Greater DevOps Landscape - Timelines

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Timeline - 1930-79

1930s

--Lambda calculus is a formal system in mathematical logic for expressing computation based on function abstraction and application using variable binding and substitution. The original system was shown to be logically inconsistent in 1935. The lambda calculus was introduced by mathematician Alonzo Church in the 1930s as part of an investigation into the foundations of mathematics.

--A Turing machine is a mathematical model of computation describing an abstract machine that manipulates symbols on a strip of tape according to a table of rules. Alan Turing invented the "a-machine" (automatic machine) in 1936. It was Turing's doctoral advisor, Alonzo Church, who later coined the term "Turing machine" in a review.

1940s

--In computer programming, assembly language is any low-level programming language with a very strong correspondence between the instructions in the language and the architecture's machine code instructions. The first assembly code in which a language is used to represent machine code instructions is found in Kathleen and Andrew Donald Booth's 1947 work.

1950s

--The Turing test, originally called the imitation game by Alan Turing in 1950, is a test of a machine's ability to exhibit intelligent behaviour equivalent to, or indistinguishable from, that of a human.

--Regular expressions originated in 1951, when mathematician Stephen Cole Kleene described regular languages using his mathematical notation called regular events.

--Lisp (historically LISP) is a family of programming languages with a long history and a distinctive, fully parenthesized prefix notation. Originally specified in 1958, Lisp is the second-oldest high-level programming language still in common use. John McCarthy developed Lisp in 1958 while he was at the Massachusetts Institute of Technology (MIT). First appeared: 1958

--ALGOL (short for "Algorithmic Language") is a family of imperative computer programming languages originally developed in 1958. ALGOL heavily influenced many other languages and was the standard method for algorithm description. First appeared: 1958

--In machine learning, the perceptron (or McCulloch-Pitts neuron) is an algorithm for supervised learning of binary classifiers. The first implementation was a machine built in 1958 at the Cornell Aeronautical Laboratory by Frank Rosenblatt.

--The term machine learning was coined in 1959 by Arthur Samuel, an IBM employee and pioneer in the field of computer gaming and artificial intelligence. The synonym self-teaching

computers was also used in this time period.

1960s

--Simula is the name of two simulation programming languages, Simula I and Simula 67, developed in the 1960s at the Norwegian Computing Center in Oslo, by Ole-Johan Dahl and Kristen Nygaard. Simula 67 introduced objects, classes, inheritance and subclasses, virtual procedures, coroutines, and discrete event simulation, and featured garbage collection. First appeared: 1962

--In machine learning, backpropagation is a gradient estimation method used to train neural network models. The term "back-propagating error correction" was introduced in 1962 by Frank Rosenblatt, but he did not know how to implement this, even though Henry J. Kelley had a continuous precursor of backpropagation already in 1960 in the context of control theory.

--In 1964, for the Multics operating system, Louis Pouzin conceived the idea of "using commands somehow like a programming language," and coined the term shell to describe it.

--Conway’s law is an adage that states organizations design systems that mirror their own communication structure. It is named after the computer programmer Melvin Conway, who introduced the idea in 1967.

--ed is a line editor for Unix and Unix-like operating systems. The ed text editor was one of the first three key elements of the Unix operating system — assembler, editor, and shell — developed by Ken Thompson in August 1969 on a PDP-7 at AT&T Bell Labs.

--Hoare logic is a formal system with a set of logical rules for reasoning rigorously about the correctness of computer programs. It was proposed in 1969 by the British computer scientist and logician Tony Hoare, and subsequently refined by Hoare and other researchers.

--Unix (trademarked as UNIX) is a family of multitasking, multiuser computer operating systems that derive from the original AT&T Unix. Initial release: 1969

--The Advanced Research Projects Agency Network (ARPANET) was the first wide-area packet-switched network with distributed control and one of the first networks to implement the TCP/IP protocol suite. Both technologies became the technical foundation of the Internet. Established: 1969

--In computing, "server" dates at least to RFC 5 (1969), one of the earliest documents describing ARPANET (the predecessor of Internet), and is contrasted with "user", distinguishing two types of host: "server-host" and "user-host".

--Telnet (short for "teletype network") is a client/server application protocol that provides access to virtual terminals of remote systems on local area networks or the Internet. Telnet was developed as secret technology in 1969 beginning with RFC 15.

1970s

--The term "relational database" was first defined by E. F. Codd at IBM in 1970. Codd introduced the term in his research paper "A Relational Model of Data for Large Shared Data Banks".

--The File Transfer Protocol (FTP) is a standard communication protocol used for the transfer of computer files from a server to a client on a computer network. Introduction: April 16, 1971

--mail is a command-line email client for Unix and Unix-like operating systems. Initial release: November 3, 1971

--roff is a typesetting markup language. As the first Unix text-formatting computer program, it is a predecessor of the nroff and troff document processing systems. Initial release: November 3, 1971

--In 1971 the first ARPANET network mail was sent, introducing the now-familiar address syntax with the '@' symbol designating the user's system address. Over a series of RFCs, conventions were refined for sending mail messages over the File Transfer Protocol.

--C is a middle-level, general-purpose computer programming language. It was created in the 1970s by Dennis Ritchie, and remains very widely used and influential. By design, C's features cleanly reflect the capabilities of the targeted CPUs. C was originally developed at Bell Labs by Dennis Ritchie between 1972 and 1973 to construct utilities running on Unix. First appeared: 1972

--Smalltalk is an object-oriented, dynamically typed reflective programming language. It was designed and created in part for educational use. Smalltalk was the product of research led by Alan Kay at Xerox Palo Alto Research Center (PARC). The first Smalltalk programming system (called Smalltalk-72) ran on a Xerox Alto and was designed to support Alan Kay's new programming paradigm called object-oriented programming. Ref

--In June 1972, five IBM engineers from the AI department founded the SAP Systemanalyse und Programmentwicklung ("System Analysis and Program Development" / "SAPD") company, as a private partnership under the German Civil Code. In 1973, SAP launched its first commercial product, the RF financial accounting system.

--In 1973, Version 4 Unix was rewritten in the higher-level language C, contrary to the general notion at the time that an operating system's complexity and sophistication required it to be written in assembly language.

--sed ("stream editor") is a Unix utility that parses and transforms text, using a simple, compact programming language. sed was developed from 1973 to 1974 by Lee E. McMahon of Bell Labs

--TCP provides reliable, ordered, and error-checked delivery of a stream of octets (bytes) between applications running on hosts communicating via an IP network. In May 1974, Vint Cerf and Bob Kahn described an internetworking protocol for sharing resources using packet switching among network nodes. The specification of the resulting protocol (TCP/IP) was

written by Vint Cerf, Yogen Dalal, and Carl Sunshine, and published in December 1974.

--Structured Query Language (SQL) is a domain-specific language used in programming and designed for managing data held in a relational database management system (RDBMS), or for stream processing in a relational data stream management system (RDSMS). First appeared: 1974

--The Data Encryption Standard is a symmetric-key algorithm for the encryption of digital data. Although its short key length of 56 bits makes it too insecure for modern applications, it has been highly influential in the advancement of cryptography. The origins of DES date to 1972, when a National Bureau of Standards study of US government computer security identified a need for a government-wide standard for encrypting unclassified, sensitive information. On 17 March 1975, the proposed DES was published in the Federal Register. Public comments were requested, and in the following year two open workshops were held to discuss the proposed standard.

--The cron command-line utility is a job scheduler on Unix-like operating systems. Users who set up and maintain software environments use cron to schedule jobs (commands or shell scripts), also known as cron jobs, to run periodically at fixed times, dates, or intervals. Initial release: May 1975

--Make is a build automation tool that automatically builds executable programs and libraries from source code by reading files called Makefiles which specify how to derive the target program. Make First appeared: April 1976

--vi is a screen-oriented text editor originally created for the Unix operating system. The original code for vi was written by Bill Joy in 1976, as the visual mode for a line editor called ex that Joy had written with Chuck Haley.

--Diffie–Hellman key exchange is a mathematical method of securely exchanging cryptographic keys over a public channel. Published in 1976 by Diffie and Hellman, this is the earliest publicly known work that proposed the idea of a private key and a corresponding public key.

--AWK is a domain-specific language designed for text processing and typically used as a data extraction and reporting tool. AWK was initially developed in 1977 by Alfred Aho (author of egrep), Peter J. Weinberger (who worked on tiny relational databases), and Brian Kernighan.

--RSA is a public-key cryptosystem that is widely used for secure data transmission. The acronym "RSA" comes from the surnames of Ron Rivest, Adi Shamir and Leonard Adleman, who publicly described the algorithm in 1977.

--Bill Joy’s ex 1.1 was released as part of the first Berkeley Software Distribution (BSD) Unix release in March 1978. According to Joy, many of the ideas in this visual mode were taken from Bravo—the bimodal text editor developed at Xerox PARC for the Alto.

--In 1978, Brian Kernighan and Dennis Ritchie published the first edition of The C Programming Language. This book, known to C programmers as K&R, served for many years as an informal specification of the language. The version of C that it describes is

commonly referred to as "K&R C".

--TeX is a typesetting system which was designed and written by Donald Knuth and first released in 1978. The first version of TeX, called TeX78, was written in the SAIL programming language to run on a PDP-10 under Stanford's WAITS operating system.

--The problem of obtaining Byzantine consensus was conceived and formalized by Robert Shostak, who dubbed it the interactive consistency problem. This work was done in 1978 in the context of the NASA-sponsored SIFT project in the Computer Science Lab at SRI International.

--Model-view-controller (MVC) is a software design pattern commonly used for developing user interfaces that divides the related program logic into three interconnected elements. Trygve Reenskaug created MVC while working on Smalltalk-79 as a visiting scientist at the Xerox Palo Alto Research Center (PARC) in the late 1970s.

--The Bourne shell, sh, was a new Unix shell by Stephen Bourne at Bell Labs. Distributed as the shell for UNIX Version 7 in 1979

--A chroot on Unix and Unix-like operating systems is an operation that changes the apparent root directory for the current running process and its children. The chroot system call was introduced during development of Version 7 Unix in 1979.

--Oracle Database (commonly referred to as Oracle DBMS, Oracle Autonomous Database, or simply as Oracle) is a proprietary multi-model database management system produced and marketed by Oracle Corporation. Initial release: 1979

Timeline - 1980-99

1980-84

--Smalltalk-80 was the first language variant made available outside of PARC, first as Smalltalk-80 Version 1, given to a small number of firms and universities.

--The Berkeley r-commands are a suite of computer programs designed to enable users of one Unix system to log in or issue commands to another Unix computer via TCP/IP computer network. Initial release: June 1981

--IPv4 is described in RFC 791 (1981).

--In March 1982, the US Department of Defense declared TCP/IP as the standard for all military computer networking.

--Revision Control System (RCS) is an early implementation of a version control system (VCS). It is a set of UNIX commands that allow multiple users to develop and maintain program code or documents. RCS was first released in 1982 by Walter F. Tichy at Purdue University. RCS is currently maintained by the GNU Project.

--TeX82, a new version of TeX rewritten from scratch, was published in 1982. Among other changes, the original hyphenation algorithm was replaced by a new algorithm written by

Frank Liang.

--The migration of the ARPANET from NCP to TCP/IP was officially completed on flag day January 1, 1983, when the new protocols were permanently activated.

--Development of the GNU operating system was initiated by Richard Stallman while he worked at MIT Artificial Intelligence Laboratory. It was called the GNU Project, and was publicly announced on September 27, 1983.

--The Simple Mail Transfer Protocol (SMTP) protocol was implemented on the ARPANET in 1983.

--X/Open group was a consortium founded by several European UNIX systems manufacturers in 1984 to identify and promote open standards in the field of information technology.

--TeX has been the official typesetting package for the GNU operating system since 1984.

1985-89

--LaTeX was created in the early 1980s by Leslie Lamport when he was working at Stanford Research Institute (SRI). He needed to write TeX macros for his own use and thought that with a little extra effort, he could make a general package usable by others. Lamport released versions of his LaTeX macros in 1984 and 1985.

--GNU Emacs is a free software text editor. It was created by GNU Project founder Richard Stallman, based on the Emacs editor developed for Unix operating systems. GNU Emacs is written in C and provides Emacs Lisp, also implemented in C, as an extension language. Version 13, the first public release, was made on March 20, 1985.

--The GNU Manifesto is a call-to-action by Richard Stallman encouraging participation and support of the GNU Project’s goal in developing the GNU free computer operating system. The GNU Manifesto was published in March 1985.

--The Free Software Foundation was founded in 1985 as a non-profit corporation supporting free software development.

--C++ is a high-level general-purpose programming language created by Danish computer scientist Bjarne Stroustrup as an extension of the C programming language, or "C with Classes". The C++ programming language was initially standardized in 1998 as ISO/IEC 14882:1998, which was then amended by the C++03, C++11, C++14, and C++17 standards. First appeared: 1985

--GDB was first written by Richard Stallman in 1986 as part of his GNU system, after his GNU Emacs was "reasonably stable". GDB is free software released under the GNU General Public License (GPL). Initial release: 1986

--The Standard Generalized Markup Language (SGML; ISO 8879:1986) is a standard for defining generalized markup languages for documents.

--In machine learning, backpropagation is a widely used algorithm for training feedforward artificial neural networks or other parameterized networks with differentiable nodes. In 1986, David E. Rumelhart et al. published an experimental analysis of the technique. This contributed to the popularization of backpropagation and helped to initiate an active period of research in multilayer perceptrons.

--The term Deep Learning was introduced to the machine learning community by Rina Dechter in 1986.

--gnuplot is a command-line and GUI program that can generate two- and three-dimensional plots of functions, data, and data fits. The program runs on all major computers and operating systems (Linux, Unix, Microsoft Windows, macOS, FreeDOS, and many others). Initial release: 1986

--The GNU Compiler Collection (GCC) is an optimizing compiler produced by the GNU Project supporting various programming languages, hardware architectures and operating systems. When it was first released in 1987 by Richard Stallman, GCC 1.0 was named the GNU C Compiler since it only handled the C programming language. GCC was first released March 22, 1987, available by FTP from MIT.

--Perl is a family of two high-level, general-purpose, interpreted, dynamic programming languages. Perl was developed by Larry Wall in 1987 as a general-purpose Unix scripting language to make report processing easier. First appeared: December 18, 1987

--Self is an object-oriented programming language based on the concept of prototypes. Self began as a dialect of Smalltalk, being dynamically typed and using just-in-time compilation (JIT) as well as the prototype-based approach to objects. Self was designed mostly by David Ungar and Randall Smith in 1986 while working at Xerox PARC. First appeared: 1987

--SQL was adopted as a standard by the ANSI in 1986 as SQL-86 and the ISO in 1987.

--Wolfram Mathematica (also known as Mathematica) is a software system with built-in libraries for several areas of technical computing that allows machine learning, statistics, symbolic computation, data manipulation, network analysis, time series analysis, NLP, optimization, plotting functions and various types of data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other programming languages. Initial release: June 23, 1988

--Internet Relay Chat (IRC) is a text-based chat system for instant messaging. IRC is designed for group communication in discussion forums, called channels, but also allows one-on-one communication via private messages as well as chat and data transfer, including file sharing. Introduced: Late August, 1988

--The Morris worm or Internet worm of November 2, 1988, is one of the oldest computer worms distributed via the Internet, and the first to gain significant mainstream media attention.

--X.509 is an International Telecommunication Union (ITU) standard defining the format of public key certificates. X.509 First published 1.0 at November 25, 1988

--GNU Make (short gmake) is the standard implementation of Make for Linux and macOS. It provides several extensions over the original Make, such as conditionals. It also provides many built-in functions which can be used to eliminate the need for shell-scripting in the makefile rules as well as to manipulate the variables set and used in the makefile. First release: 1988

--AWK was significantly revised and expanded in 1985-88, resulting in the GNU AWK implementation written by Paul Rubin, Jay Fenlason, and Richard Stallman, released in 1988.

--The Open Software Foundation (OSF) was a not-for-profit industry consortium for creating an open standard for an implementation of the operating system Unix. It was formed in 1988.

--The Portable Operating System Interface (POSIX) is a family of standards specified by the IEEE Computer Society for maintaining compatibility between operating systems. POSIX defines both the system- and user-level application programming interfaces (API). Started: 1988

--The concept of data warehousing dates back to the late 1980s when IBM researchers Barry Devlin and Paul Murphy developed the "business data warehouse". In 1988, Barry Devlin and Paul Murphy publish the article "An architecture for a business and information system" where they introduce the term "business data warehouse".

--Kerberos is a computer-network authentication protocol that works on the basis of tickets to allow nodes communicating over a non-secure network to prove their identity to one another in a secure manner. The Massachusetts Institute of Technology (MIT) developed Kerberos in 1988 to protect network services provided by Project Athena. Kerberos version 4, the first public version, was released on January 24, 1989.

--Microsoft SQL Server is a proprietary relational database management system developed by Microsoft. As a database server, it is a software product with the primary function of storing and retrieving data as requested by other software applications. Initial release: April 24, 1989

--Bash is a Unix shell and command language written by Brian Fox for the GNU Project as a free software replacement for the Bourne shell. First released in 1989, it has been used as the default login shell for most Linux distributions. Initial release: June 8, 1989

--The Hypertext Transfer Protocol (HTTP) is an application layer protocol in the Internet protocol suite model for distributed, collaborative, hypermedia information systems. Development of HTTP was initiated by Tim Berners-Lee at CERN in 1989 and summarized in a simple document describing the behavior of a client and a server using the first HTTP protocol version that was named 0.9.

1990-94

--groff (also called GNU troff) is a typesetting system that creates formatted output when given plain text mixed with formatting commands. The first version, 0.3.1, was released June 1990.

--Concurrent Versions System (CVS, also known as the Concurrent Versioning System) is a revision control system originally developed by Dick Grune in July 1986. Initial release: November 19, 1990

--CERN httpd (later also known as W3C httpd) is an early, now discontinued, web server (HTTP) daemon originally developed at CERN from 1990 onwards by Tim Berners-Lee, Ari Luotonen and Henrik Frystyk Nielsen. Implemented in C, it was the first web server software. Initial release: 24 December 1990

--In 1990, Tim Berners-Lee's proposals for hypertext implicitly introduced the idea of a URL as a short string representing a resource that is the target of a hyperlink.

--The first web browser, WorldWideWeb, was developed in 1990 by Tim Berners-Lee for the NeXT Computer and introduced to his colleagues at CERN in March 1991.

--The Linux kernel is a free and open-source, monolithic, modular, multitasking, Unix-like operating system kernel. It was originally authored in 1991 by Linus Torvalds for his i386-based PC. In April 1991, Linus Torvalds, at the time a 21-year-old computer science student at the University of Helsinki, Finland, started working on some simple ideas for an operating system inspired by UNIX, for a personal computer. He started with a task switcher in Intel 80386 assembly language and a terminal driver.

--On 17 September 1991, Torvalds prepared version 0.01 of Linux and put on the "ftp.funet.fi" – FTP server of the Finnish University and Research Network (FUNET). It was not even executable since its code still needed Minix for compilation and play. On 5 October 1991, Torvalds announced the first "official" version of Linux, version 0.02. At this point, Linux was able to run Bash, GCC, and some other GNU utilities.

--Vim (a contraction of Vi IMproved) is a free and open-source, screen-based text editor program. It is an improved clone of Bill Joy's vi. Vim's author, Bram Moolenaar, derived Vim from a port of the Stevie editor for Amiga and released a version to the public in 1991. Initial release: 2 November 1991

--Python is a high-level, interpreted, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation. Guido van Rossum began working on Python in the late 1980s as a successor to the ABC programming language and first released it in 1991 as Python 0.9.0.

--In 1991, the autoencoder was first proposed as a nonlinear generalization of principal components analysis (PCA) by Kramer.

--Pretty Good Privacy (PGP) is an encryption program that provides cryptographic privacy and authentication for data communication. PGP is used for signing, encrypting, and decrypting texts, e-mails, files, directories, and whole disk partitions and to increase the security of e-mail communications. Phil Zimmermann developed PGP in 1991.

--MD5 is one in a series of message digest algorithms designed by Professor Ronald Rivest of MIT (Rivest, 1992). When analytic work indicated that MD5's predecessor MD4 was likely to be insecure, Rivest designed MD5 in 1991 as a secure replacement. First published: April 1992

--libwww (Library World Wide Web) is a modular client-side web API for Unix and Windows. It is also the name of the reference implementation of the libwww API. In 1991 and 1992, Tim Berners-Lee and a student at CERN named Jean-François Groff rewrote various components of the original WorldWideWeb browser for the NeXTstep operating system in portable C code, in order to demonstrate the potential of the World Wide Web. Initial release: 1.0, November 1992

--In November 1992 the IETF "URI Working Group" met for the first time.

--CTAN (an acronym for "Comprehensive TeX Archive Network") is the authoritative place where TeX related material and software can be found for download. CTAN was built in 1992, by Rainer Schöpf and Joachim Schrod in Germany, Sebastian Rahtz in the UK, and George Greenwade in the U.S. CTAN was officially announced at the EuroTeX conference at Aston University, 1993. The WEB server itself is maintained by Gerd Neugebauer.

--NCSA Mosaic is a discontinued web browser, one of the first to be widely available. It was instrumental in popularizing the World Wide Web and the general Internet by integrating multimedia such as text and graphics. Mosaic is based on the libwww library. Mosaic was the first browser that could submit forms to a server. Initial release: 0.5 / January 23, 1993

--R was started by professors Ross Ihaka and Robert Gentleman as a programming language to teach introductory statistics at the University of Auckland. First appeared: August 1993

--Debian, also known as Debian GNU/Linux, is a Linux distribution composed of free and open-source software, developed by the community-supported Debian Project. The first version of Debian (0.01) was released on September 15, 1993.

--CFEngine is an open-source configuration management system, written by Mark Burgess. Its primary function is to provide automated configuration and maintenance of large-scale computer systems. The CFEngine project began in 1993 as a way for author Mark Burgess to get his work done by automating the management of a small group of workstations in the Department of Theoretical Physics. Initial release: 1993

--The HyperText Markup Language or HTML is the standard markup language for documents designed to be displayed in a web browser. Initial release: 1993

--Common Gateway Interface (CGI) is an interface specification that enables web servers to execute an external program, typically to process user requests. In 1993, the National Center for Supercomputing Applications (NCSA) team wrote the specification for calling command line executables on the www-talk mailing list.

--NCSA HTTPd is an early, now discontinued, web server originally developed at the NCSA at the University of Illinois at Urbana–Champaign by Robert McCool and others. First released in 1993, it was among the earliest web servers developed.

--Linux version 0.95 was the first to be capable of running the X Window System. In March 1994, Linux 1.0.0 was released with 176,250 lines of code. It was the first version suitable for use in production environments.

--In June 1994, the IETF published Berners-Lee's first Request for Comments that acknowledged the existence of URLs and URNs.

--The World Wide Web Consortium (W3C) is the main international standards organization for the World Wide Web. Founded in 1994 and led by Tim Berners-Lee. Formation: 1 October 1994

--Perl 5.000 was released on October 17, 1994. It was a nearly complete rewrite of the interpreter, and it added many new features to the language, including objects, references, lexical (my) variables, and modules

--Netscape Navigator was a proprietary web browser, and the original browser of the Netscape line, from versions 1 to 4.08, and 9.x. It was the flagship product of the Netscape Communications Corp and was the dominant web browser in terms of usage share in the 1990s. Initial release: 15 December 1994

--The QR code system was invented in 1994, at the Denso Wave automotive products company, in Japan.

1995

--Transport Layer Security (TLS) is a cryptographic protocol designed to provide communications security over a computer network. Netscape developed the original SSL protocols, and Taher Elgamal, chief scientist at Netscape Communications from 1995 to 1998, has been described as the "father of SSL". SSL Version 2.0, after being released in February 1995 was quickly discovered to contain a number of security and usability flaws.

--Java is a high-level, class-based, object-oriented programming language that is designed to have as few implementation dependencies as possible. Java was originally developed by James Gosling at Sun Microsystems. Java SE defines a range of general-purpose APIs and also includes the Java Language Specification and the Java Virtual Machine Specification. First appeared: May 23, 1995

--MySQL is an open-source relational database management system (RDBMS). MySQL is free and open-source software under the terms of the GNU General Public License, and is also available under a variety of proprietary licenses. Initial release: 23 May 1995

--PHP is a general-purpose scripting language geared toward web development. It was originally created by Danish-Canadian programmer Rasmus Lerdorf in 1994. PHP First appeared: June 8, 1995

--CPAN was conceived in 1993 and has been active online since October 1995. It is based on the CTAN model and began as a place to unify the structure of scattered Perl archives. On October 26, 1995, the Comprehensive Perl Archive Network (CPAN) was established as a repository for the Perl language and Perl modules.

--Ruby is an interpreted, high-level, general-purpose programming language which supports multiple programming paradigms. The first public release of Ruby 0.95 was announced on Japanese domestic newsgroups on December 21, 1995.

--In December 1995, Sun Microsystems and Netscape announced JavaScript in a press release. The first JavaScript engine was created by Brendan Eich in 1995 for the Netscape Navigator web browser. It was a rudimentary interpreter for the nascent language Eich invented.

--The predecessor of NumPy, Numeric, was originally created by Jim Hugunin with contributions from several other developers. Initial release: 1995

--The Apache HTTP Server is a free and open-source cross-platform web server software, released under the terms of Apache License 2.0. Apache is developed and maintained by an open community of developers under the auspices of the Apache Software Foundation. Initial release: 1995

--SHA-1 (Secure Hash Algorithm 1) is a hash function which takes an input and produces a 160-bit (20-byte) hash value known as a message digest – typically rendered as 40 hexadecimal digits. It was designed by the United States National Security Agency, and is a U.S. Federal Information Processing Standard. First published: 1995

--SSH was designed as a replacement for Telnet and for unsecured remote shell protocols such as the Berkeley rsh and the related rlogin and rexec protocols. In 1995, Tatu Ylönen, a researcher at Helsinki University of Technology, Finland, designed the first version of the protocol (now called SSH-1) prompted by a password-sniffing attack at his university network.

1996

--Debian first stable version (1.1) was released on June 17, 1996.

--PostgreSQL also known as Postgres, is a free and open-source relational database management system (RDBMS) emphasizing extensibility and SQL compliance. In 1996, the project was renamed to PostgreSQL to reflect its support for SQL. Initial release: 8 July 1996

--Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language such as HTML or XML. Initial release: 17 December 1996

--The Open Group is a global consortium that seeks to "enable the achievement of business objectives" by developing "open, vendor-neutral technology standards and certifications." It was established in 1996 when X/Open merged with the Open Software Foundation.

--IntelliSense is Microsoft’s implementation of code completion, best known in Visual Studio. It was first introduced as a feature of a mainstream Microsoft product in 1996 building on many already invented concepts of code completion and syntax checking.

--HTTP/1 was finalized and fully documented (as version 1.0) in 1996.

--In 1996, the iframe tag was introduced by Internet Explorer; like the object element, it can load or fetch content asynchronously.

--Newer versions of SSL/TLS are based on SSL 3.0, released in 1996.

1997

--Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs, as well as websites, web apps, web services and mobile apps. Microsoft first released Visual Studio in 1997, bundling many of its programming tools together for the first time. Visual Studio 97 / 1997-03-19

--The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary (abbreviated CatB) is an essay, and later a book, by Eric S. Raymond on software engineering methods. The essay was first presented by the author at the Linux Kongress on May 27, 1997 in Würzburg (Germany) and was published as the second chapter of the same-titled book in 1999.

--The first edition of ECMA-262 (ECMAScript) was adopted by the Ecma General Assembly in June 1997.

--The unified modeling language (UML) is a general-purpose visual modeling language that is intended to provide a standard way to visualize the design of a system. UML 1.1 was submitted to the OMG in August 1997 and adopted by the OMG in November 1997.

--The Comprehensive R Archive Network (CRAN) is R's central software repository, supported by the R Foundation. CRAN was created by Kurt Hornik and Friedrich Leisch in 1997, with the name paralleling other early packing systems such as TeX's CTAN (released 1992) and Perl's CPAN (released 1995).

--Zeev Suraski and Andi Gutmans rewrote the parser in 1997 and formed the base of PHP 3, changing the language's name to the recursive acronym PHP: Hypertext Preprocessor.

--A recurrent neural network (RNN) is a class of artificial neural networks where connections between nodes can create a cycle, allowing output from some nodes to affect subsequent input to the same nodes. This allows it to exhibit temporal dynamic behavior. Long short-term memory (LSTM) networks were invented by Hochreiter and Schmidhuber in 1997 and set accuracy records in multiple applications domains.

--Google Search is a search engine operated by Google. Google Search uses algorithms to analyze and rank websites based on their relevance to the search query. Launched: 1997

1998

--Extensible Markup Language (XML) is a markup language and file format for storing, transmitting, and reconstructing arbitrary data. It defines a set of rules for encoding documents in a format that is both human-readable and machine-readable. First published: February 10, 1998

--The Open Source Initiative (OSI) is the steward of the Open Source Definition, the set of rules that define open source software. The organization was founded in late February 1998 by Bruce Perens and Eric S. Raymond, part of a group inspired by the Netscape Communications Corporation publishing the source code for its flagship Netscape Communicator product.

--Advanced package tool, or APT, is a free-software user interface that works with core libraries to handle the installation and removal of software on Debian, and Debian-based Linux distributions. APT Initial release: 31 March 1998

--The Document Object Model (DOM) is a cross-platform and language-independent interface that treats an XML or HTML document as a tree structure wherein each node is an object representing a part of the document. First published: October 1, 1998

--OpenSSL is a software library for applications that secure communications over computer networks against eavesdropping or need to identify the party at the other end. It is widely used by Internet servers, including the majority of HTTPS websites. The OpenSSL project was founded in 1998 to provide a free set of encryption tools for the code used on the Internet. Initial release: 23 December 1998

--LAMP (Linux, Apache, MySQL, PHP/Perl/Python) is an acronym denoting one of the most common software stacks for many of the web's most popular applications. The acronym LAMP was coined by Michael Kunze in the December 1998 issue of Computertechnik, a German computing magazine, as he demonstrated that a bundle of free and open-source software "could be a feasible alternative to expensive commercial packages".

--In 1998, the Ruby Application Archive was launched by Matsumoto, along with a simple English-language homepage for Ruby.

--The Halloween documents comprise a series of confidential Microsoft memoranda on potential strategies relating to free software, open-source software, and to Linux in particular, and a series of media responses to these memoranda. Both the leaked documents and the responses were published by open-source software advocate Eric S. Raymond in 1998.

--In 1998, the Microsoft Outlook Web Access team developed the concept behind the XMLHttpRequest scripting object. XMLHttpRequest (XHR) is an API in the form of an object whose methods transfer data between a web browser and a web server. The object is provided by the browser's JavaScript environment.

--AppArmor ("Application Armor") is a Linux kernel security module that allows the system administrator to restrict programs' capabilities with per-program profiles. Profiles can allow capabilities like network access, raw socket access, and the permission to read, write, or execute files on matching paths. Initial release: 1998

--Perl 5 gained widespread popularity in the late 1990s as a CGI scripting language, in part due to its powerful regular expression and string parsing abilities.

--Between 1998 and 2004, CFEngine grew in adoption along with the popularity of Linux as a computing platform.

1999

--TLS 1.0 was first defined in RFC 2246 in January 1999 as an upgrade of SSL Version 3.0.

--Salesforce, Inc. is an American cloud-based software company headquartered in San Francisco, California. It provides applications focused on sales, customer service, marketing

automation, e-commerce, analytics, artificial intelligence, and application development. Salesforce was founded on March 8, 1999 by former Oracle executive Marc Benioff, together with Parker Harris, Dave Moellenhoff, and Frank Dominguez as a software-as-a-service (SaaS) company.

--The Apache Software Foundation (ASF) is an American nonprofit corporation to support a number of open source software projects. The ASF was formed from a group of developers of the Apache HTTP Server, and incorporated on March 25, 1999.

--HotSpot, released as Java HotSpot Performance Engine, is a Java virtual machine for desktop and server computers, developed by Sun Microsystems and now maintained and distributed by Oracle Corporation. It features improved performance via methods such as just-in-time compilation and adaptive optimization. The Java HotSpot Performance Engine was released on April 27, 1999, built on technologies from an implementation of the programming language Smalltalk named Strongtalk. Initially available as an add-on for Java 1.2, HotSpot became the default Sun JVM in Java 1.3.

--VMware Workstation Pro (known as VMware Workstation until release of VMware Workstation 12 in 2015) is a hosted hypervisor that runs on x64 versions of Windows and Linux operating systems. VMware Workstation Initial release: 15 May 1999

--RRDtool (round-robin database tool) aims to handle time series data such as network bandwidth, temperatures or CPU load. RRDtool Initial release: July 16, 1999

--GnuPG was initially developed by Werner Koch. The first production version, version 1.0.0, was released on September 7, 1999, almost two years after the first GnuPG release (version 0.0.0).

--Extreme programming (XP) is a software development methodology intended to improve software quality and responsiveness to changing customer requirements. Kent Beck developed extreme programming during his work. He began to refine the development methodology used in the project and wrote a book on the methodology (Extreme Programming Explained, published in October 1999).

--The Pragmatic Programmer: From Journeyman to Master is a book about computer programming and software engineering, written by Andrew Hunt and David Thomas and published in October 1999.

--GNU nano is a text editor for Unix-like computing systems or operating environments using a command line interface. Initial release: 18 November 1999

--OpenSSH is a suite of secure networking utilities based on the Secure Shell (SSH) protocol, which provides a secure channel over an unsecured network in a client–server architecture. OpenSSH first appeared in OpenBSD 2.6. The first portable release was made in October 1999. Initial release: 1 December 1999

--Jakarta EE, formerly Java Platform, Enterprise Edition (Java EE) and Java 2 Platform, Enterprise Edition (J2EE), is a set of specifications, extending Java SE with specifications for enterprise features such as distributed computing and web services. Initial specification release: 1999-12-17

--SourceForge, founded in 1999 by VA Software, was the first provider of a centralized location for free and open-source software developers to control and manage software development and offering this service without charge.

Timeline - 2000-09

2000

--The jail mechanism is an implementation of FreeBSD's OS-level virtualisation that allows system administrators to partition a FreeBSD-derived computer system into several independent mini-systems called jails. Jails were first introduced in FreeBSD version 4.0, that was released on March 14, 2000. FreeBSD jails mainly aim at three goals: Virtualization, Security and Ease of delegation.

--On 22 May 2000, PHP 4, powered by the Zend Engine 1.0, was released.

--SQLite is a database engine written in the C programming language. It is not a standalone app; rather, it is a library that software developers embed in their apps. As such, it belongs to the family of embedded databases. Initial release: 17 August 2000

--Python 2.0 was released on 16 October 2000, with many major new features, including a cycle-detecting garbage collector and support for Unicode.

--Apache Subversion (often abbreviated SVN, after its command name svn) is a software versioning and revision control system distributed as open source under the Apache License. CollabNet founded the Subversion project in 2000 as an effort to write an open-source version-control system which operated much like CVS but which fixed the bugs and supplied some features missing in CVS. Initial release: 20 October 2000

--Security-Enhanced Linux (SELinux) is a Linux kernel security module that provides a mechanism for supporting access control security policies, including mandatory access controls (MAC). Initial release: December 22, 2000

--C# (pronounced see sharp) is a general-purpose, multi-paradigm programming language. The C# programming language was designed by Anders Hejlsberg from Microsoft in 2000 and was later approved as an international standard by Ecma (ECMA-334) in 2002 and ISO/IEC (ISO/IEC 23270) in 2003. First appeared: 2000

--CMake development began in 1999, in response to the need for a cross-platform build environment for the Insight Segmentation and Registration Toolkit (ITK). CMake was first implemented in 2000 and further developed in 2001.

--The Linux Foundation (LF) is a non-profit technology consortium founded in 2000 as a merger between Open Source Development Labs and the Free Standards Group to standardize Linux, support its growth, and promote its commercial adoption.

--In 2000, Roy Fielding proposed Representational State Transfer (REST) as an architectural approach to designing web services. REST is an architectural style for building distributed systems based on hypermedia.

2001

--Linux version 2.4.0, released on 4 January 2001, contained support for ISA Plug and Play, USB, and PC Cards. Linux 2.4 added support for the Pentium 4 and Itanium, and for the newer 64-bit MIPS processor.

--Creative Commons (CC) is an American non-profit organization and international network devoted to educational access and expanding the range of creative works available for others to build upon legally and to share. Founded: January 15, 2001

--On February 11-13, 2001, seventeen people met to talk, ski, relax, and try to find common ground—and of course, to eat. Together they published the Manifesto for Agile Software Development.

--VMware ESXi (formerly ESX) is an enterprise-class, type-1 hypervisor developed by VMware for deploying and serving virtual computers. Initial release: March 23, 2001

--CruiseControl is a Java-based framework for a continuous build process. CruiseControl is free, open-source software, distributed under a BSD-style license. It was one of the first of its kind of software. Initial release: March 30, 2001

--YAML is a human-readable data-serialization language. It is commonly used for configuration files and in applications where data is being stored or transmitted. Initial release: 11 May 2001

--reStructuredText (RST, ReST, or reST) is a file format for textual data used primarily in the Python programming language community for technical documentation. It is part of the Docutils project of the Python Doc-SIG (Documentation Special Interest Group), aimed at creating a set of tools for Python similar to Javadoc for Java or Plain Old Documentation (POD) for Perl. Initial release: June 1, 2001

--WebKit is a browser engine developed by Apple and primarily used in its Safari web browser, as well as all iOS web browsers. The WebKit project was started within Apple by Don Melton on June 25, 2001, as a fork of KHTML and KJS.

--Code Red was a computer worm observed on the Internet on July 15, 2001. It attacked computers running Microsoft’s IIS web server. It was the first large-scale, mixed-threat attack to successfully target enterprise networks.

--The Nimda virus is a malicious file-infecting computer worm. It quickly spread, surpassing the economic damage caused by previous outbreaks such as Code Red. The first released advisory about this thread (worm) was released on September 18, 2001.

--Eclipse is an integrated development environment (IDE) used in computer programming. It contains a base workspace and an extensible plug-in system for customizing the environment. It is the second-most-popular IDE for Java development, and, until 2016, was the most popular. Eclipse was inspired by the Smalltalk-based VisualAge family of integrated development environment (IDE) products. Initial release: 1.0 / 29 November 2001

--SciPy is a free and open-source Python library used for scientific computing and technical

computing. As of 2000, there was a growing number of extension modules and increasing interest in creating a complete environment for scientific and technical computing. In 2001, Travis Oliphant, Eric Jones, and Pearu Peterson merged code they had written and called the resulting package SciPy. Initial release: Around 2001

--VMware Server (formerly VMware GSX Server) is a discontinued free-of-charge virtualization-software server suite developed and supplied by VMware, Inc. In 2001, both the product version ESX 1.0 and GSX 1.0 were launched where ESX happens to be Type1 and GSX was Type2 Hypervisor. Reference

--IPython (Interactive Python) is a command shell for interactive computing in multiple programming languages, originally developed for the Python programming language, that offers introspection, rich media, shell syntax, tab completion, and history. Initial release: 2001

--SHA-2 (Secure Hash Algorithm 2) is a set of cryptographic hash functions designed by the United States National Security Agency (NSA) and first published in 2001. They are built using the Merkle–Damgård construction, from a one-way compression function itself built using the Davies–Meyer structure from a specialized block cipher.

--The Advanced Encryption Standard (AES), also known by its original name Rijndael, is a specification for the encryption of electronic data established by the U.S. National Institute of Standards and Technology (NIST) in 2001.

2002

--ASP.NET is an open-source, server-side web-application framework designed for web development to produce dynamic web pages. It was first released in January 2002 with version 1.0 of the .NET Framework and is the successor to Microsoft's Active Server Pages (ASP) technology. Initial release: January 5, 2002

--Arch Linux is an independently developed, x86-64 general-purpose Linux distribution that strives to provide the latest stable versions of most software by following a rolling-release model. Judd Vinet started the Arch Linux project in March 2002. Initial release: 11 March 2002

--Gentoo Linux is a Linux distribution built using the Portage package management system. Gentoo Linux 1.0 was released on March 31, 2002. In 2004, Robbins set up the non-profit Gentoo Foundation, transferred all copyrights and trademarks to it.

--The Mozilla project developed and implemented an interface called nsIXMLHttpRequest into the Gecko layout engine. Mozilla created a wrapper to use this interface through a JavaScript object which they called XMLHttpRequest. The XMLHttpRequest object was accessible as early as Gecko version 0.6 released on December 6, 2000, but it was not completely functional until as late as version 1.0 of Gecko released on June 5, 2002.

--Mozilla Firefox, or simply Firefox, is a free and open-source web browser developed by the Mozilla Foundation and its subsidiary, the Mozilla Corporation. It uses the Gecko rendering engine to display web pages, which implements current and anticipated web standards.

Initial release: September 23, 2002

--The Spring Framework is an application framework and inversion of control container for the Java platform. The framework's core features can be used by any Java application, but there are extensions for building web applications on top of the Java EE (Enterprise Edition) platform. Initial release: 1 October 2002

--Torch is an open-source machine learning library, a scientific computing framework, and a script language based on the Lua programming language. Initial release: October 2002

--The Linux Namespaces originated in 2002 in the 2.4.19 kernel with work on the mount namespace kind. Additional namespaces were added beginning in 2006 and continuing into the future.

--AsciiDoc is a human-readable document format, semantically equivalent to DocBook XML, but using plain-text mark-up conventions. AsciiDoc was created in 2002 by Stuart Rackham, who published tools ('asciidoc' and 'a2x'), written in the Python programming language to convert plain-text, 'human readable' files to commonly used published document formats.

--JSON is a language-independent data format. It was derived from JavaScript. The JSON.org website was launched in 2002.

2003

--Tableau Software, LLC is an American interactive data visualization software company focused on business intelligence. Tableau was formally founded in January 2003 by Pat Hanrahan, Christian Chabot, and Chris Stolte, and moved its headquarters to the Fremont neighborhood of Seattle, Washington, the following year.

--Linux Version 2.6.0 was released on 17 December 2003. The development for 2.6.x changed further towards including new features throughout the duration of the series.

--The Python Package Index, abbreviated as PyPI and also known as the Cheese Shop, is the official third-party software repository for Python. PEP 241, a proposal to standardize metadata for indexes, was finalized in March 2001. A proposal to create a comprehensive centralised catalog was later finalized in November 2002. Launched: 2003

--Domain-driven design (DDD) is a major software design approach, focusing on modeling software to match a domain according to input from that domain's experts. The term was coined by Eric Evans in his book of the same name published in 2003.

--Google Borg is a cluster manager used by Google. It led to widespread use of similar approaches such as Docker and Kubernetes. According to the research paper published by Google in 2015, Borg was developed in 2003.

--Xen is a type-1 hypervisor, providing services that allow multiple computer operating systems to execute on the same computer hardware concurrently. It was originally developed by the University of Cambridge Computer Laboratory and is now being developed by the Linux Foundation. Xen originated as a research project at the University of Cambridge led by Ian Pratt, a senior lecturer in the Computer Laboratory, and his PhD student Keir Fraser. The

first public release of Xen was made in 2003, with v1.0 following in 2004.

--Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy. It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits like Tkinter, wxPython, Qt, or GTK. Initial release: 2003

2004

--Scala is a strong statically typed general-purpose programming language which supports both object-oriented programming and functional programming. First appeared: 20 January 2004

--RubyGems is a package manager for the Ruby programming language that provides a standard format for distributing Ruby programs and libraries. Development on RubyGems started in November 2003 and was released to the public on March 14, 2004, or Pi Day 2004.

--In April 2004, Windows Installer XML (WiX) was the first Microsoft project to be released under an open-source license, the Common Public License. Initially hosted on SourceForge, it was also the first Microsoft project to be hosted externally.

--The Web Hypertext Application Technology Working Group (WHATWG) is a community of people interested in evolving HTML and related technologies. The WHATWG was founded by individuals from Apple Inc., the Mozilla Foundation and Opera Software, leading Web browser vendors. Formation: 4 June 2004

--On 1 July 2004, PHP 5 was released, powered by the new Zend Engine II. PHP 5 included new features such as improved support for object-oriented programming, the PHP Data Objects (PDO) extension, and numerous performance enhancements.

--Maven is a build automation tool used primarily for Java projects. Maven can also be used to build and manage projects written in C#, Ruby, Scala, and other languages. Maven, created by Jason van Zyl, began as a sub-project of Apache Turbine in 2002. In 2003, it was voted on and accepted as a top level Apache Software Foundation project. In July 2004, Maven's release was the critical first milestone, v1.0. Initial release: 13 July 2004

--Ruby on Rails (simplify as Rails) is a server-side web application framework written in Ruby under the MIT License. David Heinemeier Hansson extracted Ruby on Rails from his work on the project management tool Basecamp at the web application company 37signals. Hansson first released Rails as open source in July 2004.

--Nginx is a web server that can also be used as a reverse proxy, load balancer, mail proxy and HTTP cache. The software was created by Igor Sysoev and publicly released in 2004. Originally, Nginx was developed to solve the C10k problem, and to fill the needs of multiple websites including the Rambler search engine and portal, for which it was serving 500 million requests per day by September 2008 Initial release: 4 October 2004

--Ubuntu is a Linux distribution based on Debian and composed mostly of free and open-source software. Initial release: Ubuntu 4.10 (Warty Warthog) / 20 October 2004

--Unionfs is a filesystem service for Linux, FreeBSD and NetBSD which implements a union mount for other file systems. It allows files and directories of separate file systems, known as branches, to be transparently overlaid, forming a single coherent file system. Unionfs 1.0.2 release: 2004-11-09

--Version 1.0 of Firefox was released on November 9, 2004. This was followed by version 1.5 in November 2005, version 2.0 in October 2006, version 3.0 in June 2008, version 3.5 in June 2009.

--Markdown is a lightweight markup language for creating formatted text using a plain-text editor. John Gruber and Aaron Swartz created Markdown in 2004 as a markup language that is intended to be easy to read in its source code form.

--MapReduce is a programming model and an associated implementation for processing and generating big data sets with a parallel, distributed algorithm on a cluster. Introduced: 2004

--In 2004, it was shown by K. S. Oh and K. Jung that standard neural networks can be greatly accelerated on GPUs. Their implementation was 20 times faster than an equivalent implementation on CPU. In 2005, another paper also emphasized the value of GPGPU for machine learning.

2005

--Hudson is a discontinued continuous integration (CI) tool written in Java, which runs in a servlet container such as Apache Tomcat or the GlassFish application server. Hudson became a popular alternative to CruiseControl and other open-source build servers in 2008. Initial release: 1.0 / 7 February 2005

--The Prototype JavaScript Framework is a JavaScript framework created by Sam Stephenson in February 2005 as part of Ajax support in Ruby on Rails.

--Security Assertion Markup Language (SAML) is an open standard for exchanging authentication and authorization data between parties, in particular, between an identity provider and a service provider. SAML 2.0 became an OASIS Standard in March 2005

--collectd is a Unix daemon that collects, transfers and stores performance data of computers and network equipment. Initial release: July 8, 2005

--Django is a free and open-source, Python-based web framework that follows the model–template–views (MTV) architectural pattern. Initial release: 21 July 2005

--In December 2005, Yahoo! began offering some of its Web services in JSON.

--JSONP, or JSON-P (JSON with Padding), is a historical JavaScript technique for requesting data by loading a `<script>` element, which is an element intended to load ordinary JavaScript. JSONP enables sharing of data bypassing same-origin policy. The original proposal for JSONP, where the padding is a callback function, appears to have been made by Bob Ippolito in December 2005.

--F# (pronounced F sharp) is a functional-first, general purpose, strongly typed, multi-

paradigm programming language. F# is developed by the F# Software Foundation, Microsoft and open contributors. An open source, cross-platform compiler for F# is available from the F# Software Foundation. First appeared: 2005

--Git was created by Linus Torvalds in 2005 for development of the Linux kernel, with other kernel developers contributing to its initial development. Torvalds turned over maintenance on 26 July 2005 to Junio Hamano, a major contributor to the project. Hamano was responsible for the 1.0 release on 21 December 2005 and remains the project's core maintainer.

--Puppet is produced by Puppet, Inc, founded by Luke Kanies in 2005. They use Puppet's declarative language to manage stages of the IT infrastructure lifecycle, including the provisioning, patching, configuration, and management of operating system and application components. Puppet itself is written in Ruby, while Facter is written in C++, and Puppet Server and Puppet DB are written in Clojure. Initial release: 2005

2006

--Amazon S3 or Amazon Simple Storage Service is a service offered by Amazon Web Services (AWS) that provides object storage through a web service interface. AWS launched Amazon S3 in the United States on March 14, 2006.

--Apache Hadoop is a collection of open-source software utilities that facilitates using a network of many computers to solve problems involving massive amounts of data and computation. The genesis of Hadoop was the Google File System paper that was published in October 2003. The core of Apache Hadoop consists of a storage part, known as Hadoop Distributed File System (HDFS), and a processing part which is a MapReduce programming model. Initial release: April 1, 2006

--On 5 April 2006, the World Wide Web Consortium (W3C) released the first draft specification for the XMLHttpRequest object in an attempt to create an official Web standard.

--Upstart was an event-based replacement for the traditional init daemon—the method by which several Unix-like computer operating systems perform tasks when the computer is started. Initial release: August 24, 2006

--Amazon Elastic Compute Cloud (EC2) is a part of Amazon.com's cloud-computing platform, Amazon Web Services (AWS), that allows users to rent virtual computers on which to run their own computer applications. Amazon announced a limited public beta test of EC2 on August 25, 2006. Initially, EC2 used Xen virtualization exclusively.

--jQuery is a JavaScript library designed to simplify HTML DOM tree traversal and manipulation, as well as event handling, CSS animation, and Ajax. jQuery was originally created in January 2006 at BarCamp NYC by John Resig, influenced by Dean Edwards' earlier cssQuery library. Initial release: August 26, 2006

--NumPy is a library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays. In early 2005, NumPy developer Travis Oliphant

wanted to unify the community around a single array package and ported Numarray's features to Numeric, releasing the result as NumPy 1.0 in 2006. This new project was part of SciPy.

--In 2006, Geoffrey Hinton developed the deep belief network technique for training many-layered deep autoencoders.

--In 2006, a revised version of the protocol, SSH-2, was adopted as a standard. This version is incompatible with SSH-1.

2007

--Apache Groovy is a Java-syntax-compatible object-oriented programming language for the Java platform. It is both a static and dynamic language with features similar to those of Python, Ruby, and Smalltalk. James Strachan first talked about the development of Groovy on his blog in August 2003. After the Java Community Process (JCP) standardization effort began, the version numbering changed, and a version called "1.0" was released on January 2, 2007.

--Oracle VM VirtualBox (formerly Sun VirtualBox, Sun xVM VirtualBox and Innotek VirtualBox) is a type-2 hypervisor for x86 virtualization developed by Oracle Corporation. Initial release: 17 January 2007

--Kernel-based Virtual Machine (KVM) is a virtualization module in the Linux kernel that allows the kernel to function as a hypervisor. It was merged into the mainline Linux kernel in version 2.6.20, which was released on February 5, 2007.

--Sun released the Java HotSpot virtual machine and compiler as free software under the GNU General Public License on November 13, 2006, with a promise that the rest of the JDK (which includes the Java Runtime Environment) would be placed under the GPL by March 2007.

--Rake is a Make-like program implemented in Ruby. Tasks and dependencies are specified in standard Ruby syntax. Version 0.7.3 (GitHub oldest tag) release: 21 Apr 2007

--OpenJDK (Open Java Development Kit) is a free and open-source implementation of the Java Platform, Standard Edition (Java SE). It is the result of an effort Sun Microsystems began in 2006. The OpenJDK project produces a number of components: most importantly the virtual machine (HotSpot), the Java Class Library and the Java compiler (javac). Initial release: May 8, 2007

--RSpec is a computer domain-specific language (DSL) (particular application domain) testing tool written in the programming language Ruby to test Ruby code. It is a behavior-driven development (BDD) framework which is extensively used in production applications. Initial release: May 18, 2007

--The scikit-learn project started as scikits.learn, a Google Summer of Code project by French data scientist David Cournapeau. Initial release: June 2007

--PyPy is an alternative implementation of the Python programming language to CPython

(which is the standard implementation). PyPy often runs faster than CPython because PyPy uses a just-in-time compiler. PyPy was initially a research and development-oriented project. Reaching a mature state of development and an official 1.0 release in mid-2007, its next focus was on releasing a production-ready version with more CPython compatibility.

--Development of the GitHub.com platform began on October 19, 2007. The site was launched in April 2008 by Tom Preston-Werner, Chris Wanstrath, P. J. Hyett and Scott Chacon after it had been made available for a few months prior as a beta release.

--Language Integrated Query (LINQ) is a Microsoft .NET Framework component that adds native data querying capabilities to .NET languages, originally released as a major part of .NET Framework 3.5 on 19 November 2007.

--The C# language v3.0, released in November 2007 with .NET Framework v3.5, also has full support of anonymous functions.

--F# added asynchronous workflows with await points in version 2.0 in 2007. This influenced the async/await mechanism added to C#.

2008

--Pandas is a software library written for the Python programming language for data manipulation and analysis. In particular, it offers data structures and operations for manipulating numerical tables and time series. Initial release: 11 January 2008

--HTML5 is a markup language used for structuring and presenting content on the World Wide Web. It is the fifth and final major HTML version that is a World Wide Web Consortium (W3C) recommendation. Initial release: 22 January 2008

--The control groups functionality was merged into the Linux kernel mainline in kernel version 2.6.24, which was released in January 2008.

--Sphinx is a documentation generator written and used by the Python community. It is written in Python, and also used in other environments. Sphinx converts reStructuredText files into HTML websites and other formats including PDF, EPub, Texinfo and man. Initial release: March 21, 2008

--HBase is an open-source non-relational distributed database modeled after Google's Bigtable and written in Java. It is developed as part of Apache Software Foundation's Apache Hadoop project and runs on top of HDFS (Hadoop Distributed File System) or Alluxio, providing Bigtable-like capabilities for Hadoop. Initial release: 28 March 2008

--Gradle is a build automation tool for multi-language software development. It controls the development process in the tasks of compilation and packaging to testing, deployment, and publishing. Initial release: 21 April 2008

--Google Cloud Platform (GCP) is a suite of cloud computing services offered by Google that provides a series of modular cloud services including computing, data storage, data analytics, and machine learning, alongside a set of management tools. In April 2008, Google announced App Engine, a platform for developing and hosting web applications in Google-

managed data centers, which was the first cloud computing service from the company.

--Jinja is a web template engine for the Python programming language. It was created by Armin Ronacher and is licensed under a BSD License. Initial release: July 17, 2008

--Apache Cassandra is a free and open-source, distributed, wide-column store, NoSQL database management system designed to handle large amounts of data across many commodity servers, providing high availability with no single point of failure. Initial release: July 2008

--Linux Containers (LXC) is an operating-system-level virtualization method for running multiple isolated Linux systems (containers) on a control host using a single Linux kernel. By 2008, LXC (upon which Docker was later built) adopted the "container" terminology and gained popularity in 2013 due to inclusion into Linux kernel 3.8 of user namespaces. LXC combines the kernel’s cgroups and support for isolated namespaces to provide an isolated environment for applications. Initial release: August 6, 2008

--The domain name bitcoin.org was registered on 18 August 2008.

--On August 20, 2008, Amazon added Elastic Block Store (EBS). This provides persistent storage, a feature that had been lacking since the service was introduced.

--TLS 1.2 was defined in RFC 5246 in August 2008.

--Google Chrome is a cross-platform web browser developed by Google. It was first released in 2008 for Microsoft Windows, built with free software components from Apple WebKit and Mozilla Firefox. First release: 2 September 2008.

--V8 is the JavaScript execution engine which was initially built for Google Chrome. It was then open-sourced by Google in 2008. The first version of the V8 engine was released at the same time as the first version of Chrome: 2 September 2008. Much of V8’s development is strongly inspired by the Java HotSpot Virtual Machine developed by Sun Microsystems, with the newer execution pipelines being very similar to those of HotSpot’s.

--DuckDuckGo is an American software company focused on online privacy whose flagship product is a search engine named DuckDuckGo. Launched: September 25, 2008

--Open Virtualization Format (OVF) is an open standard for packaging and distributing virtual appliances or, more generally, software to be run in virtual machines. Initial release: September 2008

--On 31 October 2008, a link to a white paper authored by Satoshi Nakamoto titled Bitcoin: A Peer-to-Peer Electronic Cash System was posted to a cryptography mailing list.

--Python 3.0 was released on 3 December 2008. It was a major revision of the language that is not completely backward-compatible.

--In 2008, Microsoft joined the Apache Software Foundation and co-founded the Open Web Foundation with Google, Facebook, Sun, IBM, Apache, and others.

--Graphite is a free open-source software (FOSS) tool that monitors and graphs numeric

time-series data such as the performance of computer systems. Graphite was developed by Orbitz Worldwide, Inc and released as open-source software in 2008.

2009

--Progress Chef (formerly Chef) is a configuration management tool written in Ruby and Erlang. It uses a pure-Ruby, domain-specific language (DSL) for writing system configuration "recipes". Initial release: January 2009

--Nakamoto implemented the bitcoin software as open-source code and released it in January 2009.

--Cross-origin resource sharing (CORS) is a mechanism that allows restricted resources on a web page to be requested from another domain outside the domain from which the first resource was served. In March 2009 the draft was renamed to "Cross-Origin Resource Sharing".

--WolframAlpha is an answer engine developed by Wolfram Research. The engine is based on Wolfram's earlier product Wolfram Mathematica, a technical computing platform. Launched: May 18, 2009

--Homebrew is a free and open-source software package management system that simplifies the installation of software on Apple's operating system, macOS, as well as Linux. Originally written by Max Howell, the package manager has gained popularity in the Ruby on Rails community and earned praise for its extensibility. Homebrew is written in the Ruby programming language and targets the version of Ruby that comes installed with the macOS operating system. Initial release: 21 May 2009

--CommonJS is a project with the goal to establish conventions on the module ecosystem for JavaScript outside of the web browser. The project was started by Mozilla engineer Kevin Dangoor in January, 2009 and initially named ServerJS. In August 2009, the project was renamed CommonJS to show the broader applicability of the APIs.

--Amazon Relational Database Service (or Amazon RDS) is a distributed relational database service by Amazon Web Services (AWS). Amazon RDS was first released on 22 October 2009, supporting MySQL databases. This was followed by support for Oracle Database in June 2011, Microsoft SQL Server in May 2012, PostgreSQL in November 2013.

--VMware Server final release: October 26, 2009

--MariaDB is a community-developed, commercially supported fork of the MySQL relational database management system (RDBMS), intended to remain free and open-source software under the GNU General Public License. Initial release: 29 October 2009

--Node.js was written initially by Ryan Dahl in 2009, about thirteen years after the introduction of the first server-side JavaScript environment, Netscape's LiveWire Pro Web. Dahl demonstrated the project at the inaugural European JSConf on November 8, 2009.

--Go is a statically typed, compiled programming language designed at Google by Robert Griesemer, Rob Pike, and Ken Thompson. Go was publicly announced in November 2009.

--DevOps as a term originated in 2009 following a talk at the O'Reilly Velocity Conference titled "10+ Deploys per Day: Dev and Ops Cooperation at Flickr." John Allspaw and Paul Hammond walked through some of the pains in the current software development lifecycle.

--In 2009, the first conference named devopsdays was held in Ghent, Belgium. The conference was founded by Belgian consultant, project manager and agile practitioner Patrick Debois.

--Microsoft first began contributing to the Linux kernel in 2009.

--SPDY is an obsolete open-specification communication protocol developed for transporting web content. Google announced SPDY in late 2009 and deployed in 2010.

Timeline - 2010-19

2010

--npm is a package manager for the JavaScript programming language maintained by npm, Inc. npm is written entirely in JavaScript and was developed by Isaac Z. Schlueter as a result of having "seen module packaging done terribly" and with inspiration from other similar projects such as PEAR (PHP) and CPAN (Perl). Initial release: 12 January 2010

--On February 1, 2010, Windows Azure Platform commercially available.

--systemd is a software suite that provides an array of system components for Linux operating systems. Its main aim is to unify service configuration and behavior across Linux distributions. Lennart Poettering and Kay Sievers, the software engineers working for Red Hat who initially developed systemd, started a project to replace Linux's conventional System V init in 2010. Initial release: 30 March 2010

--Vagrant is an open-source software product for building and maintaining portable virtual software development environments; e.g., for VirtualBox, KVM, Hyper-V, Docker containers, VMware, and AWS. Vagrant was first started as a personal side-project by Mitchell Hashimoto in January 2010. The first version of Vagrant was released in March 2010.

--Flask is a micro web framework written in Python. It is classified as a microframework because it does not require particular tools or libraries. Flask was created by Armin Ronacher of Pocoo, an international group of Python enthusiasts. Initial release: April 1, 2010

--OAuth is an open standard for access delegation, commonly used as a way for internet users to grant websites or applications access to their information on other websites but without giving them the passwords. The OAuth 1.0 protocol was published as RFC 5849, an informational Request for Comments, in April 2010.

--Google Cloud Storage is an online file storage web service for storing and accessing data on Google Cloud Platform infrastructure. Launched: May 19, 2010

--BigQuery is a managed, serverless data warehouse product by Google, offering scalable

analysis over large quantities of data. Bigquery originated from Google's internal Dremel technology, which enabled quick queries across trillions of rows of data. Launched: May 19, 2010

--ZAP (Zed Attack Proxy) is a dynamic application security testing tool published under the Apache License. When used as a proxy server it allows the user to manipulate all of the traffic that passes through it, including HTTPS encrypted traffic. The first release was announced on Bugtraq in September 2010, and became an OWASP project a few months later.

--Apache Hive is a data warehouse software project. It is built on top of Apache Hadoop for providing data query and analysis. Initial release: October 1, 2010

--NuGet is a package manager designed to enable developers to share reusable code. It is a software as a service solution whose client app is free and open-source. The Outercurve Foundation initially created it under the name NuPack. NuGet was initially distributed as a Visual Studio extension. Starting with Visual Studio 2012, both Visual Studio and Visual Studio for Mac can natively consume NuGet packages. Initial release: 5 October 2010

--AngularJS is a discontinued free and open-source JavaScript-based web framework for developing single-page applications. It was maintained mainly by Google and a community of individuals and corporations. Initial release: October 20, 2010

--Express.js, or simply Express, is a back end web application framework for building RESTful APIs with Node.js, released as free and open-source software under the MIT License. Express.js was founded by TJ Holowaychuk. The first release, according to Express.js's GitHub repository, was on 22 May 2010. Version 0.12 Initial release: 16 November 2010 ?

--JSON Web Token (JWT) is a proposed Internet standard for creating data with optional signature and/or optional encryption whose payload holds JSON that asserts some number of claims. First published: December 28, 2010

--In December 2010, the first documented description of QR code-based payments came from two patents filed by Shaun Cooley and Andrew Charles Payne, based on a prototype system developed for Norton Labs at Symantec called Norton Mobile Pay.

--Rust is a multi-paradigm, general-purpose programming language. Rust enforces memory safety without requiring the use of a garbage collector or reference counting present in other memory-safe languages. Rust grew out of a personal project begun in 2006 by Mozilla employee Graydon Hoare. Mozilla began sponsoring the project in 2009 and officially announced the project in 2010.

2011

--Apache Kafka is a distributed event store and stream-processing platform. It is an open-source system developed by the Apache Software Foundation written in Java and Scala. The project aims to provide a unified, high-throughput, low-latency platform for handling real-time data feeds. Initial release: January 2011

--Jenkins is an open source automation server. It helps automate the parts of software development related to building, testing, and deploying, facilitating continuous integration and continuous delivery. The Jenkins project was originally named Hudson, and was renamed in 2011 after a dispute with Oracle. Initial release: 2 February 2011

--Chocolatey is a machine-level, command-line package manager and installer for Windows software. It uses the NuGet packaging infrastructure and Windows PowerShell to simplify the process of downloading and installing software. Initial release: 23 March 2011

--Package Installer for Python (pip) is the de facto and recommended package-management system written in Python and is used to install and manage software packages. Initial release: 4 April 2011

--Time-based one-time password (TOTP) is a computer algorithm that generates a one-time password (OTP) that uses the current time as a source of uniqueness. In May 2011, TOTP officially became RFC 6238.

--Apache Flink is an open-source, unified stream-processing and batch-processing framework developed by the Apache Software Foundation. The core of Apache Flink is a distributed streaming data-flow engine written in Java and Scala. Initial release: May 2011

--Microsoft Power BI is an interactive data visualization software product developed by Microsoft with a primary focus on business intelligence (BI). The first release of Power BI was based on the Microsoft Excel-based add-ins: Power Query, Power Pivot and Power View. Initial release: 11 July 2011

--Kotlin is a cross-platform, statically typed, general-purpose programming language with type inference. Kotlin is designed to interoperate fully with Java, and the JVM version of Kotlin’s standard library depends on the Java Class Library, but type inference allows its syntax to be more concise. First appeared: July 22, 2011

--Google Native Client (NaCl) was a sandboxing technology for running either a subset of Intel x86, ARM, or MIPS native code, or a portable executable, in a sandbox. It allows safely running native code from a web browser, independent of the user operating system, allowing web apps to run at near-native speeds, which aligns with Google’s plans for ChromeOS. Initial release: 16 September 2011

--Apache Storm is a distributed stream processing computation framework written predominantly in the Clojure programming language. Originally created by Nathan Marz and team at BackType, the project was open sourced after being acquired by Twitter. The initial release was on 17 September 2011.

--Microsoft released a version of C# with async/await for the first time in the Async CTP (2011). And were later officially released in C# 5 (2012).

--James Dixon, then chief technology officer at Pentaho, coined the term data lake by 2011 to contrast it with data mart, which is a smaller repository of interesting attributes derived from raw data.

2012

--The first numbered pre-alpha version of the compiler, Rust 0.1, was released in January 2012.

--Ansible was written by Michael DeHaan and acquired by Red Hat in 2015. Initial release: February 20, 2012

--Go version 1.0 was released in March 2012.

--Google Compute Engine (GCE) is the infrastructure as a service (IaaS) component of Google Cloud Platform which is built on the global infrastructure that runs Google's search engine, Gmail, YouTube and other services. Google announced Compute Engine on June 28, 2012 at Google I/O 2012 in a limited preview mode.

--TypeScript is a free and open source programming language developed and maintained by Microsoft. TypeScript was first made public on October 1st, 2012 (at version 0.8), after two years of internal development at Microsoft.

--QUIC is a general-purpose transport layer network protocol initially designed by Jim Roskind at Google, implemented, and deployed in 2012. Introduction: October 12, 2012

--Amazon Redshift is a data warehouse product which forms part of the larger cloud-computing platform Amazon Web Services. It is built on top of technology from the massive parallel processing (MPP) data warehouse company ParAccel (later acquired by Actian), to handle large scale data sets and database migrations. Initial release: October 2012

--OAuth 2.0 was published as RFC 6749 in October 2012.

--Emscripten is an LLVM/Clang-based compiler that compiles C and C++ source code to WebAssembly (or to a subset of JavaScript known as asm.js, its original compilation target before the advent of WebAssembly in 2017), primarily for execution in web browsers. First release: 11/11/2012

--HTTP Strict Transport Security (HSTS) is a policy mechanism that helps to protect websites against man-in-the-middle attacks such as protocol downgrade attacks and cookie hijacking. The HSTS specification was published as RFC 6797 on 19 November 2012 after being approved on 2 October 2012 by the IESG for publication as a Proposed Standard RFC.

--From 2012, Microsoft became a significant user of GitHub, using it to host open-source projects and development tools such as .NET Core, Chakra Core, MSBuild, PowerShell, PowerToys, Visual Studio Code, Windows Calculator, Windows Terminal and the bulk of its product documentation (now to be found on Microsoft Docs).

--Prometheus is a free software application used for event monitoring and alerting. It records real-time metrics in a time series database built using a HTTP pull model. Prometheus was developed at SoundCloud starting in 2012, when the company discovered that its existing metrics and monitoring solutions (using StatsD and Graphite) were not sufficient for their needs.

2013

--A Ruby implementation of AsciiDoc called ‘Asciidoctor’, released in 2013, is in use by GitHub and GitLab. Initial release: January 30, 2013

--TOML is a file format for configuration files. It is intended to be easy to read and write due to obvious semantics which aim to be "minimal", and is designed to map unambiguously to a dictionary. Initial release: 23 February 2013

--Ruby 2.0 was intended to be fully backward compatible with Ruby 1.9.3. As of the official 2.0.0 release on February 24, 2013.

--Meson is a software tool for automating the building (compiling) of software. The overall goal for Meson is to promote programmer productivity. Meson is free and open-source software written in Python, under the Apache License 2.0. Initial release: 2 March 2013

--Docker is a set of platform as a service (PaaS) products that use OS-level virtualization to deliver software in packages called containers. Docker debuted to the public in Santa Clara at PyCon in 2013. It was released as open-source in March 2013. At the time, it used LXC as its default execution environment. Initial release: March 20, 2013

--asm.js is a subset of JavaScript designed to allow computer software written in languages such as C to be run as web applications while maintaining performance characteristics considerably better than standard JavaScript, which is the typical language used for such applications. First appeared: 21 March 2013

--On April 15, 2013, it was announced that the Xen Project was moved under the auspices of the Linux Foundation as a Collaborative Project.

--React is a free and open-source front-end JavaScript library for building user interfaces based on UI components. It is maintained by Meta (formerly Facebook) and a community of individual developers and companies. Initial release: May 29, 2013

--Electron (formerly known as Atom Shell) is a free and open-source software framework developed and maintained by GitHub. The framework is designed to create desktop applications using web technologies which are rendered using a flavor of the Chromium browser engine, and a backend using the Node.js runtime environment. Initial release: 15 July 2013

--The QUIC code was experimentally developed in Google Chrome starting in 2012, and was announced as part of Chromium version 29 (released on August 20, 2013).

--Slack is an instant messaging program designed by Slack Technologies and owned by Salesforce. Initial release: August 2013

--InfluxDB is an open-source time series database (TSDB) developed by the company InfluxData. Initial release: 24 September 2013

--In October 2013, Ecma International published the first edition of its JSON standard ECMA-404.

--Presto is a distributed query engine for big data using the SQL query language. Its architecture allows users to query data sources such as Hadoop, Cassandra, Kafka, AWS S3, Alluxio, MySQL, MongoDB and Teradata, and allows use of multiple data sources within a query. Hive was deemed too slow for Facebook's scale and Presto was invented to fill the gap to run fast queries. Original development started in 2012 and deployed at Facebook later that year. Initial release: 10 November 2013

--On November 13, 2013, Microsoft announced the release of a software as a service offering of Visual Studio on Microsoft Azure platform; at the time, Microsoft called it Visual Studio Online.

--Amazon Kinesis is a family of services provided by Amazon Web Services (AWS) for processing and analyzing real-time streaming data at a large scale. Launched in November 2013.

--In 2013, adequate containers support functionality was finished in kernel version 3.8 with the introduction of User namespaces.

--MEAN (MongoDB, Express.js, AngularJS (or Angular), and Node.js) is a free and open-source JavaScript software stack for building dynamic web sites and web applications. A variation known as MERN replaces Angular with React. The acronym MEAN was coined by Valeri Karpov. He introduced the term in a 2013 blog post.

--The FIDO ("Fast IDentity Online") Alliance is an open industry association launched in February 2013 whose stated mission is to develop and promote authentication standards that "help reduce the world's over-reliance on passwords".

--The Adversarial Tactics, Techniques, and Common Knowledge or MITRE ATT&CK is a guideline for classifying and describing cyberattacks and intrusions. It was created by the Mitre Corporation and released in 2013.

2014

--MkDocs is static site generator designed for building project documentation. It is written in Python, and also used in other environments. MkDocs converts Markdown files into HTML pages, effectively creating a static website containing documentation. Initial release: January 24, 2014

--In January 2014 CORS was accepted as a W3C Recommendation.

--Webpack is a free and open-source module bundler for JavaScript. It is made primarily for JavaScript, but it can transform front-end assets such as HTML, CSS, and images if the corresponding loaders are included. Initial release: 19 February 2014

--OpenID Connect is the third generation of OpenID technology, published in February 2014 by the OpenID Foundation. It is an authentication layer on top of the OAuth 2.0 authorization framework.

--The .NET Foundation is an organization incorporated on March 31, 2014, by Microsoft to improve open-source software development and collaboration around the .NET Framework.

--TypeScript 1.0 was released at Microsoft's Build developer conference in 2014 (12 April 2014). Visual Studio 2013 Update 2 provides built-in support for TypeScript.

--In April 2014, Windows Azure renamed Microsoft Azure.

--Heartbleed is a security bug in some outdated versions of the OpenSSL cryptography library, which is a widely used implementation of the Transport Layer Security (TLS) protocol. It was introduced into the software in 2012 and publicly disclosed in April 2014.

--Apache Spark is an open-source unified analytics engine for large-scale data processing. Spark provides an interface for programming clusters with implicit data parallelism and fault tolerance. Spark was initially started by Matei Zaharia at UC Berkeley's AMPLab in 2009, and open sourced in 2010 under a BSD license. In 2013, the project was donated to the Apache Software Foundation and switched its license to Apache 2.0. Initial release (v1.0): May 26, 2014

--Git 2.0 release: 2014-05-28

--Kubernetes was announced by Google in mid-2014. The project was created by Joe Beda, Brendan Burns, and Craig McLuckie.

--Terraform is an open-source, infrastructure as code, software tool created by HashiCorp. Initial release: 28 July 2014

--Shellshock, also known as Bashdoor, is a family of security bugs in the Unix Bash shell, the first of which was disclosed on 24 September 2014. Shellshock could enable an attacker to cause Bash to execute arbitrary commands and gain unauthorized access to many Internet-facing services, such as web servers, that use Bash to process requests.

--Babel is a free and open-source JavaScript transcompiler that is mainly used to convert ECMAScript 2015+ (ES6+) code into a backwards compatible version of JavaScript that can be run by older JavaScript engines. Initial release: September 28, 2014

--On October 28, 2014, HTML5 was published as a W3C Recommendation.

--.NET (pronounced as "dot net"; previously named .NET Core) is a free and open-source, managed computer software framework for Windows, Linux, and macOS operating systems. On November 12, 2014, Microsoft announced .NET Core, in an effort to include cross-platform support for .NET, including Linux and macOS, and the adoption of a conventional ("bazaar"-like) open-source development model under the stewardship of the .NET Foundation.

--On November 13, 2014, AWS launches a preview of EC2 Container Service (ECS), facilitating the use of container infrastructure on AWS. Third-party integration such as those with Docker are available at the time of release.

--On November 13, 2014, AWS launches AWS Lambda, its Functions as a Service (FaaS) tool. With Lambda, AWS customers can define and upload functions with specific triggers and execution code.

--Let’s Encrypt is a non-profit certificate authority run by Internet Security Research Group (ISRG) that provides X.509 certificates for Transport Layer Security (TLS) encryption at no charge. Let’s Encrypt was announced publicly on November 18, 2014.

--In 2014, Satya Nadella was named the new CEO of Microsoft. Microsoft began to adopt open source into its core business. In contrast to Ballmer’s stance, Nadella presented a slide that read, "Microsoft loves Linux".

--In 2014, with the release of version 0.9, Docker replaced LXC with its own component, libcontainer, which was written in the Go programming language.

--OverlayFS is a union mount filesystem implementation for Linux. It combines multiple different underlying mount points into one, resulting in single directory structure that contains underlying files and sub-directories from all sources. It was merged into the Linux kernel mainline in 2014, in kernel version 3.18. It was improved in version 4.0, bringing improvements necessary for e.g. the overlay2 storage driver in Docker.

--Grafana is a multi-platform open source analytics and interactive visualization web application. It provides charts, graphs, and alerts for the web when connected to supported data sources. Grafana was first released in 2014 by Torkel Ödegaard as an offshoot of a project at Orbitz. It targeted time series databases such as InfluxDB, OpenTSDB, and Prometheus. The Grafana user interface was originally based on version 3 of Kibana.

--seq2seq is an approach to machine translation (or more generally, sequence transduction) with roots in information theory, where communication is understood as an encode-transmit-decode process, and machine translation can be studied as a special case of communication. The idea of encoder-decoder sequence transduction had been developed in the early 2010s. The papers most commonly cited as the originators that produced seq2seq are two papers from 2014. In the seq2seq as proposed by them, both the encoder and the decoder were LSTMs. This had the "bottleneck" problem. The attention mechanism, proposed in 2014, resolved the bottleneck problem.

--eBPF is a technology that can run programs in a privileged context such as the operating system kernel. It is the successor to the Berkeley Packet Filter (BPF, with the "e" originally meaning "extended") filtering mechanism in Linux and is also used in non-networking parts of the Linux kernel as well. Initial release: 2014

2015

--By 2013, Prometheus was introduced for production monitoring at SoundCloud. The official public announcement was made in January 2015.

--Project Jupyter is a project to develop open-source software, open standards, and services for interactive computing across multiple programming languages. It was spun off from IPython in 2014 by Fernando Pérez and Brian Granger. Formation: February 2015

--Keras is an open-source software library that provides a Python interface for artificial neural networks. Keras acts as an interface for the TensorFlow library. Initial release: 27 March 2015

--The first stable release, Rust 1.0, was announced on May 15, 2015.

--On 8 April, 2015, GitHub announces Git Large File Storage (Git LFS). Git LFS allows users to store and work with large binary files in Git.

--Visual Studio Code, also commonly referred to as VS Code, is a source-code editor made by Microsoft for Windows, Linux and macOS. Visual Studio Code was first announced on April 29, 2015, by Microsoft at the 2015 Build conference.

--The 6th edition, ECMAScript 6 (ES6) and later renamed to ECMAScript 2015, was finalized in June 2015. This update adds significant new syntax for writing complex applications, including class declarations, ES6 modules. ES6 supports "arrow function" syntax, where a => symbol separates the anonymous function’s parameter list from the body.

--The Open Container Initiative (OCI) is a Linux Foundation project, started in June 2015 by Docker, to design open standards for operating-system-level virtualization. OCI develops runc, a container runtime that implements their specification and serves as a basis for other higher-level tools. runc was first released in July 2015 as version 0.0.1.

--Kubernetes 1.0 was released on July 21, 2015. Google worked with the Linux Foundation to form the Cloud Native Computing Foundation (CNCF) and offer Kubernetes as a seed technology.

--The FIDO2 Project is a joint effort between the FIDO Alliance and the World Wide Web Consortium (W3C) whose goal is to create strong authentication for the web. At its core, FIDO2 consists of the W3C Web Authentication (WebAuthn) standard and the FIDO Client to Authenticator Protocol 2 (CTAP2). FIDO 2.0 Proposed Standard: September 4, 2015

--On September 14, 2015, Let’s Encrypt issued its first certificate, which was for the domain helloworld.letsencrypt.org. On the same day, ISRG submitted its root program applications to Mozilla, Microsoft, Google and Apple.

--In September 2015, Node.js v0.12 and io.js v3.3 were merged back together into Node v4.0.

--Vue.js is an open-source model–view–viewmodel front end JavaScript framework for building user interfaces and single-page applications. It was created by Evan You. The first source code commit to the project was dated July 2013, and Vue was first released the following February, in 2014. Vue.js 1.0 release: October 27, 2015

--The Serverless Framework is a free and open-source web framework written using Node.js. Serverless is the first framework developed for building applications on AWS Lambda. Serverless is developed by Austen Collins and maintained by a full-time team. Initial release: October 2015

--TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks. Initial release: November 9, 2015

--On November 18, 2015, the source of Visual Studio Code was released under the MIT

License, and made available on GitHub.

--On November 18, 2015, Microsoft announced that Visual Studio Online was rebranded as "Visual Studio Team Services (VSTS)".

--Cilium is a cloud native technology for networking, observability, and security. It is based on the kernel technology eBPF, originally for better networking performance, and now leverages many additional features for different use cases. Initial release: December 16, 2015

--Python added support for async/await with version 3.5 in 2015.

--TypeScript added support for async/await with version 1.7 in 2015.

--The Cloud Native Computing Foundation (CNCF) is a Linux Foundation project that was founded in 2015 to help advance container technology and align the tech industry around its evolution.

--HTTP/2, published in 2015, provides a more efficient expression of HTTP’s semantics "on the wire".

2016

--In February 2016 Helm package manager for Kubernetes was released.

--On April 14, 2016, Visual Studio Code graduated from the public preview stage and was released to the Web.

--The General Data Protection Regulation, abbreviated GDPR, or French RGPD is a European Union regulation on information privacy in the European Union (EU) and the European Economic Area (EEA). The European Parliament and Council of the European Union adopted the GDPR on 14 April 2016, to become effective on 25 May 2018.

--On April 20, 2016, Jenkins version 2 was released with the Pipeline plugin enabled by default. The plugin allows for writing build instructions using a domain specific language based on Apache Groovy.

--Snap is a software packaging and deployment system developed by Canonical for operating systems that use the Linux kernel and the systemd init system. The first snapd 2.12 is released into Ubuntu 16.04 (xenial-updates) and Fedora 24.

--Web Authentication (WebAuthn) is a web standard published by the World Wide Web Consortium (W3C). WebAuthn is a core component of the FIDO2 Project under the guidance of the FIDO Alliance. First published: 31 May 2016

--In May 2016, the Cloud Native Computing Foundation accepted Prometheus as its second incubated project, after Kubernetes.

--ASP.NET Core is a free and open-source web framework and successor to ASP.NET, developed by Microsoft. Initial release: June 7, 2016

--Yarn is a software packaging system developed in 2016 by Facebook for the Node.js JavaScript runtime environment. Initial release: 18 June 2016

--.NET Core 1.0 was released on June 27, 2016, along with Microsoft Visual Studio 2015 Update 3, which enables .NET Core development.

--The Language Server Protocol (LSP) is an open, JSON-RPC-based protocol for use between source code editors or integrated development environments (IDEs) and servers that provide programming language-specific features. LSP was originally developed for Microsoft Visual Studio Code and is now an open standard. On 2016 June 27, Microsoft announced a collaboration with Red Hat and Codenvy to standardize the protocol's specification.

--The VS Code Go extension provides rich language support for the Go programming language. Initial Release: July 2016

--Prometheus 1.0 was released in July 2016. Subsequent versions were released through 2016 and 2017, leading to Prometheus 2.0 in November 2017.

--Windows Subsystem for Linux (WSL) is a compatibility layer for running Linux binary executables (in ELF format) natively on Windows. WSL beta was introduced in Windows 10 version 1607 (Anniversary Update) on August 2, 2016. Only Ubuntu (with Bash as the default shell) was supported.

--Angular is a TypeScript-based free and open-source web application framework led by the Angular Team at Google and by a community of individuals and corporations. Angular 2.0 was announced at the ng-Europe conference 22–23. October 2014. The drastic changes in the 2.0 version created considerable controversy among developers. Initial release: 2.0 / 14 September 2016

--PyTorch is a machine learning framework based on the Torch library, used for applications such as computer vision and natural language processing, originally developed by Meta AI and now part of the Linux Foundation umbrella. Initial release: September 2016

--Next.js is an open-source web development framework created by Vercel enabling React-based web applications with server-side rendering and generating static websites. Initial release: October 25, 2016

--Nuxt.js is a free and open source JavaScript library based on Vue.js, Node.js, Webpack and Babel.js. Nuxt is inspired by Next.js, which is a framework of similar purpose, based on React.js. Initial release: October 26, 2016

--On November 15, 2016, Microsoft announced the general availability of Azure Functions.

--Hugging Face, Inc. is an American company based in New York City that develops computation tools for building applications using machine learning. The company was founded in 2016, originally as a company that developed a chatbot app targeted at teenagers. The Hugging Face Hub is a platform (centralized web service) for hosting.

2017

--WebAssembly (sometimes abbreviated Wasm) defines a portable binary-code format and a corresponding text format for executable programs. Announced in 2015 and first released in March 2017.

--WebAssembly System Interface (WASI) is a simple interface (ABI and API) designed by Mozilla intended to be portable to any platform. It provides POSIX-like features like file I/O constrained by capability-based security.

--DVC is a free and open-source, platform-agnostic version system for data, machine learning models, and experiments. It is designed to make ML models shareable, experiments reproducible, and to track versions of models, data, and pipelines. Initial release: May 4, 2017

--The WannaCry ransomware attack was a worldwide cyberattack in May 2017 by the WannaCry ransomware cryptoworm, which targeted computers running the Microsoft Windows operating system by encrypting data and demanding ransom payments in the Bitcoin cryptocurrency.

--Apache Iceberg is an open-source high-performance format for huge analytic tables. Iceberg enables the use of SQL tables for big data while making it possible for engines like Spark, Trino, Flink, Presto, Hive, Impala, StarRocks, Doris, and Pig to safely work with the same tables, at the same time. Initial release: 10 August 2017

--WSL was no longer beta in Windows 10 version 1709 (Fall Creators Update), released on October 17, 2017. Multiple Linux distributions could be installed and were available for install in the Windows Store.

--At the end of October 2017 Microsoft announced a preview of AKS (Azure Container Service), a managed Kubernetes service in Azure.

--On November 6, 2017, Amazon announced the new C5 family of instances that were based on a custom architecture around the KVM hypervisor, called Nitro.

--Amazon SageMaker is a cloud machine-learning platform that enables developers to create, train, and deploy machine-learning (ML) models in the cloud. It also enables developers to deploy ML models on embedded systems and edge-devices. SageMaker was launched in 29 November 2017.

--Databricks grew out of the AMPLab project at University of California, Berkeley that was involved in making Apache Spark, an open-source distributed computing framework built atop Scala. In November 2017, the company was announced as a first-party service on Microsoft Azure via integration Azure Databricks.

--Javascript added support for async/await in 2017 as part of ECMAScript 2017 JavaScript edition.

--A transformer is a deep learning model that adopts the mechanism of self-attention, differentially weighting the significance of each part of the input data. It is used primarily in

the fields of natural language processing (NLP) and computer vision (CV). Transformers were introduced in 2017 by a team at Google Brain and are increasingly becoming the model of choice for NLP problems, replacing RNN models such as long short-term memory (LSTM).

2018

--Meltdown is one of the two original transient execution CPU vulnerabilities (the other being Spectre). Meltdown affects Intel x86 microprocessors, IBM POWER processors, and some ARM-based microprocessors. It allows a rogue process to read all memory, even when it is not authorized to do so. Date discovered: January 2018

--Spectre refers to one of the two original transient execution CPU vulnerabilities (the other being Meltdown), which involve microarchitectural timing side-channel attacks. These affect modern microprocessors that perform branch prediction and other forms of speculation. Date discovered: January 2018

--OpenSSH-based client and server programs have been included in Windows 10 since version 1803 (April 2018 Update)

--Python extension for Visual Studio Code is a Visual Studio Code extension with rich support for the Python language. Initial Release: 02 Feb 2018

--Nest (NestJS) is a framework for building efficient, scalable Node.js server-side applications. Initial release on github: Feb 16, 2018

--Deno is a runtime for JavaScript, TypeScript, and WebAssembly that is based on the V8 JavaScript engine and the Rust programming language. Deno was co-created by Ryan Dahl, who also created Node.js. Initial release: May 13, 2018

--On June 5, 2018, AWS Elastic Kubernetes Service (EKS) available in the US East (N. Virginia) and US West (Oregon) Regions.

--On June 13, 2018, Microsoft announced the general availability of the Azure Kubernetes Service (AKS).

--TLS 1.3 was defined in RFC 8446 in August 2018.

--On September 10, 2018, Microsoft announced another rebranding of VSTS, this time to "Azure DevOps Services".

--In 2018, Microsoft acquired GitHub, the largest host for open source project infrastructure. The deal closed on October 26, 2018.

--Blazor is a free and open-source web framework that enables developers to create web apps using C# and HTML. Initial release: 2018

2019

--In January 2019, Linuxbrew was merged back into Homebrew, adding beta support for Linux and the Windows Subsystem for Linux to the Homebrew feature set.

--Trino is an open-source distributed SQL query engine designed to query large data sets distributed over one or more heterogeneous data sources. In January 2019, the original creators of Presto, Martin Traverso, Dain Sundstrom, and David Phillips, created a fork of the Presto project. They initially kept the name Presto and used the PrestoSQL web handle to distinguish it from the original PrestoDB project.

--Generative Pre-trained Transformer 2 (GPT-2) is an open-source artificial intelligence created by OpenAI in February 2019. GPT-2 translates text, answers questions, summarizes passages, and generates text output on a level that, while sometimes indistinguishable from that of humans, can become repetitive or nonsensical when generating long passages.

--Microsoft announced WSL 2 on May 6, 2019, and it was shipped with Windows 10 version 2004.

--On 7 May 2019, Google announced that the Kotlin programming language is now its preferred language for Android app developers.

--cURL 7.66, released 11 September 2019, supports HTTP/3 (and thus QUIC).

--WebAssembly became a World Wide Web Consortium recommendation on 5 December 2019.

--In 2019, the JS Foundation and Node.js Foundation merged to form the OpenJS Foundation.

--Rust added support for async/await with version 1.39.0 in 2019.

--A second edition, The Pragmatic Programmer: Your Journey to Mastery was released in 2019 for the book’s 20th anniversary.

Timeline - 2020-

2020

--In May 2021, the IETF standardized QUIC in RFC 9000.

--QUIC support in Firefox arrived in May 2021.

--On September 21, 2020, Homebrew version 2.5.2 was released with support for bottle taps (binary package repositories) via GitHub Releases.

--In November 2020, Microsoft released .NET 5.0. The "Core" branding was removed and version 4.0 was skipped to avoid conflation with .NET Framework, which remains the Windows-specific product. It addresses the patent concerns related to the .NET Framework.

--Ruby 3.0.0 was released on Christmas Day in 2020.

--In December 2020, PrestoSQL was rebranded as Trino.

--The Rust for Linux project was announced in 2020 in the Linux kernel mailing list with goals of leveraging Rust's memory safety to reduce bugs when writing kernel drivers.

--Generative Pre-trained Transformer 3 (GPT-3) is an autoregressive language model released in 2020 that uses deep learning to produce human-like text. Given an initial text as prompt, it will produce text that continues the prompt.

2021

--On February 8, 2021, the formation of the Rust Foundation was announced by its five founding companies (AWS, Huawei, Google, Microsoft, and Mozilla).

--Terraform 1.0 was released on June 08, 2021.

--GitHub Copilot is a cloud-based artificial intelligence tool developed by GitHub and OpenAI to assist users of Visual Studio Code, Visual Studio, Neovim, and JetBrains integrated development environments (IDEs) by autocompleting code. On June 29, 2021, GitHub announced GitHub Copilot for technical preview in the Visual Studio Code development environment.

--OpenAI Codex is an artificial intelligence model developed by OpenAI. It parses natural language and generates code in response. It is used to power GitHub Copilot, a programming autocompletion tool developed for Visual Studio Code. Codex is a descendant of OpenAI's GPT-3 model, fine-tuned for use in programming applications. Released: Aug 10, 2021

--OpenSSL 3.0 release: 7 September 2021

--Log4Shell was a zero-day vulnerability in Log4j, a popular Java logging framework, involving arbitrary code execution.The vulnerability had existed unnoticed since 2013 and was privately disclosed to the Apache Software Foundation, of which Log4j is a project, by Chen Zhaojun of Alibaba Cloud's security team on 24 November 2021.

--Grafana acquired k6 in 2021.

--LaMDA (Language Model for Dialogue Applications) is a family of conversational large language models developed by Google. Originally developed and introduced as Meena in 2020, the first-generation LaMDA was announced during the 2021 Google I/O keynote, while the second generation was announced the following year.

2022

--PaLM (Pathways Language Model) is a 540 billion parameter transformer-based large language model developed by Google AI. The model was first announced in April 2022 and remained private until March 2023, when Google launched an API for PaLM and several other technologies.

--On May 11, 2022, Google unveiled LaMDA 2, the successor to LaMDA, during the 2022 Google I/O keynote.

--Chocolatey 1.0.0 was released on 18 Mar 2022.

--On September 21, 2022, Systemd support is now available in WSL.

--In October 2022, a pull request for accepting the implementation for Rust for Linux was approved by Torvalds.

--ChatGPT (Chat Generative Pre-trained Transformer) is an artificial-intelligence (AI) chatbot developed by OpenAI and launched in November 2022. It is built on top of OpenAI's GPT-3.5 and GPT-4 families of large language models (LLMs) and has been fine-tuned (an approach to transfer learning) using both supervised and reinforcement learning techniques.

--HTTP/3, the successor to HTTP/2, was published in 2022.

2023

--On February 7, 2023, Microsoft announced a major overhaul to Bing including the addition of chatbot functionality marketed as "the new Bing".

--Llama (acronym for Large Language Model Meta AI, and formerly stylized as LLaMA) is a family of autoregressive large language models (LLMs) released by Meta AI starting in February 2023.

--Generative Pre-trained Transformer 4 (GPT-4) is a multimodal large language model created by OpenAI, and the fourth in its series of GPT foundation models. It was launched on March 14, 2023, and made publicly available via the paid chatbot product ChatGPT Plus, via OpenAI's API, and via the free chatbot Microsoft Copilot.

--Bard is a conversational artificial intelligence chatbot developed by Google, based on the LaMDA family of large language models. It was developed as a response to the rise of OpenAI's ChatGPT, and was released in a limited capacity in March 2023 to lukewarm responses.

--Claude is a family of large language models developed by Anthropic. The first model was released in March 2023.

--Google Gemini is a family of multimodal large language models developed by Google DeepMind, serving as the successor to LaMDA and PaLM 2. Comprising Gemini Ultra, Gemini Pro, Gemini Flash, and Gemini Nano, it was announced on December 6, 2023, positioned as a competitor to OpenAI's GPT-4.

--Mojo is a programming language in the Python family that is currently under development. It is available both in browsers via Jupyter notebooks, and locally on Linux and macOS. First appeared: 2023

--LocalAI is the free, Open Source OpenAI alternative. LocalAI act as a drop-in replacement REST API that's compatible with OpenAI API specifications for local inferencing. First

appeared: 2023

2024

--In February, 2024, Google launched Gemini 1.5 in a limited capacity, positioned as a more powerful and capable model than 1.0 Ultra.

--GPT-4o (GPT-4 Omni) is a multilingual, multimodal generative pre-trained transformer designed by OpenAI. It was announced by OpenAI's CTO Mira Murati during a live-streamed demonstration on 13 May 2024 and released the same day.

--Deno 2 was announced on October 9, 2024.

--The Model Context Protocol (MCP) is an open standard, open-source framework introduced by Anthropic in November 2024 to standardize the way artificial intelligence (AI) systems like large language models (LLMs) integrate and share data with external tools, systems, and data sources Introduced: November 25, 2024

--OpenAI o3 is a reflective generative pre-trained transformer (GPT) model developed by OpenAI as a successor to OpenAI o1 for ChatGPT. It is designed to devote additional deliberation time when addressing questions that require step-by-step logical reasoning. The OpenAI o3 model was announced on December 20, 2024.

2025

--On January 30, 2025, Google released Gemini 2.0 Flash as the new default model, with Gemini 1.5 Flash still available for usage. This was followed by the release of Gemini 2.0 Pro on February 5, 2025.

--On May 6, 2025, Grafana k6 v1.0.0 was released after 9 years of iteration and countless community contributions.

--On June 17, 2025, Google announced general availability for 2.5 Pro and Flash. They also introduced Gemini 2.5 Flash-Lite that same day, a model optimized for speed and cost-efficiency.

--GPT-5 is a multimodal large language model developed by OpenAI and the fifth in its series of generative pre-trained transformer (GPT) foundation models. Preceded in the series by GPT-4, it was launched on August 7, 2025, combining reasoning capabilities and non-reasoning functionality under a common interface.