- 6.5 Million Hosts, 100,000 WWW Sites.
- NSFNET reverts back to a research network. Main US backbone traffic now routed through interconnected network providers
- WWW surpasses ftp-data in March as the service with greatest traffic on NSFNet based on packet count, and in April based on byte count
- Traditional online dial-up systems (CompuServe, America Online, Prodigy) begin to provide Internet access
- A number of Net related companies go public, with Netscape leading the pack.
- Registration of domain names is no longer free.
- Technologies of the Year: WWW, Search engines (WAIS development).
- RealAudio, an audio streaming technology, lets the Net hear in near real-time

RFC 1882: [The 12-Days of Technology Before Christmas](#)

Country domains registered: Ethiopia (ET), Cote d'Ivoire (CI), Cook Islands (CK) Cayman Islands (KY), Anguilla (AI), Gibraltar (GI), Vatican (VA), Kiribati (KI), Kyrgyzstan (KG), Madagascar (MG), Mauritius (MU), Micronesia (FM), Monaco (MC), Mongolia (MN), Nepal (NP), Nigeria (NG), Western Samoa (WS), San Marino (SM), Tanzania (TZ), Tonga (TO), Uganda (UG), Vanuatu (VU)

Top 10 Domains by Host #: com, edu, net, gov, mil, org, de, uk, ca, au

- New WWW technologies emerge
 - Mobile code (JAVA, JAVAscript, ActiveX),
 - Virtual environments (VRML),
 - Collaborative tools (CU-SeeMe)

1996

-- Microsoft enters

- 12.8 Million Hosts, 0.5 Million WWW Sites.

- Internet phones catch the attention of US telecommunication companies who ask the US Congress to ban the technology (which has been around for years)
- The WWW browser war begins , fought primarily between Netscape and Microsoft, has rushed in a new age in software development, whereby new releases are made quarterly with the help of Internet users eager to test upcoming (beta) versions.
- The controversial US Communications Decency Act (CDA) becomes law in the US in order to prohibit distribution of indecent materials over the Net. A few months later a three-judge panel imposes an injunction against its enforcement. Supreme Court unanimously rules most of it unconstitutional in 1997.
- Various ISPs suffer extended service outages, bringing into question whether they will be able to handle the growing number of users. AOL (19 hours), Netcom (13 hours), AT&T WorldNet (28 hours - email only)
- Domain name tv.com sold to CNET for US\$15,000
- MCI upgrades Internet backbone adding ~13,000 ports, bringing the effective speed from 155Mbps to 622Mbps.
- The [Internet Ad Hoc Committee](#) announces plans to add 7 new generic Top Level Domains (gTLD): .firm, .store, .web, .arts, .rec, .info, .nom. The IAHC plan also calls for a competing group of domain registrars worldwide.
- RFC 1925: [The Twelve Networking Truths](#)
- Restrictions on Internet use around the world:
 - *China*: requires users and ISPs to register with the police
 - *Germany*: cuts off access to some newsgroups carried on Compuserve
 - *Saudi Arabia*: confines Internet access to universities and hospitals
 - *Singapore*: requires political and religious content providers to register with the state
 - *New Zealand*: classifies computer disks as "publications" that can be censored and seized
 - *source: Human Rights Watch*

1997

-- What Next?

- 19.5 Million Hosts, 1 Million WWW sites, 71,618 Newsgroups.
- Domain name business.com sold for US\$150,000
- Early in the morning of 17 July, human error at Network Solutions causes the DNS table for .com and .net domains to become corrupted, making millions of systems unreachable.
- In protest of the DNS monopoly, AlterNIC's owner, Eugene Kashpureff, hacks DNS so users going to www.internic.net end up at www.alternic.net

Technologies of the Year: Push, Multicasting

1998 -

- US Dept of Commerce (DoC) releases the [Green Paper](#) outlining its plan to privatize DNS on 30 January. This is followed up by a [White Paper](#) on June 5
- Network Solutions registers its 2 millionth domain on 4 May

- Canada kicks off CA*net 3, the first national optical internet
- Compaq pays US\$3.3million for altavista.com
- ABCNews.com accidentally posts test US election returns one day early (2 November)
- French Internet users give up their access on 13 December to boycott France Telecom's local phone charges (which are in addition to the ISP charge)
- Open source software comes of age
- *Technologies of the Year*: E-Commerce, E-Auctions, Portals
- *Emerging Technologies*: E-Trade, XML, Intrusion Detection

1999

- [First Internet Bank of Indiana](#), the first full-service bank available only on the Net, opens for business on 22 February
- IBM becomes the first Corporate partner to be approved for Internet2 access
- European Parliament proposes banning the caching of Web pages by ISPs
- US State Court rules that domain names are property that may be garnished
- MCI/Worldcom, the vBNS provider for NSF, begins upgrading the US backbone to 2.5GBps
- A forged Web page made to look like a Bloomberg financial news story raised shares of a small technology company by 31% on 7 April.
- First large-scale Cyberwar takes place simultaneously with the war in Serbia/Kosovo
- The Web becomes the focal point of British politics as a list of MI6 agents is released on a UK Web site. Though forced to remove the list from the site, it was too late as the list had already been replicated across the Net. (15 May)
- Activists Net-wide target the world's financial centers on 18 June, timed to coincide with the G8 Summit. Little actual impact is reported.
- business.com is sold for US\$7.5million (it was purchased in 1997 for US\$150,000 (30 Nov)
- *Technologies of the Year*: E-Trade, Online Banking, MP3
- *Emerging Technologies*: Net-Cell Phones, Thin Computing, Embedded Computing
- *Viruses of the Year*: [Melissa](#) (March), [ExploreZip](#) (June)

2000

- The US timekeeper ([USNO](#)) and a few other time services around the world report the new year as 19100 on 1 Jan
 - A massive denial of service attack is launched against major web sites, including Yahoo, Amazon, and eBay in early February
 - Web size estimates by NEC-RI and Inktomi surpass 1 billion indexable pages
 - *Hacks of the Year*: RSA Security (Feb), Apache (May), Nike (June)
 - *Technologies of the Year*: ASP, NAPSTER?, IPV6?
 - *Viruses of the Year*: [Love Letter](#) (May)
 - [Current up to date web user statistics](#)
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This section is a summary of some of the material contained in [Hobbes' Internet Timeline](#) and also contains sources from [History of Internet and WWW : View from Internet Valley](#) and a variety of text books. Consult these sources for more detailed information.

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