



15-292 History of Computing

The World Wide Web
and Social Computing



1

Early Search Applications



- Gopher
 - a distributed document search and retrieval network protocol designed for the Internet.
 - Released in 1991 by Paul Lindner and Mark McCahill of the University of Minnesota.

- WAIS (Wide Area Information Servers)
 - A distributed text searching system to search index databases on remote computers.
 - Promoted by Thinking Machines Corporation.

2

Early Search Applications



The screenshot shows two overlapping browser windows. The top window is titled "WAIS search results" and displays the following text:

```

Results for query: hubble
Search of /disk1/var/wais-sources/rsi:act: hubble
Score: 1000, Date: May 23, 1995, Size: 1204
Search of /var/spool/ucppublic/waisindex/hst-status
Score: 834, Date: May 23, 1995, Size: 4971
Search of /var/spool/ucppublic/waisindex/stsci-docs
Score: 577, Date: May 23, 1995, Size: 1775
Search of hst-aec-catalog
Score: 467, Date: May 23, 1995, Size: 8609
Query Report for this Search
Score: 1, Date: Oct 07, 1995, Size: 672
  
```

The bottom window is titled "Gopher directory at gopher.tc.umn.edu" and displays the following text:

```

Gopher directory at gopher.tc.umn.edu

Directory All the Gopher Servers in the World
<Search> Search All the Gopher Servers in the World
Directory Search titles in Gopherspace using veronica
Directory Africa
Directory Asia
Directory Europe
Directory International Organizations
Directory Middle East
Directory North America
Directory Pacific
Directory Russia
Directory South America
  
```

3

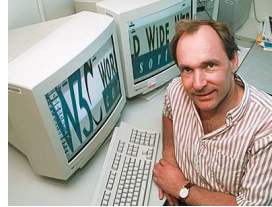
Early Search Applications



- Archie
 - Considered to be the first search engine.
 - Developed in 1990 at McGill University.
 - Keeps a database of directories and files in FTP sites on the Internet.
 - Search based on file name. Use FTP to fetch.
- Veronica
 - Very Easy Rodent-Oriented Net-wide Index to Computerized Archives
 - Developed in 1992 at the University of Nevada at Reno.
 - Searches every item in all Gopher menus for specific keywords. Use FTP to fetch.
- Jughead
 - Jonzy's Universal Gopher Hierarchy Excavation And Display
 - Developed in 1993 at the University of Utah.
 - Similar to Veronica but it searches a single server at a time.

4

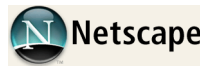
World Wide Web



- In 1989, Tim Berners-Lee, a physicist working at CERN, the European Particle Physics Laboratory, wanted a way for physicists to share information about their research.
- His documentation project was the source of the two key inventions that made the World Wide Web possible:
 - HTML – HyperText Markup Language
 - URL – Uniform Resource Locator

5

Web Browsers



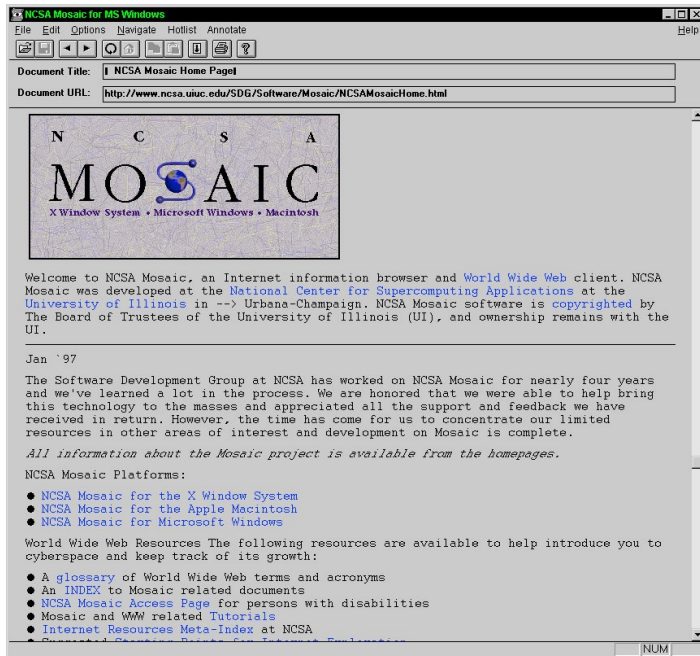
- Mosaic
 - Developed by a team at the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign (NCSA-UIUC), led by Marc Andreessen.
- Netscape Navigator
 - Andreessen and Jim Clark, one of the founders of Silicon Graphics, Inc., started Mosaic Communications
 - This company became Netscape Communications Corporation, making the first commercially successful browser.

6

Marc Andreessen

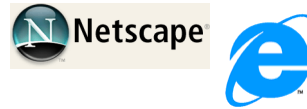


7



8

Browser Wars



- Internet Explorer
 - Microsoft acquired technology from SpyGlass (who got their technology from NCSA) to develop their browser.
 - Microsoft includes IE in their Windows operating system leading to an anti-trust suit by the U.S. Dept. of Justice in 1997.



9

Search Engines



- Lycos
 - created from a research project by Michael Mauldin of Carnegie Mellon University in 1994.
 - Now includes GamesVille, Tripod, and AngelFire services.
- Yahoo!
 - created by Stanford graduate students David Filo and Jerry Yang in 1994.
 - portal to the Internet for many users in the 1990s.
- AltaVista
 - originated in 1995 with scientists at Digital Equipment Corporation's Research lab in Palo Alto.
 - with a minimal interface, became #1 web search engine in 1997.
 - in 1998, after Digital was sold to Compaq, AltaVista was redesigned to compete with Yahoo!

10

Search Engines



- Google (1998)
 - founded by Larry Page and Sergey Brin, two Stanford Ph.D. students
 - developed a search engine based on a mathematical analysis of the relationships between websites (PageRank algorithm)
- Microsoft Search Engines
 - MSN Search (1998) - based on use of Altavista, others
 - MSN Search (2004) - based on their own algorithms
 - Windows Live Search / Live Search (2006, 2007)
 - Bing (2009)
 - Yahoo! Search, powered by Bing
- WolframAlpha (2009)
 - computational knowledge engine



Page and Brin

11

The Google Boys



12

Wikis

- A wiki is a website that allows visitors to make contributions, changes and corrections to form a global open resource.
 - Developed in 1994 by Ward Cunningham
 - Named based on a trip to Hawaii
- Wikipedia
 - Launched in 2001 by Jimmy Wales and Larry Sanger
 - Alternative to Nupedia which required domain experts and a formal review process for articles.
 - Currently over 6 million articles
- Other Wikis: WikiMapia, WikiAnswers, Wikia



13

Internet Hosts

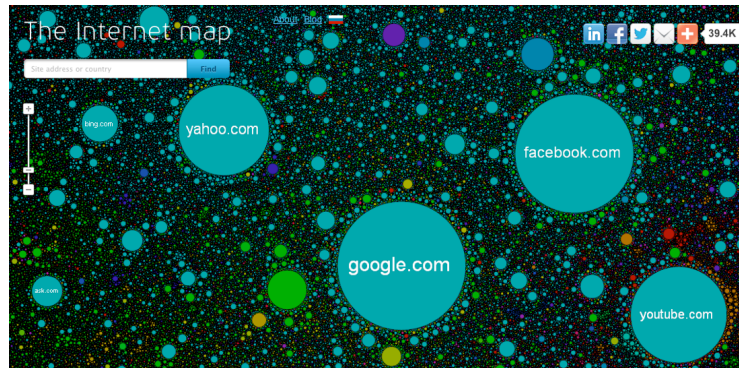
- 1981: 281
- 1985: 1,985
- 1989: 80,000
- 1993: 1,776,000
- 1997: 26,053,000
- 2001: 125,888,197
- 2005: 353,284,187
- 2009: 681,064,561
- 2012: 908,585,739
- 2015: 1,033,836,245
- 2018: 1,003,604,363

Source: Internet Systems Consortium

ISC has discontinued collecting this data in 2019 due to the change from IPv4 to IPv6

14

Internet Map internet-map.net



“Every site is a circle on the map, and its size is determined by website traffic, the larger the amount of traffic, the bigger the circle. Users’ switching between websites forms links, and the stronger the link, the closer the websites tend to arrange themselves to each other.”

15

Cloud Computing



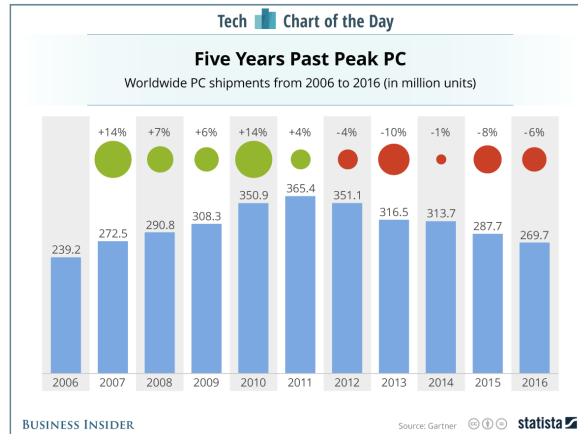
- Advent of sharing computing resources and data on demand via computing “farms” located around the world.
 - Realization of the “computing utility” concept of the 1960s?
- Term traced back to Compaq Computer in 1996
- Cloud Computing blossoms in the 2000s:
 - Elastic Compute Cloud (2006) - Amazon
 - Microsoft Azure (2008)
 - OpenStack (2010) - NASA + Rackspace Hosting
 - IBM SmartCloud (2011)
 - Oracle Cloud (2012)

16

The End of the PC Era?



- PC sales slump in the 2010s with the advent of the tablet computer and smartphones.



17

Social Networks

classmates®

ryze
Business Networking

sixdegrees™

friendster

LinkedIn



- Classmates (1995)
 - launched as a list of school affiliations, yearbooks, etc.
 - investigated for fraudulent email scams to get people to sign up
 - now marketed as Memory Lane
- Six Degrees (1997)
 - considered the first social networking site
- Ryze (2001)
 - launched by Adrian Scott, first employment social site
- Friendster (2002)
 - based on idea: six degrees of separation, popular dating site
 - could not scale up to demand
- LinkedIn (2003)
 - launched with 4500 members
 - biggest public offering in 2011 since Google

18

Social Networks



- MySpace (2003)
 - created by employees at eUniverse
 - open to all users
 - most popular social networking site 2005-2007
 - now co-owned by Justin Timberlake, focused on music
- Orkut (2004)
 - first attempt by Google at social networking
 - membership by invitation only, too exclusive, failed
- Facebook (2004)
 - created by Mark Zuckerberg at Harvard
 - allegedly stole the idea from the Winklevoss twins and Divya Narendra
 - open to university users initially
 - most popular social networking site 2008-present
 - currently has over 1 billion users
 - creation portrayed in the movie "The Social Network" in 2010



Zuckerberg






19

Mark Zuckerberg




20

Social Networks





- **Bebo (2005)**
 - launched by Michael and Xochi Birch
 - Widget-style editor, popular with young users
 - sold to AOL in 2008 for \$850 million, but AOL sold for \$10 million in 2010
- **Twitter (2006)**
 - created by Jack Dorsey
 - users send/receive tweets (max 140 characters)
- **Foursquare (2009)**
 - created by Dennis Crowley and Naveen Selvadurai
 - enabled users to share locations with friends - "check in"
- **Google Buzz (2010)**
 - suffered quickly from privacy issues
- **Google+ (2011)**
 - current social networking site by Google, closer to Facebook style




Dorsey

21

Online Shopping

- **Teleputer - invented by Michael Aldrich (1980)**
 - merging of a television with a real-time transaction processing computer via telephone line
- **Amazon (1994) - originally "Cadabra"**
 - founded by Jeff Bezos
 - started as an online bookstore, later music/movies
 - sued by Barnes & Noble and Walmart
- **Ebay (1995) - originally "AuctionWeb"**
 - online auction site
 - payments via PayPal (1998)
- **Alibaba (1999)**
 - world's largest online business trading platform
 - often associated with counterfeit items



Bezos

22

Jeff Bezos / Amazon



23

Spam



- SPAM: a canned meat product from Hormel Foods
- The word has taken on a new meaning in the computing world
 - Spam involves sending identical or nearly identical unsolicited messages to thousands of recipients.
- The new use of the term originates from a skit in Monty Python's Flying Circus.
- In July 2003, Hormel filed two legal challenges with the U.S. PTO (Patent and Trademark Office) to try to stop SpamArrest from using the decades-old name Spam, for which Hormel holds the trademark.
 - SpamArrest, which specializes in blocking junk e-mail or "spam," filed papers to trademark its corporate name early in 2003.

24

Notable Spam History



- 1971: An MIT sys-admin used CTSS MAIL to send all users an anti-war message
- 1978: The first internet E-mail spam, sent by DEC
- 1988: A user on the Portal access site posts a “HELP ME” spam to ask for money for his college fund
- 1993: A program called ARMM had a bug and ended up posting 200 messages in a row to news.admin.policy, the newsgroup where people discussed the running of the net.
 - First apparent indication of the use of the word “spam” to describe mass unwanted electronic messages
 - More info: <https://www.templetons.com/brad/spam/>

25

CAN-SPAM Act of 2003



- Sign on December 16, 2003 by President G.W. Bush
 - CAN-SPAM: Controlling the Assault of Non-Solicited Pornography and Marketing
- The bill permits e-mail marketers to send unsolicited commercial e-mail as long as it contains all of the following:
 - an opt-out mechanism
 - a functioning return e-mail address
 - a valid subject line indicating it is an advertisement
 - the legitimate physical address of the mailer
- In April 2004, Federal authorities filed the first criminal charges under this act against a group that had spammed ads for allegedly worthless "diet patch" products.

26

File Sharing, Downloading, Streaming



- Napster (1998)
 - Peer-to-peer file sharing network
 - founded by Shawn Fanning and others while at Northeastern University
 - mostly illegal MP3 music file sharing
 - lawsuit filed in 2000 by Metallica and Dr. Dre
 - lawsuit filed by RIAA, Napster loses, bankrupt 2002
- Others followed:
 - Gnutella, Freenet, Kazaa, TorrentSpy, The Pirate Bay
- Legal file downloading sites appear:
 - iTunes, Amazon MP3, eMusic
- Video Streaming: YouTube, Hulu
- U.S. Dept of Justice shut down Megaupload in 2012 and founder Kim Dotcom (Kim Schmitz) was arrested in NZ.



27

Hacking



- The term originally developed at MIT in the 1950s
 - a "hack" meant a simple, but often inelegant, solution
- In the 1990s, a hacker was someone who (usually illegally) attempts to break into or otherwise subvert the security of a program, system or network, sometimes with malicious intent.
 - Original "hackers" resent the term and prefer the term "crackers".
- The Computer Fraud and Abuse Act is a law passed by the U.S. Congress in 1986 intended to reduce "hacking" of commercial computer systems.
 - It was amended in 1994, 1996 and in 2001 by the USA PATRIOT Act.

28

Kevin Mitnick



- On Christmas Day 1994, Mitnick broke into the home computer of a computer security expert, Tsutomu Shimomura, a researcher at the federally financed San Diego Supercomputer Center.
- Arrested in February 1995 by the FBI for breaking into some of the most secure U.S. computer systems
- Released in 2000 after serving 60 months.
- Forbidden from accessing computers for 3 years.
- Now he works as a consultant in the computer security industry.

29

Cookies & Spyware



- A cookie is a packet of information sent by a server to a Web browser and then sent back by the browser each time it accesses that server.
 - Cookies were invented by Lou Montulli, a former employee of Netscape Communications.
- Spyware is computer software that gathers information about a computer user without the user's knowledge or informed consent, and then transmits this information to an organization that expects to be able to profit from it in some way.
 - In 2000, the term was used when it was discovered that a children's software program by Mattel was sending data back to Mattel.

30

Viruses



- A computer virus is a piece of program code that (like a biological virus) makes copies of itself and spreads by attaching itself to a host, often damaging the host in the process.
 - The term "virus" was first used in this sense in print by Fred Cohen in his 1984 paper *Experiments with Computer Viruses*, where he credits Len Adleman with coining it.
- Some famous viruses & worms
 - Creeper (1971), Elk Cloner (1982), Morris (1988), Melissa (1999), ILOVEYOU (2000), Code Red (2001), SoBig and Blaster (2003), Sasser (2004), Storm Worm (2006), W32.Dozer (2009)
 - Robert Tappan Morris was first convicted under the Computer Fraud and Abuse Act of 1986.
 - Stuxnet (2010) is believed to have been created by the U.S. and Israel to sabotage Iranian nuclear facilities.

31

Ergonomics & Health Issues



- Ergonomics is the science of adjusting your work environment to fit your body and make it most comfortable.
 - Typing on computer keyboards for extended periods of time has led to an outbreak carpal tunnel syndrome.
 - Standard video display terminals emit low-frequency magnetic fields that can cause disturbances at the cellular level of computer users who work too close to these terminals.
- In 2000, President Clinton approved new regulations on workplace safety with regard to ergonomics
 - The regulations were repealed by President G.W. Bush in 2001.

32

Protecting Children



- Child Pornography Prevention Act of 1996 (CPPA).
 - Made the possession or posting of digital/electronic visual representations of minors engaged in sexual activity illegal.
- Communications Decency Act of 1996 (CDA)
 - Its primary aim was regulating Internet pornography
 - Overturned by the Supreme Court in 1997 as unconstitutional
- Child Online Protection Act of 1998 (COPA)
 - Specified measures for protecting children from encountering obscene material.
- Children's Online Privacy Protection Act of 2000 (COPPA)
 - Specifies measures for the online collection of personal information by persons or entities under U.S. jurisdiction from children under 13.

33

Protecting Children



- Children's Internet Protection Act of 2000 (CIPA)
 - For any school or library that receives federal funding to reduce costs for Internet access or for internal connections, it must install programs to block and filter visual depictions that are obscene, pornographic or harmful to minors.
 - Challenged by the American Library Association and the American Civil Liberties Union
- A panel of three federal judges in Philadelphia in 2002 ruled CIPA unconstitutional.
- In 2003, The U.S. Supreme Court upheld the law.

34

SOPA and PIPA



- Stop Online Piracy Act (SOPA) - 2011
 - Would allow the U.S. Dept. of Justice and copyright holders to seek a court order against websites accused of enabling or facilitating copyright infringement
- Protect Intellectual Property Act (PIPA) - 2011
 - Would allow the U.S. Dept. of Justice and copyright holders to seek a court order against "rogue websites dedicated to the sale of infringing or counterfeit goods", especially outside the U.S.
- Many websites including Wikipedia "blacked out" pages on Jan 18, 2012 to protest these bills. (The bills did not pass.)



35

Computing History Eras



- Pre 1800s – Manual Computing Devices
- 1800s – Mechanical Computing and Tabulating
- Early 1900s – Analog Computing, Theoretical Models
- 1940s – Early Electronic Computing
- 1950s – Business Computing Emerges
- 1960s – Miniaturization, IBM's Zenith
- 1970s – Minicomputers, Microprocessors
- 1980s – Personal Computing, Rise of Microsoft & Apple
- 1990s - The Internet and the World Wide Web
- 2000s – Social Computing, Rise of Google & Facebook
- 2010s – Smart Devices, AI, Online Retail
- 2020s – *what's next?*

36