

Java (programming language)

Java is a general-purpose computer-programming language that is concurrent, class-based, object-oriented,^[15] and specifically designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere" (WORA),^[16] meaning that compiled Java code can run on all platforms that support Java without the need for recompilation.^[17] Java applications are typically compiled to bytecode that can run on any Java virtual machine (JVM) regardless of computer architecture. As of 2016, Java is one of the most popular programming languages in use,^{[18][19][20][21]} particularly for client-server web applications, with a reported 9 million developers.^[22] Java was originally developed by James Gosling at Sun Microsystems (which has since been acquired by Oracle Corporation) and released in 1995 as a core component of Sun Microsystems' Java platform. The language derives much of its syntax from C and C++, but it has fewer low-level facilities than either of them.

The original and reference implementation Java compilers, virtual machines, and class libraries were originally released by Sun under proprietary licenses. As of May 2007, in compliance with the specifications of the Java Community Process, Sun relicensed most of its Java technologies under the GNU General Public License. Others have also developed alternative implementations of these Sun technologies, such as the GNU Compiler for Java (bytecode compiler), GNU Classpath (standard libraries), and IcedTea-Web (browser plugin for applets).

The latest version is Java 10, released on March 20, 2018,^[23] which follows Java 9 after only six months^[24] in line with the new release schedule. Java 8 is still supported but there will be no more security updates for Java 9.^[25] Versions earlier than Java 8 are supported by companies on a commercial basis; e.g. by Oracle back to Java 6 as of October 2017 (while they still "highly recommend that you uninstall"^[26] pre-Java 8 from at least Windows computers).

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Syntax

Java	
	
Paradigm	Multi-paradigm: object-oriented (class-based), structured, imperative, generic, reflective, concurrent
Designed by	James Gosling
Developer	Sun Microsystems (now owned by Oracle Corporation)
First appeared	May 23, 1995 ^[1]
Typing discipline	Static, strong, safe, nominative, manifest
License	GNU General Public License, Java Community Process
Filename extensions	.java, .class, .jar
Website	oracle.com/java/ (http://oracle.com/java/)
Major implementations	
Compilers: OpenJDK (javac, sjavac), GNU Compiler for Java	

"Hello world" example

Special classes

- Applet
- Servlet
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Use outside the Java platform

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- Controversy

Class libraries

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See also

- Comparison of Java with other languages

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References

External links

(GCJ), Eclipse Compiler for Java (ECJ)

Virtual machines: Oracle HotSpot, Oracle JRockit, Azul Zing, IBM J9, Excelsior JET, Gluon VM, Microsoft JVM, Apache Harmony

JIT compilers: Oracle Graal, Azul Falcon (LLVM)

Dialects

Generic Java, Pizza

Influenced by

Ada 83, C++,^[2] C#,^[3] Eiffel,^[4] Generic Java, Mesa,^[5] Modula-3,^[6] Oberon,^[7] Objective-C,^[8] UCSD Pascal,^{[9][10]} Object Pascal^[11]

Influenced

Ada 2005, BeanShell, C#, Chapel,^[12] Clojure, ECMAScript, Fantom, Gambas,^[13] Groovy, Hack,^[14] Haxe, J#, JavaScript, Kotlin, PHP, Python, Scala, Seed7, Vala

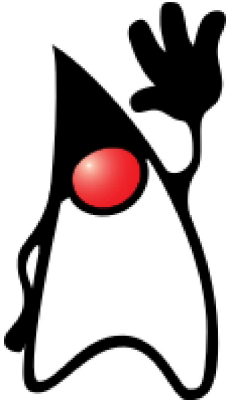
 [Java Programming at Wikibooks](#)

History

James Gosling, Mike Sheridan, and Patrick Naughton initiated the Java language project in June 1991.^[27] Java was originally designed for interactive television, but it was too advanced for the digital cable television industry at the time.^[28] The language was initially called *Oak* after an oak tree that stood outside Gosling's office. Later the project went by the name *Green* and was finally renamed *Java*, from Java coffee.^[29] Gosling designed Java with a C/C++-style syntax that system and application programmers would find familiar.^[30]

Sun Microsystems released the first public implementation as Java 1.0 in 1995.^[31] It promised "Write Once, Run Anywhere" (WORA), providing no-cost run-times on popular platforms. Fairly secure and featuring configurable security, it allowed network- and file-access restrictions. Major web browsers soon incorporated the ability to run *Java applets* within web pages, and Java quickly became popular. The Java 1.0 compiler was re-written in Java by Arthur van Hoff to comply strictly with the Java 1.0 language specification.^[32] With the advent of *Java 2* (released initially as J2SE 1.2 in December 1998 – 1999), new versions had multiple configurations built for different types of platforms. *J2EE* included technologies and APIs for enterprise applications typically run in server environments, while *J2ME* featured APIs optimized for mobile applications. The desktop version was renamed *J2SE*. In 2006, for marketing purposes, Sun renamed new *J2* versions as *Java EE*, *Java ME*, and *Java SE*, respectively.

In 1997, Sun Microsystems approached the ISO/IEC JTC 1 standards body and later the Ecma International to formalize Java, but it soon withdrew from the process.^{[33][34][35]} Java remains a *de facto* standard, controlled through the Java Community Process.^[36] At one time, Sun made most of its Java implementations available without charge, despite their proprietary software status. Sun generated revenue from Java through the selling of licenses for specialized products such as the Java Enterprise System.



Duke, the Java mascot

On November 13, 2006, Sun released much of its Java virtual machine (JVM) as free and open-source software, (FOSS), under the terms of the GNU General Public License (GPL). On May 8, 2007, Sun finished the process, making all of its JVM's core code available under free software/open-source distribution terms, aside from a small portion of code to which Sun did not hold the copyright.^[37]

Sun's vice-president Rich Green said that Sun's ideal role with regard to Java was as an "evangelist".^[38] Following Oracle Corporation's acquisition of Sun Microsystems in 2009–10, Oracle has described itself as the "steward of Java technology with a relentless commitment to fostering a community of participation and transparency".^[39] This did not prevent Oracle from filing a lawsuit against Google shortly after that for using Java inside the Android SDK (see Google section below). Java software runs on everything from laptops to data centers, game consoles to scientific supercomputers.^[40] On April 2, 2010, James Gosling resigned from Oracle.^[41]

In January 2016, Oracle announced that Java runtime environments based on JDK 9 will discontinue the browser plugin.^[42]

Principles

There were five primary goals in the creation of the Java language:^[17]

1. It must be "simple, object-oriented, and familiar".
2. It must be "robust and secure".
3. It must be "architecture-neutral and portable".
4. It must execute with "high performance".
5. It must be "interpreted, threaded, and dynamic".

Versions

As of 20 March 2018, both Java 8 and 10 are officially supported. Major release versions of Java, along with their release dates:

- JDK 1.0 (January 23, 1996)^[43]
- JDK 1.1 (February 19, 1997)
- J2SE 1.2 (December 8, 1998)
- J2SE 1.3 (May 8, 2000)
- J2SE 1.4 (February 6, 2002)
- J2SE 5.0 (September 30, 2004)
- Java SE 6 (December 11, 2006)
- Java SE 7 (July 28, 2011)
- Java SE 8 (March 18, 2014)
- Java SE 9 (September 21, 2017)
- Java SE 10 (March 20, 2018)

Practices

Java platform



James Gosling, the creator of Java (2008)



The TIOBE programming language popularity index graph from 2002 to 2015. Over the course of a decade Java (blue) and C (black) competed for the top position.

One design goal of Java is portability, which means that programs written for the Java platform must run similarly on any combination of hardware and operating system with adequate runtime support. This is achieved by compiling the Java language code to an intermediate representation called Java bytecode, instead of directly to architecture-specific machine code. Java bytecode instructions are analogous to machine code, but they are intended to be executed by a virtual machine (VM) written specifically for the host hardware. End users commonly use a Java Runtime Environment (JRE) installed on their own machine for standalone Java applications, or in a web browser for Java applets.

Standard libraries provide a generic way to access host-specific features such as graphics, threading, and networking.

The use of universal bytecode makes porting simple. However, the overhead of interpreting bytecode into machine instructions made interpreted programs almost always run more slowly than native executables. Just-in-time (JIT) compilers that compile bytecodes to machine code during runtime were introduced from an early stage. Java itself is platform-independent and is adapted to the particular platform it is to run on by a Java virtual machine for it, which translates the Java bytecode into the platform's machine language.^[44]

Implementations

Oracle Corporation is the current owner of the official implementation of the Java SE platform, following their acquisition of Sun Microsystems on January 27, 2010. This implementation is based on the original implementation of Java by Sun. The Oracle implementation is available for Microsoft Windows (still works for XP, while only later versions are currently officially supported), macOS, Linux, and Solaris. Because Java lacks any formal standardization recognized by Ecma International, ISO/IEC, ANSI, or other third-party standards organization, the Oracle implementation is the de facto standard.

The Oracle implementation is packaged into two different distributions: The Java Runtime Environment (JRE) which contains the parts of the Java SE platform required to run Java programs and is intended for end users, and the Java Development Kit (JDK), which is intended for software developers and includes development tools such as the Java compiler, Javadoc, Jar, and a debugger.

OpenJDK is another notable Java SE implementation that is licensed under the GNU GPL. The implementation started when Sun began releasing the Java source code under the GPL. As of Java SE 7, OpenJDK is the official Java reference implementation.

The goal of Java is to make all implementations of Java compatible. Historically, Sun's trademark license for usage of the Java brand insists that all implementations be "compatible". This resulted in a legal dispute with Microsoft after Sun claimed that the Microsoft implementation did not support RMI or JNI and had added platform-specific features of their own. Sun sued in 1997, and, in 2001, won a settlement of US\$20 million, as well as a court order enforcing the terms of the license from Sun.^[45] As a result, Microsoft no longer ships Java with Windows.

Platform-independent Java is essential to Java EE, and an even more rigorous validation is required to certify an implementation. This environment enables portable server-side applications.

Performance

Programs written in Java have a reputation for being slower and requiring more memory than those written in C++.^{[46][47]} However, Java programs' execution speed improved significantly with the introduction of just-in-time compilation in 1997/1998 for Java 1.1,^[48] the addition of language features supporting better code analysis (such as inner classes, the StringBuilder class, optional assertions, etc.), and optimizations in the Java virtual machine, such as HotSpot becoming the default for Sun's JVM in 2000. With Java 1.5, the performance was improved with the addition of the java.util.concurrent package, including lock free implementations of the ConcurrentMaps and other multi-core collections, and it was improved further with Java 1.6.