

Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. Some languages are very popular for particular kinds of applications, while some languages are regularly used to write many different kinds of applications. Programmable devices have existed for centuries. Debugging is often done with IDEs. Standalone debuggers like GDB are also used, and these often provide less of a visual environment, usually using a command line. Some languages are more prone to some kinds of faults because their specification does not require compilers to perform as much checking as other languages. Following a consistent programming style often helps readability. Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. Languages form an approximate spectrum from "low-level" to "high-level"; "low-level" languages are typically more machine-oriented and faster to execute, whereas "high-level" languages are more abstract and easier to use but execute less quickly. They are the building blocks for all software, from the simplest applications to the most sophisticated ones. For example, when a bug in a compiler can make it crash when parsing some large source file, a simplification of the test case that results in only a few lines from the original source file can be sufficient to reproduce the same crash. Various visual programming languages have also been developed with the intent to resolve readability concerns by adopting non-traditional approaches to code structure and display. Trade-offs from this ideal involve finding enough programmers who know the language to build a team, the availability of compilers for that language, and the efficiency with which programs written in a given language execute. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). Implementation techniques include imperative languages (object-oriented or procedural), functional languages, and logic languages. Many programmers use forms of Agile software development where the various stages of formal software development are more integrated together into short cycles that take a few weeks rather than years. New languages are generally designed around the syntax of a prior language with new functionality added, (for example C++ adds object-orientation to C, and Java adds memory management and bytecode to C++, but as a result, loses efficiency and the ability for low-level manipulation). Auxiliary tasks accompanying and related to programming include analyzing requirements, testing, debugging (investigating and fixing problems), implementation of build systems, and management of derived artifacts, such as programs' machine code. Their jobs usually involve: Although programming has been presented in the media as a somewhat mathematical subject, some research shows that good programmers have strong skills in natural human languages, and that learning to code is similar to learning a foreign language. Later a control panel (plug board) added to his 1906 Type I Tabulator allowed it to be programmed for different jobs, and by the late 1940s, unit record equipment such as the IBM 602 and IBM 604, were programmed by control panels in a similar way, as were the first electronic computers. Use of a static code analysis tool can help detect some possible problems. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. The first computer program is generally dated to 1843, when mathematician Ada Lovelace published an algorithm to calculate a sequence of Bernoulli numbers, intended to be carried out by Charles Babbage's Analytical Engine. He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm.