

The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. Programmable devices have existed for centuries. Whatever the approach to development may be, the final program must satisfy some fundamental properties. However, with the concept of the stored-program computer introduced in 1949, both programs and data were stored and manipulated in the same way in computer memory. Methods of measuring programming language popularity include: counting the number of job advertisements that mention the language, the number of books sold and courses teaching the language (this overestimates the importance of newer languages), and estimates of the number of existing lines of code written in the language (this underestimates the number of users of business languages such as COBOL). Readability is important because programmers spend the majority of their time reading, trying to understand, reusing and modifying existing source code, rather than writing new source code. One approach popular for requirements analysis is Use Case analysis. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. However, readability is more than just programming style. 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. 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. He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm. Use of a static code analysis tool can help detect some possible problems. Integrated development environments (IDEs) aim to integrate all such help. 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. Popular modeling techniques include Object-Oriented Analysis and Design (OOAD) and Model-Driven Architecture (MDA). Programs were mostly entered using punched cards or paper tape. High-level languages made the process of developing a program simpler and more understandable, and less bound to the underlying hardware. The academic field and the engineering practice of computer programming are both largely concerned with discovering and implementing the most efficient algorithms for a given class of problems. Unreadable code often leads to bugs, inefficiencies, and duplicated code. 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). 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. Programming languages are essential for software development. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA.