

History of the Internet

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From its earliest beginnings on pages of paper and in brilliant minds, the Internet has always been an emerging technology and an emerging ideal. What follows is a selective and developing chronology of some of the most important events in the cultural and technological development of cyberspace and the internet. Primarily intended for interested readers without a technological background, this selective chronology seeks to present a brief narrative chronology of the technological innovation of the internet and its predecessors as well as accompanying consumer and cultural developments. Due to the ongoing nature of the internet and society, this chronology is a work in progress.

ARPANET

1960s-1970s: ARPANET: Commonly thought of as the predecessor to the Internet and created by the US Department of Defense's Advanced Research Projects Agency (ARPA). The first known fully operational packet-switching network, the ARPANET was designed to facilitate communication between ARPA computer terminals during the early 1960s, at a time when computers were far too expensive for widespread usage. Though conception of the idea behind ARPANET began as early as 1962, the first stable link between multiple computers through the ARPANET occurred in 1969, ten years after the first conceptual network architectural models were initiated independently by Paul Baran and Donald Davies. Though a primary element of pushing the creation of the ARPANET was the ever-present concept of humanity's continual evolution and technological advancement, there were simple and practical concerns that also under-girded the development of the ARPANET. At the time, ARPA was a primary source of funding for computer development and research. During this early computing age, computers were incredibly expensive to produce and operate, and were separated by distance and purpose, forcing a single user wishing to access multiple operational functions and information to physically travel to the site of multiple computers. One of the practical elements that necessitated the development of the ARPANET was the need to efficiently link multiple computers together which would allow users to access the specified functions of different computers and data without the cost of travel and time. Additionally, given that ARPA was an agency of the Defense Department, part of the motivation was related to the desire of the U.S. Military to develop a survivable communication structure in the event of nuclear attack, (though this was not the primary motivating factor that it is often emphasized to be.) After a decade of remaining a closed computer network ARPANET transformed into the openly networked Internet of the modern age.

1960s

1962-63: Working at the Massachusetts Institute of Technology (MIT), J.C.R. Licklider authored a series of memos concerning theoretical network structures. His concept of a Galactic Network envisioned a world-wide computer network in which computer terminals would be linked to one another, allowing anyone with access to a terminal the ability to access and send information to other computers and users. While working at the Department of Defense's Advanced Research Projects Agency (ARPA), Licklider stressed the importance of realizing this network design to

his colleagues who would later go on to realize elements of the Galactic Network concept in the actualized form of the ARPANET, an early predecessor to the Internet.

1959-1964: Stemming from an interest in the survivability of communications networks in the event of a Soviet Nuclear attack, Paul Baran, an engineer at the RAND military think tank, developed a conceptual model of communication called distributed communications. Conventional models of communications, like contemporary phone lines, transfer communications from an origin point on to a local node and then on to the receiver or to a national node should the call need to go to a receiver beyond the regional area. In this sort of communications framework, eliminating regional or national nodes severely damages the entire network making communication nearly impossible. In Barans distributed communications model, communications would go from the origin point and then onto one of many different switching nodes rather than a single regional or national node. This would allow for safer communication should any given node be eliminated because there would still be multiple nodes and pathways for a communication to move across.

1965: The first network experiment linking two computers takes place between the TX-2 computer by Lincoln Labs and the Q-32 mainframe operated by the RAND corporations System Development Corporation. It is the first time in which two computers directly communicated with one another.

1966: Shortly after coming to ARPA in 1966, Lawrence Roberts published a plan for the ARPANET which utilized the concept of a computer network developed by J.C.R. Licklider and MIT researcher Leonard Kleinrock who first investigated the concept of packet switching in which blocks of data (or packets) could be sent over a linked network of nodes in such a way that network nodes could delay the routing of the data packets and pass them on to other nodes. Packet switching as a communications network differs from the alternative of circuit switching in which there are a limited number of constant communications between nodes that are only active for the duration of the communication, like a phone line. Packet switching as a method of communication was a break through over circuit switching because it allows for a more efficient use of a network by increasing the ability of a network communication to function regardless of abnormalities and decreasing the amount of time it takes for a packet of data to move across a given network. Advancing on Kleinrock and others works, Roberts published the first plan for the creation of the ARPANET in 1967 and with the help of other researchers and theoretical works, the ARPANET was planed and built with the first node of ARPANET installed at the UCLA Network Measurement Center in 1969 followed by nodes at the Stanford Research Institute, The University of California at Santa Barbara, and the University of Utah.

1970s

1970: The first radio network which makes use of random packet transmission, the Alohanet, is launched at the University of Hawaii.

1972: Robert Kahn exhibits the first public demonstration of the ARPANET at the International Computer Communication Conference. This public demonstration is also the first time that electronic mail (email) is exhibited and is a major catalyst for increasing interest in developing

network technology. The first email programs called SNDMSG and READMAIL are written by Ray Tomlinson marking the beginning of one of the most widely used applications today.

1973: Robert Kahn, program manager for ARPAs Information Processing Techniques Office (IPTO), and Vinton Cerf (then a graduate student at Stanford University) worked together on the idea of developing internetworking or of connecting multiple networks in a more open form than the closed network of the ARPANET. Kahn and Cerf helped to develop a networking protocol that would allow an open-architecture for multiple networks to be joined together. This protocol later emerged as the Transmission Control Protocol/Internet Protocol or TCP/IP. This new protocol would allow each individual network to stand alone such that if another network was brought down, it would not cause the collapse of all joined networks. Additionally, the new protocol conceptualized by Kahn and Cerf would involve no overall global manager and would join various networks together through what would later be known as routers and gateways. After the original TCP/IP protocol was written, what emerged as the Internet would result from ongoing experimentation and TCP/IP would emerge as an almost universal host protocol on which the Internet would be built. In the same year, the first international connections to the ARPANET are made with the addition of the University College of London and the Royal Radar Establishment in Norway.

1973-1975: While working at the Xerox Palo Alto Research Center, Robert Metcalfe develops a system which replaces radio transmission of network data with a cable that provides a larger amount of bandwidth, enabling the transfer of millions of bits of data per second in comparison with the thousands of bits per second when using a radio channel transmission. This system is originally known as the Alto Aloha network but which was later known as Ethernet. Metcalfe would later leave Xerox to found 3Com.

1974: Ted Nelson releases the countercultural technology manifesto Computer Lib in which Nelson advocates ordinary people learning about computer and network technology. Nelson also proposes hypertext as a way of organizing information, making it possible to link information in a less linear manner.

1975: The first commercially available popular personal computer, the Altair 8800 is introduced as a kit.

1976: Apple Computer founded by Steve Jobs and Steve Wozniak.

1977: ARPA funds the Bolt, Beranek, and Newman electronics company (intimately involved in the evolution of the ARPANET and the Internet) to use the TCP/IP protocol along with the emerging and popular Unix operating system. This is an example of the initial efforts of expanding the use of TCP/IP in the hopes of spreading a uniform standard protocol for internetworking which would allow for the emergence of the modern Internet.

1978: The first mass-marketed personal computer, the Apple II, is launched.

1979: Tom Truscott and Steve Bellovin make use of a UNIX program that allows files to be transferred between networked computers to exchange electronic newsletters between Duke University and the University of North Carolina by way of a dial-up connection. This system spreads and comes to be known as USENET. USENET distributes online forums or newsgroups concerning any number of topics across the Internet, allowing users to submit messages to newsgroups and communicate electronically in an informal manner.

1980-1982: At a meeting of computer scientists determined to expand accessibility to the ARPANET, Dave Farber reveals how a project which he and his colleagues at the University of Delaware are working on aims to build an inexpensive network by using dial-up phone links rather than radio or satellite as the means of connection. In 1982, after funding from the National Science Foundation, computer scientists build the PhoneNet system and establish Internet connections between the PhoneNet system, the ARPANET, and the first commercial network, Telenet. This CSNET system broadens overall access to the Internet and allows almost any school to access the network through less costly PhoneNet service. CSNET also greatly expands the geographic reach of the Internet by allowing e-mail between the United States, Germany, France, Japan, Korea, Finland, Sweden, Australia, Israel, and the United Kingdom. This incarnation of the Internet would continue to grow at an increasing rate by way of the increase in the number of networks that were attached to the Internet.

1981: 3Com announces an Ethernet product for workstation computers followed by a version for personal computers in 1982. The 3Com Ethernet networking system allows users to build more affordable local area networks (LANs) and has come to be the standard way of building personal networks. In the same year, IBM releases its own Personal Computer (PC) which will become the industry standard. Sun Microsystems launches the Sun I workstation.

1982-1983: ARPANET is split into two separate entities: MILNET to serve the needs of national defense and the military community and ARPANET which is primarily utilized by academics and researchers. This is the first step toward the commercialization of the Internet. The unofficial birth of the Internet occurs when both ARPANET and Defense Data Networks begin to use TCP/IP protocol. After an increase in the number of users and networks connected to the Internet, computer scientists begin to consider new methods of naming and addressing users and networks. The Domain Name System, first defined by Paul Mockapetris, Jon Postel, and Craig Partridge is created to divide Internet names between host names (x.com) and user names (user@x.com). This method of naming made the maintenance of host information more manageable. ARPA created six domains consisting initially of: edu (educational), gov (government), mil (military), com (commercial), org (other organizations), and net (network resources).

1984: Apple Macintosh is launched.

1985: The first domain is registered.

1989: Performance Systems International begins offering TCP/IP network services to businesses.

1990: ARPANET, thought outdated and obsolete is decommissioned. During the same year, Tim Berners-Lee, Robert Cailliau, and other CERN scientists begin to create the first actual incarnation of the World Wide Web. Berners-Lee and his colleagues developed a shared format for hypertext documents which was named hypertext markup language or HTML. In addition to HTML, Berners-Lee and others created uniform resource locator (URL) as a standard address format that could specify the computer being targeted and the type of information being requested. URL and HTML significantly increased the possibility of interaction between users and networks across the Internet. URL also made different Internet services such as Usenet news accessible to all users employing the system.

1991: Senator Al Gore sponsors the High Performance Computing Act which establishes the National Research and Education Network.

1993: The Whitehouse and the United Nations go online and develop an official internet presence.

1994: Jeff Bezos designs the business plan for Amazon.com.

1995: Bill Gates authors the now famous memo, The Coming Internet Tidal Wave. By 1995, the bulk of US internet traffic is routed through interconnected network service providers and Microsoft Windows 95 is launched. 1995 proves to be an eventful year in the formation of contemporary internet culture because it also sees the official launch of the online bookstore Amazon.com, the internet search engine Yahoo, online auction site Ebay, the Internet Explorer web browser by Microsoft, and the creation by Sun Microsystems of the Java programming language which allows for the programming of animation on websites giving rise to a new level of internet interactivity.

1996: The United States Congress passes the Communications Decency Act which is seen as a direct assault by censors on the ideals of free speech and information as promoted online. Congress passes the act in response to perceived public concern over the increased availability of pornography and other graphic and controversial matter made possible by the spread of the internet and cyberspace. The Communications Decency Act or Telecommunications Reform Act was an attempt by the US government to extend congressional oversight of laws aimed at regulated radio and television to the internet. John Perry Barlow responds with his now famous essay A Declaration of Independence for Cyberspace. Barlow's essay is an impassioned declaration of cyberspace and the internet as realms of freedom and liberty that is not subject to the authority of national governments.

1998: Google Inc. is founded by Sergey Brin and Larry Page to promote and oversee their new search engine which will rival yahoo.

1999: The dawn of internet music and video piracy controversies rises with the introduction of the Napster file-sharing software by Shawn Fanning, a college student. During the same year, the Internet encounters the first malicious computer virus capable of automatically copying and sending itself to all email addresses listed in an infected users address book.

2000: After a bitter antitrust lawsuit, Microsoft is ordered to break into two separate businesses focusing on its highly successful Windows operating system and its other numerous software applications. 2000 would go down in Internet history as the rise and burst of the internet bubble. That year, the presence of internet consumer companies was widespread and visible in everyday life, including the visibility of .dotcom companies which paying millions of dollars for half-minute advertisements to air during the Super Bowl. When investors heard reports that Microsoft would be unable to settle its antitrust lawsuit with the government, the Dow Jones Industrial Average suffers the biggest one-day drop in its history up to that point. Microsoft will settle its lawsuit in 2001 allowing it to remain a single company, but in 2000, the internet revolution marches on with Googles rise to become the worlds largest search engine and the first official instance of internet voting taking places in the United States during a Democratic party primary in Arizona.

2002: Napster is shut down after it fails to win a lawsuit brought by the Recording Industry Association of America.

2003: The rise of spam; unsolicited junk mail messages begin to account for over half of all e-mail messages sent and received. Though the US Congress passes anti-spam legislation, the scourge of unsolicited email remains.

A note on sources:

This ongoing chronology would not be possible without the efforts of numerous authors and researchers to document the continuing cultural and technological emergence of the internet. Every attempt will be made to acknowledge the sources from which this chronology is built. Please note, this following list is incomplete and, like the chronology itself, represents an ongoing process of documentation.

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