

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. Use of a static code analysis tool can help detect some possible problems. These compiled languages allow the programmer to write programs in terms that are syntactically richer, and more capable of abstracting the code, making it easy to target varying machine instruction sets via compilation declarations and heuristics. Some languages are very popular for particular kinds of applications, while some languages are regularly used to write many different kinds of applications. However, because an assembly language is little more than a different notation for a machine language, two machines with different instruction sets also have different assembly languages. Programs were mostly entered using punched cards or paper tape. However, readability is more than just programming style. Expert programmers are familiar with a variety of well-established algorithms and their respective complexities and use this knowledge to choose algorithms that are best suited to the circumstances. Implementation techniques include imperative languages (object-oriented or procedural), functional languages, and logic languages. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. 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. The choice of language used is subject to many considerations, such as company policy, suitability to task, availability of third-party packages, or individual preference. Different programming languages support different styles of programming (called programming paradigms). Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix notation. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. 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. It is usually easier to code in "high-level" languages than in "low-level" ones. Normally the first step in debugging is to attempt to reproduce the problem. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. Expert programmers are familiar with a variety of well-established algorithms and their respective complexities and use this knowledge to choose algorithms that are best suited to the circumstances. 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 few lines from the original source file can be sufficient to reproduce the same crash. It affects the aspects of quality above, including portability, usability and most importantly maintainability. Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. They are the building blocks for all software, from the simplest applications to the most sophisticated ones.