In the Name of Allah

A Selection of the History of Computer Hardware & Software

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1940: Bombe

The Bombe was an electromechanical device used by British cryptologists to help decipher German Enigma-machine (3-rotor version) encrypted secret messages during World War II. The US Navy and US Army later produced their own machines to the same functional specification, but engineered differently from each other and from the British Bombe. The initial design of the bombe was produced in 1939 at the UK Government Code and Cypher School (GC&CS) at Bletchley Park by Alan Turing, with an important refinement devised in 1940 by Gordon Welchman. It was a substantial development from a device that had been designed in 1938 in Poland known as the "cryptologic bomb". The bombe was designed to discover some of the daily settings of the Enigma machines on the various German military networks. In 1943, an improved version of the bombe was developed at Bletchley Park in response to the 4-rotor Enigma.

1941: Z3

The Z3 was an electromechanical computer designed by Konrad Zuse. It was the world's first working programmable, fully automatic digital computer. The Z3 was built with 2000 relays, implementing a 22-bit word length that operated at a clock frequency of about 5–10 Hz. Program code and constant data were stored on punched film. The Z3 was completed in Berlin in 1941. The German Aircraft Research Institute used it to perform statistical analyses of wing flutter. The original Z3 was destroyed in 1943 during an Allied bombardment of Berlin.

1943: Colossus computer

Colossus was the name of a series of computers developed for British codebreakers in 1943-1945 to help in the cryptanalysis of the Lorenz cipher. Colossus used thermionic valves (vacuum tubes) and thyratrons to perform Boolean and counting operations. Colossus is thus regarded as the world's first programmable, electronic, digital computer, although it was programmed by plugs and switches and not by a stored program. Colossus was designed by the engineer Tommy Flowers to solve a problem posed by mathematician Max Newman at the Government Code and Cypher School (GC&CS) at Bletchley Park.

1944: Harvard Mark-I

The IBM Automatic Sequence Controlled Calculator (ASCC), called Mark-I by Harvard University's staff, was a general purpose electro-mechanical computer that was used in the war effort during the last part of World War II. The original concept was presented to IBM by Howard Aiken in November 1937. After a feasibility study by IBM's engineers, Thomas Watson personally approved the project and its funding in February 1939. The ASCC was developed and built by IBM at their Endicott plant and shipped to Harvard in February 1944. It began computations for the US Navy. One of the first programs to run on the Mark I was initiated on 29 March 1944 by John von Neumann, who worked on the Manhattan project at the time. The Mark I read its instructions from a 24-channel punched paper tape and executed the current instruction and then read in the next one. This separation of data and instructions is known as the Harvard architecture.

1946: ENIAC

ENIAC (Electronic Numerical Integrator And Computer) was the first electronic general-purpose computer. It was Turing-complete, digital, and capable of being reprogrammed to solve a large class of numerical problems. Though ENIAC was designed and primarily used to calculate artillery firing tables for the United States Army's Ballistic Research Laboratory, its first programs included a study of the feasibility of the hydrogen bomb. ENIAC was announced in 1946 but the construction contract was signed on June 5, 1943. Work on the computer began in secret at the University of Pennsylvania's Moore School of Electrical Engineering[10] the following month, under the code name "Project PX".

1945-1947: Stored Program Computer or Von Neumann architecture

The Von Neumann architecture, also known as the Von Neumann model and Princeton architecture, is a computer architecture based on that described in 1945 by the mathematician and physicist John von Neumann and others in the "First Draft of a Report on the EDVAC". This describes a design architecture for an electronic digital computer with parts consisting of a processing unit containing an arithmetic logic unit and processor registers, a control unit containing an instruction register and program counter, a memory to store both data and instructions, external mass storage, and input and output mechanisms. The meaning has evolved to be any stored-program computer. At the time that the "First Draft" report was circulated, Turing was producing a report entitled Proposed Electronic Calculator which described in engineering and programming detail, his idea of a machine that was called the Automatic Computing Engine (ACE). Both von Neumann's and Turing's papers described stored-program computers, but von Neumann's earlier paper achieved greater circulation and the computer architecture it outlined became known as the "von Neumann architecture". It is believed that von Neumann knew of Turing's theoretical work, but the "First Draft" report received much publicity, despite its incomplete nature and questionable lack of attribution of the sources of some of the ideas.

1946: ACE

The Automatic Computing Engine (ACE) was an early electronic stored-program computer design produced by Alan Turing at the National Physical Laboratory (NPL). On 19 February 1946 Turing presented a detailed paper to the National Physical Laboratory (NPL) Executive Committee, giving the first reasonably complete design of a stored-program computer. Although Turing knew from his wartime experience at Bletchley Park that what he proposed was feasible, the secrecy surrounding Colossus, that was subsequently maintained for several decades, prevented him from saying so. Turing's colleagues at the NPL, not knowing about Colossus, thought that the engineering work to build a complete ACE was too ambitious, so the first version of the ACE that was built was the Pilot Model ACE, a smaller version of Turing's original design.

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| 2nd generation: Age of Transistors |
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1947: Invention of the Transistor

The first transistor was successfully demonstrated on December 23, 1947 at Bell Laboratories, the research arm of American Telephone and Telegraph (AT&T). The three individuals credited with the invention of the transistor were William Shockley, John Bardeen and Walter Brattain. A transistor is a semiconductor device used to amplify and switch electronic signals and electrical power. The transistor is the fundamental building block of modern electronic devices, and is ubiquitous in modern electronic systems. It revolutionized the field of electronics, and paved the way for smaller and cheaper radios, calculators, and computers. The essential usefulness of a transistor comes from its ability to use a small signal applied between one pair of its terminals to control a much larger signal at another pair of terminals. This property is called gain. It can produce a stronger output signal, a voltage or current, which is proportional to a weaker input signal; that is, it can act as an amplifier. Alternatively, the transistor can be used to turn current on or off in a circuit as an electrically controlled switch, where the amount of current is determined by other circuit elements.

1956: MIT TX-0

The TX-0 for Transistorized Experimental computer zero, but affectionately referred to as tixo (pronounced "tix oh"), was an early fully transistorized computer and contained a then-huge 64K of 18-bit words of magnetic core memory. The TX-0 was designed at the MIT Lincoln Laboratory, built in 1955, and went online in 1956 and was used continually through the 1960s at MIT. The transistorized TX-0 computer used 3600 transistors in its computer's circuitry and had also used the Philco high-frequency surface-barrier transistors in its design.

1957: FORTRAN language

In 1957 the first high-level programming language "FORTRAN" was designed at IBM for scientific computing. Its name stands for FORmula TRANslating system. The components were very simple, and provided the programmer with low-level access to the computers innards.

1964: BASIC language

BASIC (an acronym for Beginner's All-purpose Symbolic Instruction Code) is a family of general-purpose, high-level programming languages whose design philosophy emphasizes ease of use. In 1964, John G. Kemeny and Thomas E. Kurtz designed the original BASIC language at Dartmouth College in New Hampshire. They wanted to enable students in fields other than science and mathematics to use computers. Versions of BASIC became widespread on microcomputers in the mid-1970s and 1980s. Microcomputers usually shipped with BASIC, often in the machine's firmware. Having an easy-to-learn language on these early personal computers allowed small business owners, professionals, hobbyists, and consultants to develop custom software on computers they could afford.

1966: Apollo Guidance Computer

The Apollo Guidance Computer (AGC) was a digital computer produced for the Apollo program. The AGC provided computation and electronic interfaces for guidance, navigation, and control of the spacecraft. The AGC had a 16-bit word length, with 15 data bits and one parity bit. Most of the software on the AGC was stored in a special read only memory known as "core rope memory". Astronauts communicated with the AGC using a numeric display and keypad called the DSKY. The AGC and its DSKY user interface were developed in mid 1960s for the Apollo program by the MIT Instrumentation Laboratory. The AGC is notable for being one of the first integrated circuit-based computers. The AGC made its first debute orbiting the earth on Apollo-7 in 1968. Processor: Discrete IC RTL based; Frequency: 2 MHz; Memory: 16-bit wordlength, 2048 words RAM (magnetic core memory), 36,864 words ROM (core rope memory). AGC software was written in AGC assembly language and stored on rope memory. Margaret Hamilton was the lead Apollo flight software engineer.

1969: ARPANET

The Advanced Research Projects Agency Network (ARPANET) was an early packet switching network and the first network to implement the protocol suite TCP/IP. Both technologies became the technical foundation of the Internet. ARPANET was initially funded by the Advanced Research Projects Agency (ARPA) of the United States Department of Defense.

The first successful message on the ARPANET was sent by UCLA student programmer Charley Kline, at 10:30 pm on 29 Oct 1969. Kline transmitted from the university's SDS Sigma 7 Host computer to the Stanford Research Institute's SDS 940 Host computer. The message text was the word "login". On an earlier attempt only the 'l' and 'o' letters were transmitted, but the system then crashed. Hence the literal first message over the ARPANET was "lo". About an hour later,

after the programmers repaired the code that caused the crash, the SDS Sigma 7 computer effected a full login. The first permanent ARPANET link was established on 21 November 1969, between the IMP at UCLA and the IMP at the Stanford Research Institute. By 5 December 1969, the entire four-node network was established.

The term "internet" was adopted in the first RFC published on the TCP protocol (RFC 675: Internet Transmission Control Program, Dec 1974) as an abbreviation of the term "internetworking". In general, an internet was any network using TCP/IP.

1969: PASCAL language

Pascal is a historically influential high-level imperative and procedural programming language, designed in 1968-1969 and published in 1970 by Niklaus Wirth as a small and efficient language intended to encourage good programming practices using structured programming and data structuring. It was named in honor of the French mathematician and philosopher Blaise Pascal. Initially, Pascal was largely but not exclusively, intended to teach students structured programming. Pascal was the primary high-level language used for development in the Apple Lisa, and in the early years of the Macintosh. The first Pascal compiler was designed in Zürich for the CDC 6000 series mainframe computer family. Niklaus Wirth reports that a first attempt to implement it in Fortran in 1969 was unsuccessful due to Fortran's inadequacy to express complex data structures. The second attempt was formulated in the Pascal language itself and was operational by mid-1970.

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| 3rd generation: Age of Personal Computing |
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1970: Kenbak-1

The Kenbak-1 is considered by the Computer History Museum to be the world's first personal computer. It was designed and invented by John Blankenbaker of Kenbak Corporation in 1970, and was first sold in early 1971. Unlike a modern personal computer, the Kenbak-1 was built of small-scale integrated circuits, and did not use a microprocessor. The system first sold for US$750. Only around 40 machines were ever built and sold. In 1973, production of the Kenbak-1 stopped as Kenbak Corporation folded. With only 256 bytes of memory, an 8-bit word size, and input and output restricted to lights and switches, the Kenbak-1 was most useful for learning the principles of programming but not capable of running application programs.

1970: UNIX operating system

In the late 1960s, Bell Labs was involved in a project with MIT and General Electric to develop a time-sharing system, called Multiplexed Information and Computing Service (Multics), allowing multiple users to access a mainframe simultaneously. Dissatisfied with the project's progress, Bell Labs management ultimately

withdrew. Ken Thompson, a programmer in the Labs' computing research department, had worked on Multics. He decided to write his own operating system. He found a little-used PDP-7 at Bell Labs and in about a month's time, Thompson had implemented a self-hosting operating system. The new operating system was initially without organizational backing, and also without a name. In 1970, Peter Neumann coined the project name UNICS (UNiplexed Information and Computing Service) as a pun on Multics. When the Computing Sciences Research Center wanted to use Unix on a machine larger than the PDP-7, while another department needed a word processor, Thompson and Ritchie added text processing capabilities to Unix and received funding. For the first time in 1970, the Unix operating system was officially named and ran on the PDP-11/20, all written in PDP-11/20 assembly language. In 1972, Unix was rewritten in the higher-level language C programming language. The Unix operating system was first presented formally to the outside world at the 1973 Symposium on Operating Systems Principles, where Ritchie and Thompson delivered a paper. This led to requests for the system, but under a 1956 consent decree in settlement of an antitrust case, the Bell System (the parent organization of Bell Labs) was forbidden from entering any business other than "common carrier communications services" and license any patents it had upon request. Unix could not, therefore, be turned into a product. Although, Ken Thompson quietly began answering requests by shipping out tapes and disks.

1972: C language

The origin of C is closely tied to the development of the Unix operating system, originally implemented in assembly language. Ritchie and Thompson decided to port the operating system to a PDP-11. The original PDP-11 version of Unix was developed in assembly language. The developers were considering to rewrite the system using the B language, however B's inability to take advantage of some of the PDP-11's features, notably byte addressability, led to C. The development of C started in 1972 on the PDP-11 Unix system, and first appeared in Version 2 Unix. The language was not initially designed with portability in mind, but soon ran on different platforms as well. In the same year, a large part of Unix was rewritten in C. By 1973, with the addition of struct types, the C language had become powerful enough that most of the Unix's kernel was written in C.

1973: Xerox Alto

Douglas Engelbart invented the GUI (Graphical User Interface) pronounced "gooey" at Stanford Research Institute in the 1960s, complete with windows, icons, menus, and mouse. These ideas were adopted by researchers at Xerox PARC and incorporated into machines they built. The Xerox Alto, developed at Xerox PARC in 1973, was the first computer to use a mouse, the desktop metaphor, and a graphical user interface (GUI). It was the first example of what would today be recognized as a complete personal computer. Memory: 128-512 kB

1974: Intel 8080 & Founding of Digital Research

In 1974 Intel came out with the 8080, the first general-purpose 8-bit CPU. Intel wanted an operating system for the 8080, in part to be able to test it. Intel asked one of its consultants, Gary Kildall, to write one. Kildall and a friend first built a controller for the newly-released Shugart Associates 8-inch floppy disk and hooked the floppy disk up to the 8080, thus producing the first microcomputer with a disk. Kildall then wrote a disk-based operating system called CP/M (Control Program for Microcomputers) for it. Since Intel did not think that disk-based microcomputers had much of a future, when Kildall asked for the rights to CP/M, Intel granted his request. Kildall then formed a company "Digital Research" to further develop and sell CP/M.

1975: Founding of Microsoft

In Jan 1975 Paul Allen suggested Bill Gates, which were childhood friends, that they could program a BASIC interpreter for the popular device MITS Altair 8800 microcomputer. After a call from Gates claiming to have a working interpreter, MITS requested a demonstration. Since they didn't actually had an Altair 8800, Allen worked on a simulator for the Altair while Gates developed the interpreter. Although they developed the interpreter on a simulator and not the actual device, the interpreter worked flawlessly when they demonstrated the interpreter to MITS in March 1975. MITS agreed to distribute it, marketing it as Altair BASIC. Following this success, they officially established "Microsoft" on April 1975, with Gates as the CEO. Allen came up with the original name of "Micro-Soft".

1976: Apple-I

The Apple-I, was released by the Apple Computer Company in 1976. They were designed and hand-built by Steve Wozniak. Wozniak's friend Steve Jobs had the idea of selling the computer. The Apple-I was Apple's first product, and to finance its creation, Jobs sold his VW Microbus, and Wozniak sold his HP-65 calculator for $500. It was demonstrated in July 1976 at the Homebrew Computer Club in Palo Alto, California. CPU: MOS-6502 @ 1 MHz; Memory: 4 KB standard; Graphics: 40×24 characters, hardware-implemented scrolling.

By 1976 there were several firms racing to introduce the first truly successful commercial personal computers. Three machines were all released in 1977 eventually selling millions of machines, later referred to as the "1977 Trinity":

1977: Commodore PET

Chuck Peddle designed the Commodore PET (Personal Electronic Transactor) around his MOS 6502 processor. It was essentially a single-board computer with a new display chip (the MOS 6545) driving a small built-in monochrome monitor with 40×25 character graphics. The processor card, keyboard, monitor and cassette drive were all mounted in a single metal case. OS: Commodore BASIC; CPU: MOS Technology 6502 @ 1 MHz; Memory: 8 KB; Storage: cassette tape, 5.25" floppy, 8" floppy, hard disk; Display: 40×25 or 80×25 text; Graphics: monochrome character graphics.

1977: Apple-II

Apple computer announced the Apple II in 1977 as a complete computer. It had color graphics, a full QWERTY keyboard, and internal slots for expansion, which were mounted in a high quality streamlined plastic case. The monitor and I/O devices were sold separately. The original Apple II operating system was only the built-in BASIC interpreter contained in ROM. Apple DOS was added to support the diskette drive. Its higher price and lack of floating point BASIC, along with a lack of retail distribution sites, caused it to lag in sales behind the other Trinity. OS: Integer BASIC; CPU: MOS Technology 6502; Memory: 4 KB; Graphics: Lo-res (40×48, 16-color) & Hi-res (280×192, 6 color).

1977: TRS-80

Tandy Corporation (Radio Shack) introduced the TRS-80, known as the Model-I. It used a Zilog Z80 processor clocked at 1.77 MHz (the later models were shipped with a Z80A processor). The basic model originally shipped with 4 kB of RAM, and later 16 kB, in the main computer. The expansion unit allowed for RAM expansion for a total of 48K. Its other strong features were its full stroke QWERTY keyboard, small size, well written Microsoft floating-point BASIC and inclusion of a monitor and tape deck for approximately half the cost of the Apple II.

1977: Dominance of CP/M

In 1977 "Digital Research" rewrote CP/M to make it suitable for running on the many microcomputers using the Intel 8080, Zilog Z80, and other CPU chips. Many application programs were written to run on CP/M, allowing it to completely dominate the world of microcomputing for about 5 years.

1981: IBM PC 5150

The IBM PC was the first PC that justified widespread use. IBM responded to the success of the Apple II with the IBM PC, released in Aug 1981. Like the Apple II, it was based on an open, card-based architecture, which allowed third parties to develop for it. It used the Intel 8088 CPU running at 4.77 MHz, containing 29,000 transistors. The first model used an audio cassette for external storage, though there was an expensive floppy disk option. The IBM PC typically came with PC DOS, an operating system based upon Gary Kildall's CP/M-80 operating system. Memory: 16 KB - 64 KB

1981: MS-DOS

When IBM designed the IBM PC, it looked around for software to run on it. People from IBM contacted Bill Gates to license his ROM BASIC interpreter. They also asked him if he knew of an operating system to run on the PC. Gates suggested that IBM contact "Digital Research" then the world's dominant operating systems company. Making what was surely the worst business decision in recorded history, Kildall refused to meet with IBM, sending a subordinate instead, Kildall's wife and business partner "Dorothy McEwen" to meet with IBM representatives. They were unable to negotiate a standard non-disclosure agreement with her covering the

not-yet-announced PC. Consequently, IBM went back to Gates asking if he could provide them with an operating system. When IBM came back, Gates realized that a local computer manufacturer, Seattle Computer Products, had a suitable operating system, DOS (Disk Operating System). He approached them and asked to buy it (allegedly for $50,000), which they readily accepted. Gates then offered IBM a DOS/BASIC package, which IBM accepted. IBM wanted certain modifications, so Gates hired the person who wrote DOS, Tim Paterson, as an employee of Gates' fledgling company "Micro-Soft" to make them. IBM rebranded it as PC DOS, while Micro-Soft sold variations and upgrades as MS-DOS (Micro-Soft Disk Operating System) and quickly came to dominate the IBM PC market. A key factor here was Gates' wise decision to sell MS-DOS to computer companies for bundling with their hardware, compared to Kildall's attempt to sell CP/M to end users one at a time (at least initially).

1981: Xerox Star

In 1981, Xerox Corporation introduced the Xerox Star workstation, officially known as the "8010 Star Information System". Drawing upon its predecessor the Xerox Alto, it was the first commercial system to incorporate various technologies that today have become commonplace in personal computers, including a bit-mapped display, a windows-based graphical user interface, icons, folders, mouse, Ethernet networking, file servers, print servers and e-mail. It also included a programming language system called Smalltalk.

OS: Pilot; CPU: AMD Am2900; Memory: 384 KB; Storage: 10 MB, 29 MB, or 40 MB 8" hard drive; Display: 17"; Graphics: 1024×809 pixels @ 38.7 Hz.

1983: Apple Lisa

One day Steve Jobs from Apple computer visited Xerox PARC and saw the GUI on a Xerox Alto, and instantly realized its potential value, something Xerox management famously did not. Jobs then embarked on building an Apple with a GUI and in 1983 Apple Computer introduced the first mass-marketed microcomputer with a graphical user interface, the Lisa. The Lisa ran on a Motorola 68000 microprocessor and came equipped with 1 MB of RAM, a 12" black-and-white monitor, dual 5.25" floppy disk drives and a 5 megabyte Profile hard drive. The Lisa's slow operating speed and high price ($10,000) however, led to its commercial failure.

1983: Compaq Portable PC

Compaq announced their first product, the Compaq Portable, a portable IBM PC compatible personal computer. It was released in March 1983 at $2995. The Compaq Portable was one of the progenitors of today's laptop. It was the second IBM PC compatible, being capable of running all software that would run on an IBM PC. It was a commercial success.

OS: MS-DOS; CPU: Intel 8088 @ 4.77 MHz; Memory: 128 KB; Display: Built-in 9" green screen monitor.

1983: GNU Project

The GNU Project is a free software, mass collaboration project, announced on 27 Sep 1983, by Richard Stallman at MIT. Its aim is to give computer users freedom and control in their use of their computers and computing devices, by collaboratively developing and providing software that is based on the following freedom rights: users are free to run the software, share it (copy, distribute), study it and modify it. By June 1987, the project had accumulated and developed free software for an assembler, an almost finished portable optimizing C compiler (GCC), an editor (GNU Emacs), and various Unix utilities (such as ls, grep, awk, make and ld). They had an initial kernel that needed more updates.

1984: Apple Macintosh

The Macintosh-128K, originally released as the Apple Macintosh, is the original Apple Macintosh personal computer. It was Steve Jobs' second attempt (after the failure of Lisa) and turned to be a huge success, not only because it was much cheaper ($2,500), but also because it was user friendly, meaning that it was intended for users who not only knew nothing about computers but furthermore had absolutely no intention whatsoever of learning. OS: Apple System Software 1.0; CPU: Motorola 68000 @ 7.8 MHz (6 MHz effectively); Memory: 128 KB (built-in); Display: 9" black-and-white CRT 512×342 pixels.

1985: Microsoft Windows-1.0

When Microsoft decided to build a successor to MS-DOS, it was strongly influenced by the success of the Macintosh. It produced a GUI-based system called Windows, which originally ran on top of MS-DOS (i.e., it was more like a shell than a true operating system). For about 10 years, from 1985 to 1995, Windows was just a graphical environment on top of MS-DOS.

1986: NSFNET

In the early 1980s the US National Science Foundation (NSF) funded the establishment for national supercomputing centers at several universities, and provided interconnectivity in 1986 with the NSFNET project, which also created network access to the supercomputer sites in the United States from research and education organizations. It was around the time when ARPANET was interlinked with NSFNET in the late 1980s, that the term "Internet" was used as the name of the large and global TCP/IP network.

1988: NeXT Computer

Steve Jobs was the head of Apple's SuperMicro division, which was responsible for the development of the Macintosh and Lisa personal computers. Jobs's division did not release upgraded versions of the Macintosh. As a result, sales plummeted and Apple was forced to write off millions of dollars in unsold inventory. Apple's CEO John Sculley ousted Jobs from his day-to-day role at Apple, replacing him with Jean-Louis Gassée in 1985. Later that year, Jobs began a power struggle to regain control of the company. The board of directors sided with Sculley while Jobs took a business visit to Western Europe and the Soviet Union on behalf of

Apple. After several months of being sidelined, Jobs resigned from Apple in Sep 1985. He told the board he was leaving to set up a new computer company, and that he would be taking several Apple employees from the SuperMicro division with him. He also told the board that his new company would not compete with Apple. Jobs named his new company NeXT Inc. They released the NeXT Computer in 1988 and NeXTstation high-end workstation in 1990. The NeXT Computer and its object-oriented NeXTSTEP operating system was the platform that Tim Berners-Lee used at CERN for creating the World Wide Web.

1989: Prince of Persia video game

Prince of Persia is a fantasy platform game, originally developed by Jordan Mechner and released in 1989 for the Apple II, that represented a great leap forward in the quality of animation seen in video games. After the original release on the Apple II, it was ported to a wide range of platforms including MS-DOS for IBM compatible PCs.

1990: CERNET & World-Wide-Web

In 1988 Tim Berners Lee began to discuss with management the idea of a hyperlinked information system for CERN (European Organization for Nuclear Research). In March of 1989 he distributed the first written proposal for the Web, which was then called "Mesh". Berners-Lee and his colleague Robert Cailliau published a formal proposal in Nov 1990 to build a "Hypertext project" called "WorldWideWeb" (one word, also "W3") as a "web" of "hypertext documents" to be viewed by "browsers" using a client–server architecture. At this point HTML and HTTP had already been in development for about two months and the first Web server was about a month from completing its first successful test. Berners-Lee finished the first website in December of that year. The first test was completed around 20 December 1990.

This proposal estimated that a read-only web would be developed within three months and that it would take six months to achieve "the creation of new links and new material by readers, [so that] authorship becomes universal" as well as "the automatic notification of a reader when new material of interest to him has become available". While the read-only goal was met, accessible authorship of web content took longer to mature.

1991: Linux Kernel

In the early nineties a commercial UNIX operating system for Intel 386 PCs was too expensive for private users. MINIX, a Unix-like system intended for academic use, was released by Andrew S. Tanenbaum to exemplify the principles conveyed in his OS textbook in 1987. While source code for the system was available, modification and redistribution were restricted. In addition, MINIX's 16-bit design was not well adapted to the 32-bit features of the increasingly cheap and popular Intel 386 architecture for personal computers. In 1991 Helsinki, Finnish student Linus Torvalds began a project that later became the Linux kernel. He wrote the program specifically for the hardware he was using and independent of an operating system because he wanted to use the functions of his new PC with an

80386 processor. Development was done on MINIX using the GNU C compiler. His main incentive was that he needed an OS for his i386 PC but he couldn't afford one. In the middle of December 1992 Torvalds published version 0.99 using the GNU GPL. Torvalds and GNU developers worked to integrate GNU components with Linux to make a fully functional and free operating system.

1993: DOOM FPS game

DOOM is a 1993 science fiction horror-themed first-person shooter (FPS) video game by id Software. It is considered one of the most significant and influential titles in the video game industry, for having ushered in the popularity of the first-person shooter genre. DOOM's primary distinguishing feature at the time of its release was its relatively realistic 3D graphics. The advance from id Software's previous game Wolfenstein-3D was enabled by several new technologies in the Doom engine. The development of DOOM started in 1992, when John Carmack developed a new 3D game engine (the Doom engine) while the rest of the id Software team finished the Wolfenstein-3D prequel.

1990s: Rise of the Internet and World-Wide-Web

The public global Internet began rising by gradually connecting different national and large area networks around the globe: (ARPANET+NSFNET), CERNET, JUNET, ...

1995: Java language

Java is a high-level general-purpose computer programming language that is concurrent, class-based, object-oriented, and specifically designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere" (WORA). Java was originally developed by James Gosling at Sun Microsystems (which has since been acquired by Oracle Corporation) and released in 1995 as a core component of Sun Microsystems' Java platform. The language derives much of its syntax from C and C++. Major web browsers soon incorporated the ability to run Java applets within web pages, and Java quickly became popular.