



appendix

D

High-Level Programming Languages

This appendix contains a brief background of each of the languages used as examples in Chapter 6.

Ada

The language Ada, named after Augusta Ada Byron (1815–1851), who was an advocate of Charles Babbage and the daughter of poet Lord Byron, was developed at the initiative of the U.S. Department of Defense in an attempt to obtain a single, general-purpose language for all its software development needs. A major emphasis during Ada's design was to incorporate features for programming real-time computer systems used as a part of larger machines such as missile guidance systems, environmental control systems within buildings, and control systems in automobiles and small home appliances. Ada thus contains features for expressing activities in parallel processing environments as well as convenient techniques for handling special cases (called exceptions) that might arise in the application environment. Although originally designed as an imperative language, newer versions of Ada have embraced the object-oriented paradigm.

The design of the Ada language has consistently emphasized features that lead to the efficient development of reliable software, a characteristic exemplified by the fact that all of the internal control software in the Boeing 777 aircraft was written in Ada. This is also a major reason that Ada was used as a starting point in the development of the language SPARK, as indicated in Chapter 5.

C

The language C was developed by Dennis Ritchie at Bell Laboratories in the early 1970s. Although originally designed as a language for developing system software, C has achieved popularity throughout the programming community and has been standardized by the American National Standards Institute.

C was originally envisioned as merely a step up from machine language. Consequently, its syntax is terse compared with other high-level languages that use complete English words to express some primitives that are represented by special symbols in C. This terseness allows for efficient representations of complex algorithms, which is a major reason for C's popularity. (Often a concise representation is more readable than a lengthy one.)

C++

The language C++ was developed by Bjarne Stroustrup at Bell Laboratories as an enhanced version of the language C. The goal was to produce a language compatible with the object-oriented paradigm. Today, C++ is not only a prominent object-oriented language in its own right but it has served as a starting point for the development of two other leading object-oriented languages: Java and C#.

C#

The language C# was developed by Microsoft to be a tool in the .NET Framework, which is a comprehensive system for developing application software for machines running Microsoft system software. The C# language is very similar to C++ and Java. Indeed, the reason Microsoft introduced C# as a different language was not that it is truly new in the language sense, but that, as a different language, Microsoft could customize specific features of the language without concern for standards that were already associated with other languages or for proprietary rights of other corporations. Thus the novelty of C# is in its role as a prominent language for developing software utilizing the .NET Framework. With Microsoft's backing, C# and the .NET Framework promise to be prominent players in the world of software development for years to come.

FORTRAN

FORTRAN is an acronym for FORMula TRANslator. This language was one of the first high-level languages developed (it was announced in 1957) and one of the first to gain wide acceptance within the computing community. Over the years its official description has undergone numerous extensions, meaning that today's FORTRAN language is much different from the original. Indeed, by studying the evolution of FORTRAN, one would witness the effects of research in programming language design. Although originally designed as an imperative language, newer versions of FORTRAN now encompass many object-oriented features. FORTRAN continues to be a popular language within the scientific community. In particular, many numerical analysis and statistical packages are, and will probably continue to be, written in FORTRAN.

Java

Java is an object-oriented language developed by Sun Microsystems in the early 1990s. Its designers borrowed heavily from C and C++. The excitement over Java is due, not to the language itself, but to the language's universal implementation and the vast number of predesigned templates that are available in the Java programming environment. The universal implementation means that a program written in Java can be executed efficiently over a wide range of machines; and the availability of templates means that complex software can be developed with relative ease. For example, templates such as applet and servlet streamline the development of software for the World Wide Web.