

In discussing Java, it is important to distinguish between the Java programming language, the Java Virtual Machine, and the Java platform. The Java programming language is the language in which Java applications, applets, servlets, and components are written. When a Java program is compiled, it is converted to byte codes that are the portable machine language of a CPU architecture known as the Java Virtual Machine (also called the Java VM or JVM). The JVM can be implemented directly in hardware, but it is usually implemented in the form of a software program that interprets and executes byte codes.

The Java platform is distinct from both the Java language and Java VM. The Java platform is the predefined set of Java classes that exist on every Java installation; these classes are available for use by all Java programs. The Java platform is also sometimes referred to as the Java runtime environment or the core Java APIs (application programming interfaces). The Java platform can be extended with optional packages (formerly called standard extensions). These APIs exist in some Java installations but are not guaranteed to exist in all installations.

The Java programming language is a state-of-the-art, object-oriented language that has a syntax similar to that of C. The language designers strove to make the Java language powerful, but, at the same time, they tried to avoid the overly

complex features that have bogged down other object-oriented languages like C++. By keeping the language simple, the designers also made it easier for programmers to write robust, bug-free code. As a result of its elegant design and next-generation features, the Java language has proved popular with programmers, who typically find it a pleasure to work with Java after struggling with more difficult, less powerful languages.

Java

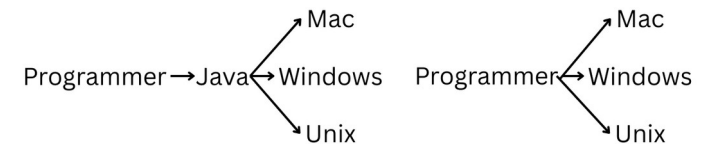
Language	Platform
What you write in	Classes that always exist
Set of possible things to do	Extendable with packages

The Java platform is just as important as the Java programming language and the Java Virtual Machine. All programs written in the Java language rely on the set of predefined classes[†] that comprise the Java platform. Java classes are organized into related groups known as *packages*. The Java platform defines packages for functionality such as input/output, networking, graphics, user-interface creation, security, and much more.

It is important to understand what is meant by the term platform. To a computer programmer, a platform is defined by the APIs he can rely on when writing programs. These APIs are usually defined by the operating system of the target computer. Thus, a programmer writing a program to run under Microsoft Windows must use a different set of APIs than a programmer writing the same program for a Unix-based system. In this respect, Windows and Unix are distinct platforms.

Java is not an operating system. Nevertheless, the Java platform provides APIs with a comparable breadth and depth to those defined by an operating system. With the Java platform, you can write applications in Java without sacrificing the advanced features available to programmers writing native applications targeted at a particular underlying operating system. An application written on the Java platform runs on any operating system that supports the Java platform. This means you do not have to create distinct Windows, Macintosh, and Unix versions of your programs, for example. A single Java program runs on all these operating systems, which explains why “Write once, run anywhere” is Sun’s motto for Java.

The Java platform is not an operating system, but for programmers, it is an alternative development target and a very popular one at that. The Java platform reduces programmers’ reliance on the underlying operating system, and, by allowing programs to run on top of any operating system, it increases end users’ freedom to choose an operating system.

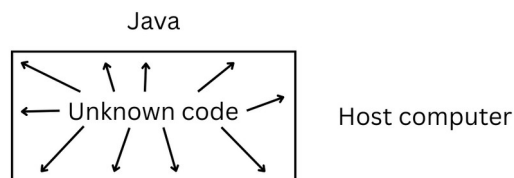


Another key benefit of Java is its security features. Both the language and the platform were designed from the ground up with security in mind. The Java platform allows users to download untrusted code over a network and run it in a secure environment in which it cannot do any harm: untrusted code cannot infect the host system with a virus, cannot read or write files from the hard drive, and so forth. This capability alone makes the Java platform unique.

Java 1.2 took the security model a step further. It made security levels and restrictions highly configurable and extended them beyond applets. As of Java 1.2, any Java code, whether it is an applet, a servlet, a JavaBeans component, or a complete Java application, can be run with restricted permissions that prevent it from doing harm to the host system.

The security features of the Java language and platform have been subjected to intense scrutiny by security experts around the world. In the earlier days of Java, security-related bugs, some of them potentially serious, were found and promptly fixed. Because of the strong security promises Java makes, it is big news when a new security bug is found. No other mainstream platform can make security guarantees nearly as strong as those Java makes. No one can say that Java security holes will not be found in the future, but if Java's security is not yet perfect, it has been proven strong enough for practical day-to-day use and is certainly better than any of the alternatives.

Sun's corporate motto has always been "The network is the computer." The designers of the Java platform believed in the importance of networking and designed the Java platform to be network-centric. From a programmer's point of view, Java makes it easy to work with resources across a network and to create network-based applications using client/server or multitier architectures.



Java is both dynamic and extensible. Java code is organized in modular object-oriented units called *classes*. Classes are stored in separate files and are loaded into the Java interpreter only when needed. This means that an application can decide as it is running what classes it needs and can load them when it needs them. It also means that a program can dynamically extend itself by loading the classes it needs to expand its functionality.

The network-centric design of the Java platform means that a Java application can dynamically extend itself by loading new classes over a network. An application that takes advantage of these features ceases to be a monolithic block of code. Instead, it becomes an interacting collection of independent software components. Thus, Java enables a powerful new metaphor of application design and development.

The Java language and the Java platform were designed from the start with the rest of the world in mind. When it was created, Java was the only commonly used programming language that had internationalization features at its core rather than tacked on as an afterthought. While most programming languages use 8-bit characters that represent only the alphabets of English and Western European languages, Java uses 16-bit Unicode characters that represent the phonetic alphabets and ideographic character sets of the entire world. Java's internationalization features are not restricted to just low-level character representation, however. The features permeate the Java platform, making it easier to write internationalized programs with Java than it is with any other environment.

The final, and perhaps most important, reason to use Java is that programmers like it. Java is an elegant language combined with a powerful and (usually) well-designed set of APIs. Programmers enjoy programming in Java and are often amazed at how quickly they can get results with it. Because Java is a simple and elegant language with a well-designed, intuitive set of APIs, programmers write better code with fewer bugs than for other platforms, thus reducing development time.