**History of the Internet**

How many times have you used the Internet today? Once, twice, too many times to count? For most people it is the latter. Today, the Internet has become an essential part of our everyday lives by keeping us connected with those around us, sharing knowledge, and even supporting our dreams. What started off as two computers sending a message between each other has evolved into a world-wide connection but most people take for granted its humble start.

The possibility of the Internet began with the development of electronic computers in the 1950s but it was not until the USSR launches Sputnik, the first artificial earth satellite, into space in 1957 that prompted the development of the internet. The US formed the Advanced Research Projects Agency (ARPA) within the Department of Defense in order to establish a US lead in science and technology applicable to the military as well as find a better communication system. ARPA, was later renamed to "DARPA" (for Defense).

In 1961, Leonard Kleinrock publishes the first paper on Packet switching theory, which forms the basis for the creation of the Internet. He was then hired in October 1962 to work for DARPA after his "Galactic Network" concept was published. His "Galactic Network" is the first recorded description of the social interactions that could be enabled through networking via globally interconnected set of computers through which everyone could quickly access data and programs from any site. Leonard most important theory thought was his theory on packet switching because packet switching would allow for a digital networking communication that could transmit all data regardless of content, type, or structure because it broke the data down into suitably sized blocks, called packets.

Leonard Kleinrock ended up leaving DARPA before he could see his theory in practice. Before he did though, he convinced his successors, Ivan Sutherland, Bob Taylor, Lawrence G. Roberts, of the importance of his packet switching networking concept.

Besides packet switching the other key step was to figure out how to make the computers talk to one another. In 1965, to explore this, Roberts working with Thomas Merrill connected a TX-2 computer in Massachusetts to a Q-32 computer in California through a low speed dial-up telephone line creating the first wide-area computer network ever built. What they found from this experiment was that the time-shared computers could work well together, running programs and retrieving data as necessary on the remote machine. However, they also concluded that the circuit switched telephone system was absolutely inadequate for communication as Kleinrock had predicted and thus confirmed his theory for packet switching.

After, Roberts and Merrill’s successful experiment connecting the TX-2 computer in Massachusetts to the Q-32 computer in California, Roberts began developing the computer network concept and quickly put together his plan for the "ARPANET.” ARPANET became the technical core of what would become the Internet.

In 1967, Roberts presented his paper on ARPANET at a conference, only to find that there were other papers on a packet network concept from the UK by Donald Davies and Roger Scantlebury of NPL, Paul Baran and others at RAND group. It happened that the work at MIT (1961-1967), at RAND (1962-1965), and at NPL (1964-1967) had all happened without any of the researchers knowing about the others work. With so many different network methods it was important for them to find something to unify their work. Robert E. Kahn of DARPA and ARPANET along with Vinton Cerf of Stanford University worked out a process where the differences between network protocols were hidden by using a common internetwork protocol, and instead of the network being responsible for reliability the hosts became responsible.

In 1968, after Roberts and DARPA had refined the overall structure and specifications for the ARPANET, they gave BBN Technologies a contract to build the network. The BBN proposed a network make up of small computers called Interface Message Processors (IMPs), that would functioned as gateways (today called routers) interconnecting local resources. At each site, the IMPs performed store-and-forward packet switching functions. The host computers were connected to the IMPs via custom serial communication interfaces which included the hardware and the packet switching software. These IMPs could support up to four local hosts, and could communicate with up to six remote IMPs via leased lines.

In September of 1969, the ARPANET went live. A connection was made between computers at The University of California Los Angeles (UCLA) and The Stanford Research Institute (SRI) creating the first ARPANET link. These two computers would thus become the first and second nodes on the ARPANET. On October 29, 1969 the first host-to-host message was sent from UCLA to SRI.

Two more nodes were added at UC Santa Barbara and University of Utah. These last two nodes incorporated application visualization projects, with Glen Culler and Burton Fried at UCSB investigating methods for display of mathematical functions using storage displays to deal with the problem of refresh over the net, and Robert Taylor and Ivan Sutherland at Utah investigating methods of 3-D representations over the net. Thus, by the end of 1969, four host computers were connected together into the initial ARPANET, and the Internet was officially off the ground. Over the next several years, nodes are continuously added to the ARPANET.

In October 1972, Kahn exhibited the ARPANET at the International Computer Communication Conference (ICCC). This was the first public demonstration of this new network technology to the public. Along with its first public appearance, the initial "hot" application, electronic mail, was introduced. In March Ray Tomlinson at BBN wrote the basic email message send and read software, motivated by the need of the ARPANET developers for an easy coordination mechanism. 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.

By 1973, thirty institutions were connected to the ARPANET. However, there were still some problems to work out. Up until this point, operating system had been working on the NCP protocol since there was really no standard but NCP did not have the ability to address networks (and machines) further downstream than a destination IMP on the ARPANET. As mention earlier, with so many different networks they needed something to unify their work. Thus, Kahn and Cerf, the developer of the existing ARPANET Network Control Program (NCP) protocol, finally develop a new version of the protocol in 1974 which could meet the needs of an open-architecture network environment. This protocol would eventually be called the Transmission Control Protocol/Internet Protocol (TCP/IP). In 1975, their new two-network TCP/IP communication was tested between Stanford and University College London (UCL). Between 1978 and 1983, several other TCP/IP prototypes were developed at multiple research centers but the migration of the ARPANET to TCP/IP protocols was officially and permanently activated in January 1983.

The Transmission Control Protocol/Internet Protocol (TCP/IP) suite is the set of communications protocols used for the Internet and other similar networks. It came to be known as TCP/IP, because of its most important protocols are the Transmission Control Protocol (TCP) and Internet Protocol (IP). TCP/IP provides end-to-end connectivity specifying how data should be formatted, addressed, transmitted, routed and received at the destination. It does this through its four abstraction layers which sort all Internet protocols according to the scope of networking involved from lowest to highest, the lowest being the link layer contains communication technologies for a local network, then the internet layer (IP) connects local networks, thus establishing internetworking, then the transport layer handles host-to-host communication. Over time four versions were developed: TCP v1, TCP v2, TCP v3 and IP v3, and TCP/IP v4 but the last protocol is still in use today.

Between 1978 and 1989 not much was happened. In 1978, there is boom in a new set of niche industries, like software and modems, because of the appearance of very small computers and their communication via modem to dial up services. Vint Cerf and other at DARPA continue to make changes and improve the Internet. Also in during this year, the ARPANET experiment is formally completed. Thus over the next few years, the task becomes one of sustaining and maintaining the vision of a free and open Internet that can keep up with the rapidly growing computer industry. Improvements to the Internet included implementing in 1984 the newly developed DNS (Domain Name Sever) across the Internet, with domains of .gov, .edu, .org, .net, and .com. By 1989, the Internet had become a well-established technology supporting a broad community of researchers and developers, and was beginning to noticed and used by other communities for commercial use.

In March 1989, Tim Berners-Lee of CERN addresses the issue of the constant change in the currency of information and the turn-over of people on projects. In his proposal he referenced ENQUIRE, a database and software project he had built in 1980, and described a more elaborate information management system. Instead of an hierarchical or keyword organization, Berners-Lee proposes a hypertext system that will run across the Internet on different operating systems. With help from Robert Cailliau, he published a more formal proposal in November 1990 to build a "Hypertext project" which would become the World Wide Web. What made the WWW possible was Berners-Lee's innovative idea to join hypertext and the Internet. In the process of combining them, Berners-Lee developed three essential technologies (1) a system of globally unique identifiers for resources on the Web and elsewhere as the Universal Document Identifier (UDI), later known as Uniform Resource Locator (URL) (2) the publishing language HyperText Markup Language (HTML) and (3) the Hypertext Transfer Protocol (HTTP). Tim Berners-Lee a few years later went and formed the World Wide Web Consortium (W3C). He is currently the director of the World Wide Web Consortium (W3C), which oversees the Web's continued development. The W3C is comprised of various companies that were willing to create standards and recommendations to improve the quality of the Web. These standards and ideas are freely available to anyone with no patent and no royalties due. The World Wide Web Consortium decided that its standards should be based on royalty-free technology, so that they could easily be adopted by anyone.

With the rise of the World Wide Web there was the creation of browsers. Browsers were created as search engines that attempted to organize the Internet by allowing people to track pages on the Web. Today however, browsers have evolved as software applications for retrieving, presenting and traversing information resources on the World Wide Web. It is able to get this information because the information is identified by a Uniform Resource Locator (URL). With the URL the browser is able to find any piece of information be it a web page, image, video or other piece of content. The first full-text Web search engine was WebCrawler in 1994 since before WebCrawler, only Web page titles were searched. However, the first web browser was invented in 1990 by Sir Tim Berners-Lee. It was originally called WorldWideWeb but and was later renamed Nexus so as not to be confused with his Hypertext Project. In 1993, Marc Andreessen released his browser software called Mosaic (later Netscape) which would become the "the world's first popular browser" and also made World Wide Web system easier to use and more accessible to the average person.

From Andreesen's browser idea sparked the internet boom of the 1990s and the “Browser Wars;” a metaphorical term referring to the competitions between Browsers for dominance via usage. Microsoft responded with its Internet Explorer in 1995, also heavily influenced by Mosaic, initiating the industry's first browser war. Opera debuted in 1996 but has never achieved widespread use. In 1998, Netscape launched the Mozilla browser that would eventually evolve into Firefox. Apple's Safari was released in April of 2011. The most recent addition to the browser market is Google Chrome, released in September 2008. In December 2011, Chrome overtook Internet Explorer 8 as the most widely used web browser. As of today the major web browsers are Chrome, Firefox, Internet Explorer, Opera, and Safari.

Interestingly enough, the war still continues today and there is now a new front to concur as the mobile web evolves. As more widespread use of smartphones and other mobile devices has occurred the focus for these browsers has to become mobile. Currently, WebKit has become the most dominant layout engine so far since Internet Explorer, Firefox and Opera — have a poorer experience when viewing most mobile versions of Web sites.

With the spark of the Browser wars there became a Dot-com bubble. Starting roughly in 1997, there was a speculative bubble where stock markets in industrialized nations saw their equity value rise rapidly from growth in the Internet sector and related fields. It is called the Dot-com bubble since during this period there was a large founding of new Internet-based companies commonly referred to as dot-coms. Companies were seeing their stock prices shoot up if they simply added an "e-" prefix to their name and/or a ".com" to the end, which one author called "prefix investing.” With a combination of rapidly increasing stock prices, market confidence that the companies would turn future profits, individuals speculated in stocks. These venture capitalists created an environment in which many investors were willing to overlook traditional financial measure in favor of confidence in the technological advancements.

In March 2000, the dot-com bubble burst. It was caused when in 1999 the U.S. Federal Reserve began to increased interest rates six times in order to slow the economy. A majority of the dot-coms ceased trading because they had burned through their venture capital money. Many never having made a profit because their strategy was "get big fast" therefore they offered their services or end product for free thinking that if they could build enough brand awareness, they could charge profitable rates for their services later. However, that was not the case. By 2001, the bubble's deflation was running full speed. A majority of the dot-coms had ceased trading, after having burnt through their money and venture capital, often without ever making a profit. Of all the hundred, if not thousands, of companies that started, only two companies were able to make it through. They were Amazon and Ebay.

Even though the technology market took a major hit, the Internet continued to change and grow. One example is the creation of XHTML (Extensible HyperText Markup Language) which was developed out of HTML. Many pages on the web contained HTMLs that were poorly formed, containing certain errors such as missing closing tags, tags not closed in the proper order, and attributes not quoted. XHTML was created to prevent these errors by setting rules that would eventually result better and more efficient codes for webpage visitors. XHTML 1.0 became the first version of XHTML in January 2000. It contained a bunch of new XHTML syntax rules and XHTML tag rules that needed to be followed. Another feature in XHTML 1.0 was that web developers had to classify their documents into one of three document types which include transitional, frameset, and strict. Next came the XHTML 1.1 edition in 2001. It is not that much different from XHTML 1.0 but introduced the idea of modules which is a set of related elements. The most current version of XHTML is XHTML5 released in September 2009.

In addition to XHTML, the WorldWideWeb changed in the early 2000’s. This change came to be known as Web 2.0 in order to describe the new use of technology in web sites. Although phrase Web 2.0 bring to mind a new version of the World Wide Web, the major change is in the ways software developers and end-users use the Web. Web 2.0 sites allowed users to interact and collaborate with each other in a social such as networking sites, blogs, video sharing sites, hosted services, web applications, and much more. Features and techniques of Web 2.0 websites include the following, referred to as the acronym SLATES by Andrew McAfee: Search which is the feature of finding information through keyword search, Links which connects information together, Authoring which is the ability to create and update content, Tags which users use to categorize content by adding "tags"—short descriptions—to assist searching, Extensions which are software’s that make the Web an application, and Signals which update users of content changes.

Even though Web 2.0 has made the web more user friendly, the best technologically advancement has been the creation of the mobile web. Traditionally, access to the Web has been via fixed-line services on large-screen laptops and desktop computers. Now however, thanks to the WAP (Wireless Application Protocol) and WML (Wireless Markup Language) the Web is becoming more accessible by portable and wireless devices like smartphones and tablets. The first mobile phone with Internet connectivity was the Nokia 9000 Communicator in 1996. The feasibility of Internet services via mobile phones was limited though since prices were sky high and network providers did not have developed systems and services to conveniently provide this service on phones. In 2001, Research in Motion released their BlackBerry product which could access the Internet but the growth of mobile phone Internet access was more gradual than expected. It was not until 2008 that more mobile devices accessed the Internet than personal computers. Even as far as we have come with mobile technology mobile Web access still suffers from compatibility and usability problems.

Over the past 50 plus years the internet has gone light-years from its start. Right now we are in the wave of mobile technology but what comes after that? Where else can the Internet go? I think we can all say we can look forward to what innovative ideas will come in the future.

Resources

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

<http://www.zakon.org/robert/internet/timeline/>

<http://www.computerhistory.org/internet_history/internet_history_70s.html>

<http://www.internetsociety.org/internet/what-internet/history-internet/brief-history-internet>

<http://www.livinginternet.com/i/ii.htm>

<http://www.isoc.org/oti/printversions/0797prleiner.html>