

ADDIS ABABA INSTITUTE OF TECHNOLOGY

FUNDAMENTAL OF WEB DESIGN AND DEVELOPMENT

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DEPARTMENT OF SOFTWARE ENGINEERING

**Introduction to Web and WWW based Assignment**

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Themes

1. The History of the Internet (The Evolution)
2. View the 5-10 popular websites of your choice from Web archive URL and put your observation and assessment.
3. List 5 website each on the 12 categories you learned and observe them in different years in web archives.
4. What are the guidelines for evaluating the value of a website? Try to evaluate 2-5 websites based on the guideline and put your judgment.

# The History of the Internet

## Introduction

The evolution of the internet revolves around four distinct aspects. There is the technological evolution that began with early research on packet switching, the ARPANET, other related technologies, and the yet expanding substructure such as scale, efficiency, and integrated functionalities. There is the operations and management aspect of a wholesome and sophisticated substructure. There is the social aspect which resulted in an ever-broadening community coevolving with the technology. And there is the commercialization aspect, resulting in a very successful transition of research into a broadly applicable and available information infrastructure.

This paper discusses the landmarks in the history of the internet, how it evolved from the Advanced Research Projects Agency (ARPA) in 1957, its formative years (1957-1984) until nowadays; from the early internet devised and implemented in American research units, universities, and telecommunication companies that had vision and internet in cutting-edge research until a global phenomenon. Then to the entry of the internet into the commercial phase (1984-1989), facilitated by the upgrading backbone links, the writing of new software programs and the rapidly increasing number of interconnected international and intercontinental networks; the massive expansion of the internet into a global network; the instant and growing success of social networking – sites that enable Net users to share information, photos, private journals, hobbies and personal as well as commercial interests with networks of mutual friends and colleagues.

## The Formative Years

The history of the internet began in the early 1960s which was the Cold War period, when the United States and the Soviet Union were competing in expanding their influence in the world and viewing each other with suspicion. On October 4, 1957, the Soviet Union successfully launched the first space satellite, Sputnik. This necessitated American reaction. The US Department of Defense responded by establishing the Advanced Research Projects Agency (ARPA), designed to promote research that would ensure that the USA compete with and excel over the USSR in any technological race. ARPA’s mission was to produce innovative research ideas, to produce innovative research ideas, to provide meaningful technological impact that went far beyond the convention evolutionary development approaches, and to act on these ideas by developing prototype systems. One of the ARPA offices was the Information Processing Techniques Office (IPTO) which funded research in computer science designed to mobilize American universities and research laboratories to build up a strategic communication network (Command and Control Research) that would make available messaging capabilities to the government.

In his series of memos written in 1962 discussing his “Galactic Network Concept”, J.C.R Licklider of MIT, envisioned a globally interconnected set of computers through which everyone could easily access data and programs from any site. Licklider was the first head of the computer research program at ARPA, starting in 1962. His role was to interconnect the Department of Defense’s main computers via a global, dispersed network. In August 1962, Licklider and Welden Clark published the first paper on the concept of the Internet titled “On-Line Man Computer Communication.” They saw communication network as a tool for scientific collaboration. While at ARPA (also known as Defense Advanced Research Projects Agency, DARPA), he convinced his successors at DARPA, Ivan Sutherland, Bob Taylor, and Lawrence G. Roberts, of the importance of this networking concept.

In 1961, Leonard Kleinrock at MIT published the first paper on packet switching theory, which convinced MIT researched Lawrence G. Roberts of the hypothetical feasibility of communication using packets rather than circuits – one of the major steps along the path towards computer networking. In late 1966, Roberts went to DARPA to develop the computer network concept and quickly put together his plan for the “ARPANET”, publishing it in 1967. It just so happened that the National Physics Laboratory (NPL) and the RAND corporation had been working in parallel on a packet network system along with DARPA without knowing about each other’s work.

In 1965, Roberts working with Thomas Merrill, connected the TX-2 computer in Mass to the Q-32 in California with a low speed dial-up telephone line creating the first small, wide-area computer network ever built. This made them realize that the time-shared computers could work well together, running programs and retrieving data as necessary on the remote machine. But more importantly, it confirmed Kleinrock’s conviction that packet switching was needed in place of the inadequate circuit switched telephone system.

Due to Kleinrock’s early development of packet switching theory and his focus on analysis, design and measurement, his Network Measurement Center at UCLA was selected to be the first node on the ARPANET. Doug Engelbart’s project on “Augmentation of Human Intellect” (which included NLS, an early hypertext system) at Stanford Research Institute (SRI) provided a second node. One month later, when SRI was connected to the ARPANET, the first host-to-host message was sent from Kleinrock’s laboratory to SRI. Two more nodes were added at UC Santa Barbara and University of Utah. Thus, by the end of 1969, four host computers were connected together into the initial ARPANET, and the budding internet was shooting off the ground.

Computers were quickly added to the ARPANET during the following years, and work proceeded on completing a functionally complete Host-to-Host protocol and other network software. In December 1970 the Network Working Group (NWG) working under S. Crocker finished the initial ARPANET Host-to-Host protocol, called Network Control Protocol (NCP). As the ARPANET sites completed implementing NCP during the period 1971-1972, the network users finally could begin to develop applications. Via ARPANET’s NCP, users where able to access and use computers and printers in other locations and transport files between computers.

Leonard Kleinrock wanted to develop a design methodology that would scale to very large networks, and the only way he thought was available to accomplish that was to introduce the concept of distributed control, wherein the responsibility for controlling the network routing would be shared among all the nodes, and therefore, no node would be unduly tasked. This resulted in robust networks.

In 1971, UNIX operating system was developed at Bell Lab, quickly gaining the appreciation of many scientists. UNIX provides a suite of programs which makes the computer work. It is a stable, multi-user, multi-tasking system for servers, desktops and later on also for laptops. In 1972, ALOHANET connected the ARPANET and a commercial version of ARPANET, called TELNET, became the first Public Packet Data Service. The Telnet protocol was a relatively simple procedure. It was a minimal mechanism that permitted basic communication between two host machines. Telnet applications allow users to log on and to operate remote computers. Such applications can, for example, be used to search and consult remote databases such as library catalogues.

In October 1972, Robert Kahn organized a large very successful demonstration of the ARPANET at the International Computer Communication Conference (ICCC). This was the first public demonstration of this new network technology to the public. It was also in 1972 that the initial “hot” application, electronic mail, was introduced. In July, Roberts expanded its utility by writing the first email utility program to list, selectively read, file forward, and respond to messages. From there email took off as the largest network application for over a decade. This was a harbinger of the kind of activity we see on the World Wide Web today, namely, the enormous growth of all kinds of “people-to-people” traffic.

A year later, in 1973, ARPANET was connected to international hosts. File Transfer Protocol (FTP) came into existence and worked using a Client Server Architecture. The file-transfer protocol specified the formatting for data files traded over the network. FTP made it possible to share files between machines. Moving files might seem simple, but the difference between machines made it very difficult. FTP was the first application to permit two computers to cooperate as peers instead of treating one as a terminal to the other. Telnet, FTP and TALK were the first applications to become available on ARPANET. Talk was the first program that allowed Net users to engage in real-time conversation over the network, in which, net users typed messages onto a split screen and read replies written at the bottom of the screen.

In 1974, Vint Cerf and Robert Kahn developed a set of protocols that implemented the open architecture philosophy. These new protocols were the Transmission Control Protocol (TCP) and the Internet Protocol (IP). TCP includes rules that computers on a network use to establish and break connections; IP includes rules for routing of individual data packets. The Transmission Control Protocol/Internet Protocol (TCP/IP) organizes the data into packages, put them into the right order on arrival at their destination, and checked them for errors. Most of the applications use the client/server model. A request is made for a particular service from the client to the server. The server responds or the conversation continues between the client and server until one of the participants ends it.

By 1983, all networks connected to the ARPANET made use of TCP/IP and the old Network Control Protocol was replaced entirely. From then on, the collection of interconnected and publicly accessible networks using TCP/IP protocols came to be called the “Internet”. The term “Internet” was first used by Vint Cerf and Robert Kahn in their 1974 article about the TCP protocol.

In 1984, the number of hosts increased to 1024. As more researchers connected their computers and computer networks to the ARPANET, interest in the network grew in the academic community. One reason for increased interest in the project was its adherence to an open architecture philosophy: Each  
network could continue using its own protocols and data-transmission methods internally. There was no need for special accommodations to be connected to the Internet, there was no global control over the network, and all could join in. This open architecture philosophy was revolutionary at the time. Most companies used to make their networks distinct and incompatible with other networks. They feared competition and strove to make their products inaccessible to competitors. The shift to an open architecture approach is one of the most celebrated features of the Internet.

## Commercial Phase

During the mid-1980s, the Internet entered its commercial phase. In 1984, the Department of  
Defense split the ARPANET into two specialized networks: ARPANET would continue its advanced research activities, and MILNET (for Military Network) would be reserved for military uses that required greater security. Connections were developed so that users could communicate between the two networks.

In 1986, the number of Internet hosts increased to 5000. By 1987, when the number of hosts  
reached 10,000, congestion on the ARPANET caused by the limited-capacity leased telephone  
lines was becoming complicated. To trim down the traffic load on the ARPANET, a network run by the National Science Foundation, called NSFnet, merged with another NSF network, called CSNet, and with BITNET to compose one network that could carry much of the network traffic. As the civilian network became increasingly commercial, budget limitations impelled the U.S. government’s departure from  
participation in the Internet’s structure. In turn, private telecoms companies entered the picture. By the late 1980s, many other TCP/IP networks had merged or established interconnections. In 1988, the NSFnet backbone was upgraded to DS-1 (1.544 Mbps) links, which was able to handle more than 75 million packets a day. This innovation immediately yielded further expansion of the Internet.

The NSFnet began to encompass many other lower-level networks such as those developed by academic  
institutions. Gradually, the Internet as we know it today, a maze of interconnected networks came  
about. Canada (CA), Denmark (DK), France (FR), Iceland (IS), Norway (NO) and Sweden (SE) connected to NSFnet. The first transatlantic fiber-optic cable was installed, using glass fibers so transparent that repeaters (to regenerate and recondition the signal) were needed about 40 miles apart. Linking North America and France, the 3,148-mile shark-proof cable was capable of handling 40,000 telephone calls simultaneously.

Also in 1989, Englishman Tim Berners-Lee, a researcher at the *Organisation Europeenne pour la Recherche Nucleaire* (CERN) in Geneva, proposed the idea of an international system of protocols: Building a distributed hypermedia server which would allow net users to prepare electronic documents that are composites of, or pointers to, many different files of potentially different types, scattered  
across the world. Berners-Lee called it the World Wide Web (WWW). He wrote the first WWW client (a browser-editor running under NeXTStep) and most of the communications software, defining URLs (Uniform Resource Locator, webpage address), HTTP (Hypertext Transfer Protocol between a server and clients) and HTML (interactive Hypertext Markup Language). His hypermedia software program  
enabled people to access, link and create communications in a single global web of information.

The web was superimposed on the Internet and incorporated its protocols. The web thus marked the coming together of three different strands of innovation: Personal computing, networking, and connective software. Using hyperlinks embedded in hypertext, net users acting as producers of information link up files containing text, sound and graphics to create webpages. The sources of information linked in this way can be located on any computer that is also part of the web. Each information source may itself be linked to an indefinite number of webpages. Hypertext and  
hyperlinks allow net users acting as receivers of information to wander from one source of information to another effortlessly, deciding for themselves which information they wish to have transferred to their browser and which link they want to explore or to skip. Net users could also index the data they possess and search for further data.

## Above and Beyond

During the 1990s we witnessed a massive expansion of the Net. The Internet’s accessibility, its multiapplication and its decentralized nature were instrumental in this rapid growth. Business as well as personal computers with different operating systems could join the universal network. The Internet became a global phenomenon, more countries and people joined and groundbreaking minds expanded the horizons of the platform with new, imaginative innovations. In 1990, the ARPANET project was officially over when it handed over control of the public Internet backbone to the National Science  
Foundation.

In 1991, the Internet Society was formed and Croatia (HR), Hong Kong (HK), Hungary (HU), Poland (PL), Portugal (PT), Singapore (SG), South Africa (ZA), Taiwan (TW) and Tunisia (TN) joined the NSFnet network whose backbone was upgraded to DS-3 (44.736 Mbps) as the traffic passed to 1 trillion bytes and 10 billion packets per month. That year, 1991, saw another milestone as the popular encryption program PGP (Pretty Good Privacy) was released by Philip Zimmerman. Unfortunately, PGP presents a technological-ethical challenge with significant social implications as it is also used by Net abusers. As PGP is freely available, powerful tool, it is used by criminals and radicals who wish to hide their Net identity in order to advance anti-social behavior. In 1991, the WWW was presented to the public and in 1993 the Internet became available to the general public; in 2015 the number of Internet users around the world is calculated around 3 billion.

## Conclusion

The internet has revolutionized the computer and communications world irreversibly. The invention of the telegraph, telephone, radio, and computer set the stage for this unprecedented integration of capabilities. The Internet and its architecture have grown in evolutionary fashion from modest beginnings, rather than from a Grand Plan. The ingenuity of the Internet as it was developed in the 1960s by the ARPA scientists lies in the packet switching technology. The Net diffusiveness and its focus on flexibility, decentralization and collaboration brought about the Internet as we know it today. For Internet Service Providers (ISPs), anticipating and accommodating the rapidly shifting traffic demands has been a technological, economical, and political challenge. The internet is at once a world-wide broadcasting capability, a mechanism for information dissemination, and a medium for collaboration and interaction between individuals and their computers without regard for geographic location.

The result is the most impressive web of communications in the history of humanity.  
Millions of people around the globe cannot describe their lives and function as they wish  
without the Internet. One should not conclude that the Internet has now finished changing. The Internet, although a network in name and geography, is a creature of the computer, not the traditional network of the telephone or television industry. It will, indeed it must, continue to change and evolve at the speed of the computer industry if it is to remain relevant. If the Internet stumbles, it will not be because we lack for technology, vision, or motivation. It will be because we cannot set a direction and march collectively into the future.