Java version history

The Java language has undergone several changes since JDK 1.0 as well as numerous additions of classes and packages to the standard library. Since J2SE 1.4, the evolution of the Java language has been governed by the Java Community Process (JCP), which uses *Java Specification Requests* (JSRs) to propose and specify additions and changes to the Java platform. The language is specified by the *Java Language Specification* (JLS); changes to the JLS are managed under JSR 901 (http://www.jcp.org/en/jsr/detail?id=901).

In addition to the language changes, other changes have been made to the Java Class Library over the years, which has grown from a few hundred classes in JDK 1.0 to over three thousand in J2SE 5. Entire new APIs, such as Swing and Java2D, have been introduced, and many of the original JDK 1.0 classes and methods have been deprecated. Some programs allow conversion of Java programs from one version of the Java platform to an older one (for example Java 5.0 backported to 1.4) (see Java backporting tools).

Regarding Oracle Java SE Support Roadmap,[1] version 11 is the currently supported long-term support (LTS) version, together with Java 8 LTS, where Oracle Customers will receive Oracle Premier Support. Java 8 LTS last free software public update for commercial use was released by Oracle in January 2019, while Oracle continues to release no-cost public Java 8 updates for development[1] and personal use indefinitely.[2] Java 10 a previously supported rapid release version, had its support ended in September 2018 the same date support for Java 11 began. Java 7 is no longer publicly supported. For Java 11, long-term support will not be provided by Oracle for the public; instead, the broader OpenJDK community, as AdoptOpenJDK or others, is expected to perform the work.[3]

Java 16 General Availability began on March 16, 2021, a release candidate is available for Java 17,[4][5] and Java 18 is in development.

History

In September 2017, Mark Reinhold, chief Architect of the Java Platform, proposed to change the release train to "one feature release every six months" rather than the then-current two-year schedule.[12][13] This proposal took effect for all following versions, and is still the current release schedule.

JDK 1.0

The first version was released on January 23, 1996.[14][15] The first stable version, JDK 1.0.2, is called Java 1.[15]

JDK 1.1

Major additions in the release on February 19, 1997 included:[16]

- an extensive retooling of the AWT event model
- inner classes added to the language
- JavaBeans

Version	Release date	End of Free Public Updates[1][6][7][8]	Extended Support Until
JDK Beta	1995	?	?
JDK 1.0	January 1996	?	?
JDK 1.1	February 1997	?	?
J2SE 1.2	December 1998	?	?
J2SE 1.3	May 2000	?	?
J2SE 1.4	February 2002	October 2008	February 2013
J2SE 5.0	September 2004	November 2009	April 2015
Java SE 6	December 2006	April 2013	December 2018 December 2026, paid support for Azul Platform Core[9]
Java SE 7	July 2011	April 2015	July 2022
Java SE 8 (LTS)	March 2014	**January 2019 for Oracle (commercial)** December 2030 for Oracle (non-commercial) December 2030 for Azul At least May 2026 for AdoptOpenJDK At least May 2026 for Amazon Corretto	December 2030
Java SE 9	September 2017	March 2018 for OpenJDK	N/A
Java SE 10	March 2018	September 2018 for OpenJDK	N/A
Java SE 11 (LTS)	September 2018	September 2026 for Azul At least October 2024 for AdoptOpenJDK At least September 2027 for Amazon Corretto At least October 2024 for Microsoft[10][11]	September 2026 September 2028 for Azul[9]
Java SE 12	March 2019	September 2019 for OpenJDK	N/A
Java SE 13	September 2019	March 2020 for OpenJDK	N/A
Java SE 14	March 2020	September 2020 for OpenJDK	N/A
Java SE 15	September 2020	March 2021 for OpenJDK March 2023 for Azul[9]	N/A
Java SE 16	March 2021	September 2021 for OpenJDK	N/A

Java SE 17 (LTS)	September 2021	September 2029 for Azul At least September 2027 for Microsoft	September 2029 or later September 2031 for Azul Platform Prime
Java SE 18	March 2022	September 2022 for OpenJDK	N/A

Legend: 🟥 Old version 🟨 Older version, still maintained 🟩 **Latest version** 🟦 Future release

- JDBC
- RMI
- reflection which supported Introspection only, no modification at runtime was possible. (The ability to modify objects reflectively was added in J2SE 1.2, by introducing the AccessibleObject (https://docs.oracle.com/en/java/javase/11/docs/api/java.base/java/lang/reflect/AccessibleObject.html) class and its subclasses such as the Field (https://docs.oracle.com/en/java/javase/11/docs/api/java.base/java/lang/reflect/Field.html) class.)
- JIT (Just In Time) compiler on Microsoft Windows platforms, produced for JavaSoft by Symantec
- Internationalization and Unicode support originating from Taligent[17]

JDK 1.0

Released	January 23, 1996

JDK 1.1

Released	February 19, 1997

J2SE 1.2

Codename **Playground**

The release on December 8, 1998 and subsequent releases through J2SE 5.0 were rebranded retrospectively **Java 2** and the version name "J2SE" (Java 2 Platform, Standard Edition) replaced JDK to distinguish the base platform from J2EE (Java 2 Platform, Enterprise Edition) and J2ME (Java 2 Platform, Micro Edition). This was a very significant release of Java as it tripled the size of the Java platform to 1520 classes in 59 packages. Major additions included:[18]

J2SE 1.2

Codename	Playground
Released	December 8, 1998

- `strictfp` keyword
- the Swing graphical API was integrated into the core classes
- Sun's JVM was equipped with a JIT compiler for the first time
- Java plug-in
- Java IDL, an IDL implementation for CORBA interoperability
- Collections framework

J2SE 1.3

Codename **Kestrel**

The most notable changes in the May 8, 2000 release were:[19][20]

J2SE 1.3

Codename	Kestrel
Released	May 8, 2000

- HotSpot JVM included (the HotSpot JVM was first released in April 1999 for the J2SE 1.2 JVM)
- RMI was modified to support optional compatibility with CORBA

- Java Naming and Directory Interface (JNDI) included in core libraries (previously available as an extension)
- Java Platform Debugger Architecture (JPDA)
- JavaSound
- Synthetic proxy classes

J2SE 1.4

Codename **Merlin**

The February 6, 2002 release was the first release of the Java platform developed under the Java Community Process as JSR 59 (http://www.jcp.org/en/jsr/detail?id=59). Major changes included:[21][22]

J2SE 1.4	
Codename	Merlin
Released	February 6, 2002
End of public support	October 2008
End of paid support	February 2013

- Language changes

  - `assert` keyword (specified in JSR 41 (https://web.archive.org/web/20080616233205/http://www.jcp.org/en/jsr/detail?id=41))
- Library improvements

  - Regular expressions modeled after Perl regular expressions
  - Exception chaining allows an exception to encapsulate original lower-level exception
  - Internet Protocol version 6 (IPv6) support
  - Non-blocking I/O (Java) (named NIO) (specified in JSR 51 (http://www.jcp.org/en/jsr/detail?id=51))
  - Logging API (specified in JSR 47 (http://www.jcp.org/en/jsr/detail?id=47))
  - Image I/O API for reading and writing images in formats like JPEG and PNG
  - Integrated XML parser and XSLT processor (JAXP) (specified in JSR 5 (http://www.jcp.org/en/jsr/detail?id=5) and JSR 63 (http://www.jcp.org/en/jsr/detail?id=63))
  - Integrated security and cryptography extensions (JCE, JSSE, JAAS)
  - Java Web Start included (Java Web Start was first released in March 2001 for J2SE 1.3) (specified in JSR 56 (http://www.jcp.org/en/jsr/detail?id=56))
  - Preferences API (`java.util.prefs`)

Public support and security updates for Java 1.4 ended in October 2008. Paid security updates for Oracle customers ended in February 2013.[23]

J2SE 5.0

Codename **Tiger**

The release on September 30, 2004 was originally numbered 1.5, which is still used as the internal version number. The number was changed to "better reflect the level of maturity,

J2SE 5.0	
Codename	Tiger
Released	September 30, 2004
End of public	November 2009

stability, scalability and security of the J2SE".[24] This version was developed under JSR 176 (http://www.jcp.org/en/jsr/det ail?id=176).

support	
End of paid support	April 2015

J2SE 5.0 entered its end-of-public-updates period on April 8, 2008; updates are no longer available to the public as of November 3, 2009. Updates were available to paid Oracle customers until May 2015.[1]

Tiger added a number of significant new language features:[25][26]

- Generics: provides compile-time (static) type safety for collections and eliminates the need for most typecasts (type conversion) (specified by JSR 14 (http://www.jcp.org/en/j sr/detail?id=14))
- Metadata: also called annotations; allows language constructs such as classes and methods to be tagged with additional data, which can then be processed by metadata-aware utilities (specified by JSR 175 (http://www.jcp.org/en/jsr/detail?id=175))
- Autoboxing/unboxing: automatic conversions between primitive types (such as `int`) and primitive wrapper classes (such as `Integer` (https://docs.oracle.com/javase/10/doc s/api/java/lang/Integer.html)) (specified by JSR 201 (http://www.jcp.org/en/jsr/detail?i d=201))
- Enumerations: the `enum` keyword creates a typesafe, ordered list of values (such as `Day.MONDAY`, `Day.TUESDAY`, etc.); previously this could only be achieved by non-typesafe constant integers or manually constructed classes (typesafe enum pattern) (specified by JSR 201 (http://www.jcp.org/en/jsr/detail?id=201))
- Varargs: the last parameter of a method can now be declared using a type name followed by three dots (e.g. `void drawtext(String... lines)`); in the calling code any number of parameters of that type can be used and they are then placed in an array to be passed to the method, or alternatively the calling code can pass an array of that type
- Enhanced `for each` loop: the `for` loop syntax is extended with special syntax for iterating over each member of either an array or any `Iterable` (https://docs.oracle.co m/javase/10/docs/api/java/lang/Iterable.html), such as the standard `Collection` (http s://docs.oracle.com/javase/10/docs/api/java/util/Collection.html) classes (specified by JSR 201 (http://www.jcp.org/en/jsr/detail?id=201))
- Improved semantics of execution for multi-threaded Java programs; the new Java memory model addresses issues of complexity, effectiveness, and performance of previous specifications[27]
- Static imports

There were also the following improvements to the standard libraries:

- Automatic stub generation for RMI objects
- Swing: New skinnable look and feel, called synth
- The concurrency utilities (https://java.sun.com/j2se/1.5.0/docs/guide/concurrency/over view.html) in package `java.util.concurrent` (https://java.sun.com/j2se/1.5.0/docs/api/ja va/util/concurrent/package-summary.html)[28]
- Scanner class for parsing data from various input streams and buffers

Java 5 is the last release of Java to officially support Microsoft Windows 98 and Windows ME,[29] while Windows Vista was the newest version of Windows that J2SE 5 was supported on prior to Java 5 going end-of-life in October of 2009.[23]

Java 5 Update 5 (1.5.0_05) is the last release of Java to work on Windows 95 (with Internet Explorer 5.5 installed) and Windows NT 4.0.[30]

Java 5 was first available on Apple Mac OS X 10.4 (Tiger)[31] and was the default version of Java installed on Apple Mac OS X 10.5 (Leopard).

Public support and security updates for Java 1.5 ended in November 2009. Paid security updates for Oracle customers ended in April 2015.

Versioning change

This version introduced a new versioning system for the Java language, although the old versioning system continued to be used for developer libraries:

> Both version numbers "1.5.0" and "5.0" are used to identify this release of the Java 2 Platform Standard Edition. Version "5.0" is the product version, while "1.5.0" is the developer version. The number "5.0" is used to better reflect the level of maturity, stability, scalability and security of the J2SE.
>
> — Version 1.5.0 or 5.0? (http://docs.oracle.com/javase/1.5.0/docs/relnotes/version-5.0.html)[32]

This correspondence continued through later releases (Java 6 = JDK 1.6, Java 7 = JDK 1.7, and so on).

Java 5 updates

Table of Java 5 updates

Release	Release date	Highlights
Java SE 5	2004-10-04	Metadata, generic types, autoboxing and auto-unboxing of primitive types, enhanced `for` loop, enumerated types, static import, formatted I/O, varargs, and concurrency utilities. Improved startup time and memory footprint. Sharing of read-only data between multiple running JVMs. Remote monitoring and management. A new JVM profiling API. Programmatic generation of stack traces. Support for XML 1.1 with Namespaces, XML Schema, SAX 2.0.2, DOM Level 3, and XSLT with a fast XSLTC compiler. Unicode 4.0 support.
Java SE 5 Update 1	2004-12-25	50 bugs have been fixed.
Java SE 5 Update 2	2005-03-16	A few crashes were fixed. The program is now compiled with better optimization. Calendar bugfixes and other bugfixes were made.
Java SE 5 Update 3	2005-05-03	This release fixes several bugs, including crashes of the Linux Mozilla plugin.
Java SE 5 Update 4	2005-07-04	With the release, J2SE support for Windows 64-bit has progressed from release candidate to final release. This version runs on AMD64/EM64T 64-bit mode machines with Windows Server 2003 x64 Editions.
Java SE 5 Update 5	2005-09-18	Several bugs were fixed and performance enhancements were made. Last release for Windows 95 and Windows NT 4.0.
Java SE 5 Update 6	2005-12-07	Prior to this update, an applet or application could specify the version of the JRE on which it would run. This has changed. All applets are executed with the latest JRE version.
Java SE 5 Update 7	2006-05-29	Several bugs were fixed and performance enhancements were made.
Java SE 5 Update 8	2006-08-13	Several bugs were fixed and performance enhancements were made.
Java SE 5 Update 9	2006-11-12	This release fixes several minor regressions.
Java SE 5 Update 10	2006-12-22	An implementation of the epoll I/O event notification facility, supported by Linux 2.6, was added. Many bugs were fixed.
Java SE 5 Update 11	2007-03-08	Several bugs were fixed and performance enhancements were made.
Java SE 5 Update 12	2007-06-11	
Java SE 5 Update 13	2007-10-05	Multiple security vulnerabilities in Java Web Start relating to local file access were fixed. A security vulnerability in the JRE allowing network access restrictions to be circumvented was fixed. Several other security issues and minor bugs were fixed.
Java SE 5 Update 14		
Java SE 5 Update 15	2008-03-06	Several crashes due to heap buffer out-of-bounds were fixed, along with several other bugs. New root certificates from AOL, DigiCert, and TrustCenter are now included.

Java SE 5 Update 16	2008-07-23	This release fixes several security flaws, such as DoS vulnerabilities, buffer overflows, and other bugs which could lead to crashes or which would give applets access to certain system resources. These vulnerabilities were located in Java Web Start, in the Java Management Extensions (JMX) Management Agent, and in the functions for handling XML data.
Java SE 5 Update 17	2008-12-03	The UTF-8 charset implementation was updated to handle the non-shortest form of UTF-8 byte sequences, introducing an incompatibility from previous releases. New root certificates were added. Many bugs were fixed.
Java SE 5 Update 18	2009-03-25	Several security issues were resolved. The behavior of the JNDI feature to store and retrieve Java objects in an LDAP directory was slightly modified. Five new root certificates were added. Many bugs were fixed.
Java SE 5 Update 19	2009-05-29	Support was added for several system configurations. Service Tag support was added. Many bugs were fixed, including several crashes and memory leaks.
Java SE 5 Update 20	2009-08-06	Several security vulnerabilities were resolved, such as potential system access by untrusted applets, and integer overflows in image processing and in Unpack200. Several new root certificates were added. Many other minor bugs were fixed.
Java SE 5 Update 21	2009-09-09	Many minor bugs were fixed.
Java SE 5 Update 22	2009-11-04	This release marks the End of Service Life (EOSL) for Java 5, and is its final public version. Several security vulnerabilities, reported as Sun Alerts 269868, 270474, 270475, and 270476, were fixed. Several other bugs were fixed. Furthermore, two new root certificates were added.
Java SE 5 Update 23	2010-01-13	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 32 security fixes.
Java SE 5 Update 24	2010-04-15	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 2 security fixes.
Java SE 5 Update 25	2010-07-07	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 26 security fixes.
Java SE 5 Update 26	2010-10-12	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 2 security fixes.
Java SE 5 Update 27	2010-12-08	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 22 security fixes.
Java SE 5 Update 28	2011-02-15	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 22 security fixes[33]
Java SE 5 Update 29	2011-03-21	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 21 security fixes.
Java SE 5 Update 30	2011-06-07	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended

		Patchset Cluster; 1 security fix.
Java SE 5 Update 31	2011-08-16	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 10 security fixes.
Java SE 5 Update 32	2011-10-18	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 20 security fixes[34]
Java SE 5 Update 33	2011-12-12	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 21 security fixes.
Java SE 5 Update 34	2012-02-14	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 14 security fixes[35]
Java SE 5 Update 35	2012-04-26	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 5 security fixes.
Java SE 5 Update 36	2012-06-12	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 14 security fixes[36]
Java SE 5 Update 38	2012-08-14	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 30 security fixes[37]
Java SE 5 Update 39	2013-02-19	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 50 security fixes[38]
Java SE 5 Update 40	2013-02-19	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 5 security fixes[39]
Java SE 5 Update 41	2013-03-04	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 2 security fixes[40]
Java SE 5 Update 45	2013-04-16	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 42 security fixes[41]
Java SE 5 Update 51	2013-06-18	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 40 security fixes[42]
Java SE 5 Update 55	2013-10-15	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 51 security fixes[43]
Java SE 5 Update 61	2014-01-14	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 36 security fixes[44]
Java SE 5 Update 65	2014-04-15	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 37 security fixes[45]
Java SE 5 Update 71	2014-07-15	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 20 security fixes[46]

Java SE 5 Update 75	2014-10-16	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 25 security fixes[47]
Java SE 5 Update 81	2015-01-21	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 19 security fixes[48]
Java SE 5 Update 85	2015-04-14	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 14 security fixes[49]

Java SE 6

Codename **Mustang**

As of the version released on December 11, 2006, Sun replaced the name "J2SE" with **Java SE** and dropped the ".0" from the version number.[50] Internal numbering for developers remains 1.6.0.[51]

This version was developed under JSR 270 (http://www.jcp.or g/en/jsr/detail?id=270).

Java SE 6	
Codename	Mustang
Released	November 11, 2006
End of public support	February 2013

During the development phase, new builds including enhancements and bug fixes were released approximately weekly. Beta versions were released in February and June 2006, leading up to a final release that occurred on December 11, 2006.

Major changes included in this version:[52][53]

- Support for older Win9x versions dropped; unofficially, Java 6 Update 7 was the last release of Java shown to work on these versions of Windows. This is believed to be due to the major changes in Update 10.
- Scripting Language Support (JSR 223): Generic API for tight integration with scripting languages, and built-in Mozilla JavaScript Rhino integration.
- Dramatic performance improvements for the core platform,[54][55] and Swing.
- Improved Web Service support through JAX-WS (JSR 224).
- JDBC 4.0 support (JSR 221).
- Java Compiler API (JSR 199): an API allowing a Java program to select and invoke a Java Compiler programmatically.
- Upgrade of JAXB to version 2.0: Including integration of a StAX parser.
- Support for pluggable annotations (JSR 269).[56]
- Many GUI improvements, such as integration of SwingWorker in the API, table sorting and filtering, and true Swing double-buffering (eliminating the gray-area effect).
- JVM improvements include: synchronization and compiler performance optimizations, new algorithms and upgrades to existing garbage collection algorithms, and application start-up performance.

Java 6 can be installed to Mac OS X 10.5 (Leopard) running on 64-bit (Core **2** Duo and higher) processor machines.[57] Java 6 is also supported by both 32-bit and 64-bit machines running Mac OS X 10.6 (Snow Leopard).

Java 6 reached the end of its supported life in February 2013, at which time all public updates, including security updates, were scheduled to be stopped.[58][59] Oracle released two more updates to Java 6 in March and April 2013, which patched some security vulnerabilities.[60][61]

Java 6 updates

After Java 6 release, Sun, and later Oracle, released several updates which, while not changing any public API, enhanced end-user usability or fixed bugs.[62]

Release	Release date	Highlights
Java SE 6	2006-12-23	This release adds many enhancements in the fields of Web services, scripting, databases, pluggable annotations, and security, as well as quality, compatibility, and stability. JConsole is now officially supported. Java DB support has been added.
Java SE 6 Update 1	2007-05-07	
Java SE 6 Update 2	2007-07-03	
Java SE 6 Update 3	2007-10-03	
Java SE 6 Update 4	2008-01-14	HotSpot VM 10
Java SE 6 Update 5	2008-03-05	Several security flaws were eliminated. New root certificates from AOL, DigiCert, and TrustCenter are now included.
Java SE 6 Update 6	2008-04-16	A workaround for the infamous Xlib/XCB locking assertion issue was introduced. A memory leak when using Kerberos authentication with LoginContext was fixed. Several other bugs were fixed.
Java SE 6 Update 7[63]		Unofficially, Java SE 6 Update 7 (1.6.0.7) is the last version of Java that was shown to be working on the Win9x family of operating systems
Java SE 6 Update 10[64]	2008-10-15	HotSpot VM 11. Major changes for this update include: ■ Java Deployment Toolkit, a set of JavaScript functions to ease the deployment of applets and Java Web Start applications.[64] ■ Java Kernel, a small installer including only the most commonly used JRE classes. Other packages are downloaded when needed. ■ Enhanced updater. ■ Enhanced versioning and pack200 support: server-side support is no longer required.[64] ■ Java Quick Starter, to improve cold start-up time. ■ Improved performance of Java2D graphics primitives on Windows, using Direct3D and hardware acceleration. ■ A new Swing look and feel called Nimbus and based on synth.[65] ■ Next-Generation Java Plug-In: applets now run in a separate process and support many features of Web Start applications.[64]
Java SE 6 Update 11[66]	2008-12-03	13 security fixes[67]
Java SE 6 Update 12[68]	2008-12-12	No security fixes; 64-bit Java plug-in (for 64-bit web browsers only); Windows Server 2008 support; performance improvements of graphics and JavaFX applications
Java SE 6 Update 13[69]	2009-03-24	7 security fixes, JNDI store and retrieve Java objects in LDAP slightly modified, JMX Change (createMBeanunregisterMBean), 4 new root certificates added
Java SE 6 Update 14[70]	2009-05-28	HotSpot VM 14. This release includes extensive performance updates to the JIT compiler, compressed

pointers for 64-bit machines, as well as support for the G1 (Garbage First) low-pause garbage collector.[71][72]

The `-XX:+DoEscapeAnalysis` option directs the HotSpot JIT compiler to use escape analysis to determine whether local objects can be allocated on the stack instead of the heap.[73]

Some developers have noticed an issue introduced in this release which causes debuggers to miss breakpoints seemingly randomly.[74] Sun has a corresponding bug, which is tracking the issue. The workaround applies to the Client and Server VMs.[75] Using the `-XX:+UseParallelGC` option will prevent the failure. Another workaround is to roll back to update 13, or to upgrade to update 16.

Java SE 6 Update 15	2009-08-04	Introduced patch-in-place functionality[76]
Java SE 6 Update 16	2009-08-11	Fixed the issue introduced in update 14 which caused debuggers to miss breakpoints[77]
Java SE 6 Update 17[78]	2009-11-04	Security fixes; two new root certificates
Java SE 6 Update 18[79]	2010-01-13	No security fixes; Hotspot VM 16; support for Ubuntu 8.04 LTS Desktop Edition, SLES 11, Windows 7, Red Hat Enterprise Linux 5.3, Firefox 3.6, VisualVM 1.2; updated Java DB; many performance improvements
Java SE 6 Update 19[80]	2010-03-30	Security fixes; root certificate changes: seven new, three removed, five replaced with stronger signature algorithms; interim fix for TLS renegotiation attack
Java SE 6 Update 20[81]	2010-04-15	2 security fixes
Java SE 6 Update 21[82]	2010-07-07	No security fixes; Hotspot VM 17; support for Red Hat Enterprise Linux 5.4 and 5.5, Oracle Enterprise Linux 4.8, 5.4, 5.5; Google Chrome 4 support; support for Customized Loading Progress Indicators; VisualVM 1.2.2
Java SE 6 Update 22[83]	2010-10-12	29 security fixes; RFC 5746 (https://datatracker.ietf.org/doc/html/rfc5746) support
Java SE 6 Update 23[84]	2010-12-08	No security fixes; Hotspot VM 19; better support for right-to-left languages
Java SE 6 Update 24[85]	2011-02-15	21 security fixes; updated Java DB
Java SE 6 Update 25	2011-03-21	No security fixes; Hotspot VM 20; support for Internet Explorer 9, Firefox 4 and Chrome 10; improved BigDecimal; includes "tiered" compilation in the Server VM that enables it to start quickly as does the Client VM, while achieving better peak performance (this feature is enabled by specifying `-server` and `-XX:+TieredCompilation` command options)[86]
Java SE 6 Update 26[87]	2011-06-07	17 new security fixes;[88] last version compatible with Windows Vista SP1
Java SE 6 Update 27[89]	2011-08-16	No security fixes; certification for Firefox 5

Java SE 6 Update 29[90]	2011-10-18	20 security fixes, various bug fixes[91]
Java SE 6 Update 30[92]	2011-12-12	No security fixes; fix for SSL regression in Update 29; support for Red Hat Enterprise Linux 6
Java SE 6 Update 31[93]	2012-02-14	14 security fixes and one bug fix; last version work reliably for Windows 2000[94]
Java SE 6 Update 32[95]	2012-04-26	No security fixes, various bug fixes
Java SE 6 Update 33[96]	2012-06-12	14 security fixes, improved VM configuration file loading
Java SE 6 Update 34[97]	2012-08-14	No security fixes, various bug fixes
Java SE 6 Update 35[98]	2012-08-30	Contains a security-in-depth fix[99]
Java SE 6 Update 37[100]	2012-10-16	30 security fixes
Java SE 6 Update 38[101]	2012-12-11	Various bug fixes[102]
Java SE 6 Update 39[103]	2013-02-01	50 security fixes
Java SE 6 Update 41[104]	2013-02-19	5 security fixes
Java SE 6 Update 43[105]	2013-03-04	2 security fixes
Java SE 6 Update 45[106]	2013-04-16	42 security fixes;[107] other changes;[106] final public update.[108]
Java SE 6 Update 51[109]	2013-06-18	Not available publicly, only available through the Java SE Support program and in Apple Update for OS X Snow Leopard, Lion & Mountain Lion; up to 40 security fixes[110]
Java SE 6 Update 65[111]	2013-10-15	Not available publicly, only available through the Java SE Support program and in Apple Update for OS X Snow Leopard, Lion & Mountain Lion; at least 11 critical security fixes[112]
Java SE 6 Update 71[113]	2014-01-14	Not available for public download; 33 fixes[114]
Java SE 6 Update 75[115]	2014-04-15	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster no. #54; 25 security fixes[116]
Java SE 6 Update 81[117]	2014-07-15	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 11 security fixes[118]
Java SE 6 Update 85[119]	2014-10-16	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 18 security fixes[120]
Java SE 6 Update 91[121]	2015-01-21	Linux x64 and Windows i586 versions are available as the Java SE 6 Reference Implementation.[122] Other versions are only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 15 security fixes[123]
Java SE 6 Update 95	2015-04-14	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 14 security fixes[124]
Java SE 6 Update 101	2015-07-15	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 18 security fixes[125] Certification for IE 10 and 11 was introduced in 1.6.0_101

Java SE 6 Update 105	2015-10-20	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 17 security fixes[126]
Java SE 6 Update 111	2016-01-20	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 13 security fixes[127]
Java SE 6 Update 113	2016-02-05	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 1 security fix[128]
Java SE 6 Update 115	2016-04-21	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 8 security fixes[129]
Java SE 6 Update 121	2016-07-19	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 15 security fixes[130]
Java SE 6 Update 131	2016-10-18	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 13 security fixes[131]
Java SE 6 Update 141	2017-01-17	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 17 security fixes[132]
Java SE 6 Update 151	2017-04-18	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 10 security fixes[133]
Java SE 6 Update 161	2017-07-18	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 5 security fixes[134]
Java SE 6 Update 171	2017-10-20	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 7 security fixes[135]
Java SE 6 Update 181	2018-01-16	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 12 security fixes[136]
Java SE 6 Update 191	2018-04-17	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 7 security fixes[137]
Java SE 6 Update 201	2018-07-17	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 3 security fixes[138]
Java SE 6 Update 211	2018-10-18	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 8 security fixes[139]

Java SE 7

Java 7 (codename **Dolphin**[140]) is a major update that was launched on July 7, 2011[141] and was made available for developers on July 28, 2011.[142] The development period was

Java SE 7

Codename	Dolphin

organized into thirteen milestones; on June 6, 2011, the last of the thirteen milestones was finished.[142][143] On average, 8 builds (which generally included enhancements and bug fixes) were released per milestone. The feature list at the OpenJDK 7 project (https://openjdk.java.net/projects/jdk7/features/) lists many of the changes.

Released	July 28, 2011
End of public support	April 2015
End of paid support	June 2022

Additions in Java 7 include:[144]

- JVM support for dynamic languages, with the new `invokedynamic` bytecode under JSR-292,[145] following the prototyping work currently done on the Multi Language Virtual Machine
- Compressed 64-bit pointers[146] (available in Java 6 with `-XX:+UseCompressedOops`)[147]
- These small language changes (grouped under a project named Coin):[148]

    - Strings in switch[149]
    - Automatic resource management in try-statement[150]
    - Improved type inference for generic instance creation, aka the diamond operator `<>`[151]
    - Simplified varargs method declaration[152]
    - Binary integer literals[153]
    - Allowing underscores in numeric literals[154]
    - Catching multiple exception types and rethrowing exceptions with improved type checking[155]

- Concurrency utilities under JSR 166[156]
- New file I/O library (defined by JSR 203) adding support for multiple file systems, file metadata and symbolic links. The new packages are `java.nio.file`, `java.nio.file.attribute` and `java.nio.file.spi`[157][158]
- Timsort is used to sort collections and arrays of objects instead of merge sort
- Library-level support for elliptic curve cryptography algorithms
- An XRender pipeline for Java 2D, which improves handling of features specific to modern GPUs
- New platform APIs for the graphics features originally implemented in version 6u10 as unsupported APIs[159]
- Enhanced library-level support for new network protocols, including SCTP and Sockets Direct Protocol
- Upstream updates to XML and Unicode
- Java deployment rule sets[160]

Lambda (Java's implementation of lambda functions), Jigsaw (Java's implementation of modules), and part of Coin were dropped from Java 7, and released as part of Java 8 (except for Jigsaw, which was released in Java 9).[161][162]

Java 7 was the default version to download on java.com from April 2012 until Java 8 was released.[163]

Java 7 updates

Oracle issued public updates to the Java 7 family on a quarterly basis[164] until April 2015 when the product reached the end of its public availability.[165] Further updates for JDK 7, which are scheduled to continue until Jul 2022, are only made available to customers with a support contract.[166]

Table of Java 7 updates

Release	Release date	Highlights
Java SE 7[167]	2011-07-28	Initial release; HotSpot VM 21
Java SE 7 Update 1[168]	2011-10-18	20 security fixes, other bug fixes
Java SE 7 Update 2[169]	2011-12-12	No security fixes; HotSpot VM 22; reliability and performance improvements; support for Solaris 11 and Firefox 5 and later; JavaFX included with Java SE JDK, improvements for web-deployed applications
Java SE 7 Update 3[170]	2012-02-14	14 security fixes[171]
Java SE 7 Update 4[172]	2012-04-26	No security updates; HotSpot VM 23; JDK Support for Mac OS X
Java SE 7 Update 5[173]	2012-06-12	14 security fixes[174]
Java SE 7 Update 6[175]	2012-08-14	JavaFX and Java Access Bridge included in Java SE JDK and JRE installation, JavaFX support for touch-enabled monitors and touch pads, JavaFX support for Linux, JDK and JRE Support for Mac OS X, JDK for Linux on ARM[176]
Java SE 7 Update 7[177]	2012-08-30	4 security fixes[99]
Java SE 7 Update 9[178]	2012-10-16	30 security vulnerabilities fixes[179]
Java SE 7 Update 10[180]	2012-12-11	New security features, such as the ability to disable any Java application from running in the browser and new dialogs to warn you when the JRE is insecure, and bug fixes
Java SE 7 Update 11[181]	2013-01-13	Olson Data 2012i; bugfix for problems with registration of plugin on systems with Stand-alone version of JavaFX Installed, security fixes for CVE-2013-0422 (https://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2013-0422);[182] the default security level for Java applets and web start applications has been increased from "Medium" to "High"
Java SE 7 Update 13[183]	2013-02-01	50 security fixes
Java SE 7 Update 15[184]	2013-02-19	5 security fixes
Java SE 7 Update 17[185]	2013-03-04	2 security fixes
Java SE 7 Update 21[186]	2013-04-16	Multiple changes including 42 security fixes, a new Server JRE that doesn't include the plug-in, and the JDK for Linux on ARM
Java SE 7 Update 25[187]	2013-06-18	Multiple changes including 40 security fixes[110][188]
Java SE 7 Update 40[189]	2013-09-10	621 bug fixes,[190] New security features, hardfloat ARM, Java Mission Control 5.2 and Retina Display support[191]
Java SE 7 Update 45[192]	2013-10-15	51 security fixes;[112] protections against unauthorized redistribution of Java applications; restore security prompts; JAXP changes; TimeZone.setDefault change
Java SE 7 Update 51[193]	2014-01-14	36 security fixes; block JAVA applets without manifest (like Remote console – Java Applet – IBM IMM card, HP iLO card) even if warning dialog is with sentence "will be blocked in next version",[194][195] 17 bug fixes
Java SE 7 Update 55[196]	2014-04-15	37 security fixes,[116] 19 bug fixes[197]

Java SE 7 Update 60[198]	2014-05-28	Java Mission Control 5.3,[199] 130 bug fixes[200]
Java SE 7 Update 65[201]	2014-07-15	18 bug fixes[202]
Java SE 7 Update 67[203]	2014-08-04	1 bug fix[203]
Java SE 7 Update 71[204]	2014-10-14	16 bug fixes[205]
Java SE 7 Update 72[206]	2014-10-14	Same release date with Update 71 as a corresponding Patch Set Update (PSU) for Java SE 7,[207] 36 bug fixes[208]
Java SE 7 Update 75[209]	2015-01-20	12 bug fixes,[210] SSLv3 disabled by default
Java SE 7 Update 76[211]	2015-01-20	Same release date with Update 75 as a corresponding Patch Set Update (PSU) for Java SE 7,[207] 97 bug fixes[212]
Java SE 7 Update 79[213]	2015-04-14	21 security fixes, 6 bug fixes,[214]
Java SE 7 Update 80[215]	2015-04-14	Last public release of Java 7; same release date with Update 79 as a corresponding Patch Set Update (PSU) for Java SE 7, 104 bug fixes[216]
Java SE 7 Update 85	2015-07-15	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 25 security fixes[217]
Java SE 7 Update 91	2015-10-20	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 20 security fixes[218]
Java SE 7 Update 95	2016-01-19	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 8 security fixes[219]
Java SE 7 Update 97	2016-02-05	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 1 security fix[128]
Java SE 7 Update 99	2016-03-23	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 1 security fix[220]
Java SE 7 Update 101	2016-04-18	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 22 security fixes[221]
Java SE 7 Update 111	2016-07-19	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 36 security fixes[130]
Java SE 7 Update 121	2016-10-18	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 32 security fixes[131]
Java SE 7 Update 131	2017-01-17	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 34 security fixes[132]
Java SE 7 Update 141	2017-04-18	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 8 security fixes[222]
Java SE 7 Update 151	2017-07-18	Not available publicly, only available through the Java SE

		Support program and in Solaris 10's Recommended Patchset Cluster; 4 security fixes[134]
Java SE 7 Update 161	2017-10-20	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 4 security fixes[135]
Java SE 7 Update 171	2018-01-16	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 51 security fixes[136]
Java SE 7 Update 181	2018-04-17	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 12 security fixes[137]
Java SE 7 Update 191	2018-07-17	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 9 security fixes[138]
Java SE 7 Update 201	2018-10-18	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 13 security fixes[139]
Java SE 7 Update 211	2019-01-15	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 5 security fixes[223]
Java SE 7 Update 221	2019-04-16	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 5 security fixes[224]
Java SE 7 Update 231	2019-07-16	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 6 security fixes[225]
Java SE 7 Update 241	2019-10-15	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 15 security fixes[226]
Java SE 7 Update 251	2020-01-14	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 12 security fixes[227]
Java SE 7 Update 261	2020-04-14	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 15 security fixes[228]
Java SE 7 Update 271	2020-07-14	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 11 security fixes[229]
Java SE 7 Update 281	2020-10-20	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 8 security fixes[230]
Java SE 7 Update 291	2021-01-19	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 1 security fixes[231]
Java SE 7 Update 301	2021-04-12	Not available publicly, only available through the Java SE Support program and in Solaris 10's Recommended Patchset Cluster; 11 security fixes[232]

Java SE 8

Java 8 was released on March 18, 2014,[233][234] and included some features that were planned for Java 7 but later deferred.[235]

Work on features was organized in terms of JDK Enhancement Proposals (JEPs).[236]

Java SE 8	
LTS version	
Released	March 18, 2014
No. of JEPs	8

- JSR 335, JEP 126: Language-level support for lambda expressions (officially, lambda expressions; unofficially, closures) under Project Lambda[237] and default methods (virtual extension methods)[238][239][240] which allow the addition of methods to interfaces without breaking existing implementations. There was an ongoing debate in the Java community on whether to add support for lambda expressions.[241][242] Sun later declared that lambda expressions would be included in Java and asked for community input to refine the feature.[243] Supporting lambda expressions also enables functional-style operations on streams of elements, such as MapReduce-inspired transformations on collections. Default methods allow an author of an API to add new methods to an interface without breaking the old code using it. Although it was not their primary intent,[238] default methods also allow multiple inheritance of behavior (but not state).

- JSR 223, JEP 174: Project Nashorn, a JavaScript runtime which allows developers to embed JavaScript code within applications
- JSR 308, JEP 104: Annotation on Java types[244]
- Unsigned integer arithmetic[245]
- JSR 337, JEP 120: Repeating annotations[246]
- JSR 310, JEP 150: Date and time API[247]
- JEP 178: Statically-linked JNI libraries[248]
- JEP 153: Launch JavaFX applications (direct launching of JavaFX application JARs)[249]
- JEP 122: Remove the permanent generation[250]

Java 8 is not supported on Windows XP[251] but as of JDK 8 update 25, it can still be installed and run under Windows XP.[252] Previous updates of JDK 8 could be run under XP by downloading archived zip format file and unzipping it for the executable.The last version of Java 8 could run on XP is update 251.But the its components compatibility starts to break on unsupported OS in early build during Java 8 updates development.

From October 2014, Java 8 was the default version to download (and then again the download replacing Java 9) from the official website.[253] "Oracle will continue to provide Public Updates and auto updates of Java SE 8, Indefinitely for Personal Users".[2]

Java 8 updates

Table of Java 8 updates

Release	Release date	Highlights
Java SE 8	2014-03-18	Initial release
Java SE 8 Update 5[254]	2014-04-15	Using "*" in `Caller-Allowable-Codebase` attribute; 11 bug fixes
Java SE 8 Update 11[255]	2014-07-15	Java Dependency Analysis Tool (jdeps); Java Control Panel option to disable sponsors; JAR file attribute – Entry-Point; JAXP processing limit property – maxElementDepth; 18 security bug fixes,[256] 15 bug fixes
Java SE 8 Update 20[257]	2014-08-19	669 bug fixes,[258] JMC 5.4, String deduplication (disabled by default)
Java SE 8 Update 25[259]	2014-10-14	10 bug fixes
Java SE 8 Update 31[260]	2015-01-19	26 bug fixes; SSLv3 (disabled by default)
Java SE 8 Update 40[261]	2015-03-03	645 bug fixes,[262] Added the notion of "memory pressure" to help indicate how much of system's memory is still available (low pressure = high memory, high pressure = low memory)
Java SE 8 Update 45[263]	2015-04-14	13 bug fixes
Java SE 8 Update 51[264]	2015-07-14	Added support for native sandbox on Windows platforms (disabled by default); also, 25 security fixes, 14 bug fixes
Java SE 8 Update 60[265]	2015-08-18	480 bug fixes[266]
Java SE 8 Update 65[267]	2015-10-20	25 security fixes, 3 bug fixes
Java SE 8 Update 66[268]	2015-11-16	15 bug fixes
Java SE 8 Update 71[269]	2016-01-19	8 security fixes, 5 bug fixes[270]
Java SE 8 Update 72	2016-01-19	8 security fixes, 5 bug fixes, several enhancements
Java SE 8 Update 73[271]	2016-02-03	1 security fix
Java SE 8 Update 74[272]	2016-02-03	1 security fix
Java SE 8 Update 77[273]	2016-03-23	1 security fix
Java SE 8 Update 91[274]	2016-04-19	9 security fixes, 4 bug fixes and enhancements
Java SE 8 Update 92[275]	2016-04-19	Security and bug fixes from 8u91, plus 76 additional bug fixes; the `ExitOnOutOfMemoryError` and `CrashOnOutOfMemoryError` flags have been introduced
Java SE 8 Update 101[276]	2016-07-19	Security and bug fixes from 8u92, plus 9 additional bug fixes
Java SE 8 Update 102[277]	2016-07-19	Security and bug fixes from 8u101, plus 118 additional bug fixes
Java SE 8 Update 111[278]	2016-10-18	7 Security fixes and 9 bug fixes
Java SE 8 Update 112[279]	2016-10-18	Additional features and 139 bug fixes over 8u111
Java SE 8 Update 121[280]	2017-01-17	3 additional features, 5 changes, and 11 bug fixes over 8u112.
Java SE 8 Update 131[281]	2017-04-18	4 changes and 42 bug fixes (2 notable).

Java SE 8 Update 141[282]	2017-07-18	Additional feature, 3 changes and 12 bug fixes.
Java SE 8 Update 144[283]	2017-07-26	32 Security fixes and bug fixes from 8u141.
Java SE 8 Update 151[284]	2017-10-17	22 Security fixes, 2 notes, 1 certificate revocation, 1 new feature, 6 changes and 24 bug fixes from 8u144.
Java SE 8 Update 152[285]	2017-10-17	Security fixes, 1 new feature, 1 change and 238 bug fixes from 8u151 (1 notable).
Java SE 8 Update 161[286]	2018-01-16	21 Security fixes, 3 new features, 9 changes and 1 bug fix from 8u152.
Java SE 8 Update 162[287]	2018-01-16	Security fixes, 63 bug fixes.
Java SE 8 Update 171[288]	2018-04-17	Security fixes, bug fixes.
Java SE 8 Update 172[289]	2018-04-17	Security fixes, bug fixes.
Java SE 8 Update 181[290]	2018-07-17	Security fixes, bug fixes.
Java SE 8 Update 191[291]	2018-10-16	New features, changes, bug fixes, security fixes.
Java SE 8 Update 192[292]	2018-10-16	New features, changes, bug fixes.
Java SE 8 Update 201[293]	2019-01-15	New features, changes, bug fixes.
Java SE 8 Update 202[294]	2019-01-15	New features, changes, bug fixes.
Java SE 8 Update 211[295]	2019-04-16	New features, changes, bug fixes. **License Update**.
Java SE 8 Update 212[296]	2019-04-16	New features (e.g. 5 currency symbols, including for Bitcoin and "New Japanese Era Name Reiwa"[296]), changes, bug fixes. **License Update**.
Java SE 8 Update 221[297]	2019-07-16	New features, changes, bug fixes.
Java SE 8 Update 231[298]	2019-10-15	New features, changes, bug fixes and 18 security fixes.
Java SE 8 Update 241[299]	2020-01-14	New features, changes, bug fixes.
Java SE 8 Update 251[300]	2020-04-14	New features, changes, bug fixes. The last version that was shown to be working on Windows XP unofficially.
Java SE 8 Update 261[301]	2020-07-14	New features, changes, bug fixes.
Java SE 8 Update 271[302]	2020-10-20	New features, changes, bug fixes.
Java SE 8 Update 281[303]	2021-01-19	New features, changes, bug fixes.
Java SE 8 Update 291[304]	2021-04-20	New features, changes, bug fixes.
Java SE 8 Update 301[305]	2021-07-20	New features, changes, bug fixes.

Java SE 9

Java SE 9 was made available on September 21, 2017,[306] due to controversial acceptance of the current implementation of Project Jigsaw by Java Executive Committee,[307] which led Oracle to fix some open issues and concerns, and to refine some critical technical questions. In the last days of June 2017, Java Community Process expressed nearly unanimous consensus on the proposed Module System scheme.[308]

Java SE 9	
Released	September 21, 2017
No. of JEPs	9

- JSR 376: Modularization of the JDK under Project Jigsaw (Java Platform Module System)[162]
- JavaDB was removed from JDK[309]
- JEP 193: Variable handles (https://openjdk.java.net/jeps/193) : define a standard means to invoke the equivalents of various `java.util.concurrent.atomic` and `sun.misc.Unsafe` operations
- JEP 213: Milling Project Coin (https://openjdk.java.net/jeps/213) : Allow @SafeVarargs on private instance methods; Allow effectively-final variables to be used as resources in the try-with-resources statement; Allow diamond with anonymous classes if the argument type of the inferred type is denotable; Complete the removal, begun in Java SE 8, of underscore from the set of legal identifier names; Support for private methods in interfaces
- JEP 222: jshell: The Java Shell (Read-Eval-Print Loop) (https://openjdk.java.net/jeps/222) : JShell is a REPL command-line interface for the Java language.[310]
- JEP 254: Compact Strings (https://openjdk.java.net/jeps/254)
- JEP 263: HiDPI graphics: automatic scaling and sizing (https://openjdk.java.net/jeps/263)
- JEP 266: More concurrency updates (https://openjdk.java.net/jeps/266) : It includes a Java implementation of Reactive Streams,[311] including a new `Flow` class[312] that included the interfaces previously provided by Reactive Streams[313]
- JEP 268: XML catalogs (https://openjdk.java.net/jeps/268)
- JEP 282: jlink: The Java Linker (https://openjdk.java.net/jeps/282) : create a tool that can assemble and optimize a set of modules and their dependencies into a custom run-time image. It effectively allows to produce a fully usable executable including the JVM to run it
- JEP 295: Ahead-of-Time Compilation (https://openjdk.java.net/jeps/295) : Ahead-of-time compilation provided by GraalVM.

The first Java 9 release candidate was released on August 9, 2017.[314] The first stable release of Java 9 was on September 21, 2017.[315]

History

At JavaOne 2011, Oracle discussed features they hoped to release for Java 9 in 2016.[316] Java 9 should include better support for multi-gigabyte heaps, better native code integration, a different default garbage collector (G1, for "shorter response times")[317] and a self-tuning JVM.[318] In early 2016, the release of Java 9 was rescheduled for March 2017[319] and later again postponed four more months to July 2017.[320]

Java 9 updates

Release	Release date	Highlights
Java SE 9[321]	2017-09-21	Initial release
Java SE 9.0.1[322]	2017-10-17	October 2017 security fixes and critical bug fixes
Java SE 9.0.4[323]	2018-01-16	Final release for JDK 9; January 2018 security fixes and critical bug fixes

Java SE 10

OpenJDK 10 was released on March 20, 2018, with twelve new features confirmed.[324] Among these features were:

Java SE 10	
Released	March 20, 2018
No. of JEPs	12

- JEP 286: Local-Variable Type Inference (https://openjdk.java.net/jeps/286)
- JEP 296: Consolidate the JDK Forest into a Single Repository (https://openjdk.java.net/jeps/296)
- JEP 304: Garbage-Collector Interface (https://openjdk.java.net/jeps/304)
- JEP 307: Parallel Full GC for G1 (https://openjdk.java.net/jeps/307)
- JEP 310: Application Class-Data Sharing (https://openjdk.java.net/jeps/310)
- JEP 312: Thread-Local Handshakes (https://openjdk.java.net/jeps/312)
- JEP 313: Remove the Native-Header Generation Tool (javah) (https://openjdk.java.net/jeps/313)
- JEP 314: Additional Unicode Language-Tag Extensions (https://openjdk.java.net/jeps/314)
- JEP 316: Heap Allocation on Alternative Memory Devices (https://openjdk.java.net/jeps/316)
- JEP 317: Experimental Java-Based JIT Compiler (https://openjdk.java.net/jeps/317)
- JEP 319: Root Certificates (https://openjdk.java.net/jeps/319)
- JEP 322: Time-Based Release Versioning (https://openjdk.java.net/jeps/322)

The first of these JEP 286 *Local-Variable Type Inference*, allows the `var` keyword to be used for local variables with the actual type calculated by the compiler. So we can do:

```
var list = new ArrayList<String>(); // infers ArrayList<String>
var stream = list.stream();         // infers Stream<String>
```

Java 10 updates

Release	Release date	Highlights
Java SE 10[325]	2018-03-20	Initial release
Java SE 10.0.1[326]	2018-04-17	Security fixes, 5 bug fixes[327]
Java SE 10.0.2[328]	2018-07-17	Final release for JDK 10. Security fixes, 7 bug fixes[329]

Java SE 11

JDK 11 was released on September 25, 2018 and the version is currently open for bug fixes. It offers LTS, or Long Term Support. Among others, Java 11 includes a number of new features, such as:[330]

Java SE 11	
LTS version	
Released	September 25, 2018
No. of JEPs	17

- JEP 181: Nest-Based Access Control (https://openjdk.java.net/jeps/181)

- JEP 309: Dynamic Class-File Constants (https://openjdk.java.net/jeps/309)
- JEP 315: Improve Aarch64 Intrinsics (https://openjdk.java.net/jeps/315)
- JEP 318: Epsilon: A No-Op Garbage Collector (https://openjdk.java.net/jeps/318)
- JEP 320: Remove the Java EE and CORBA Modules (https://openjdk.java.net/jeps/320)
- JEP 321: HTTP Client (Standard) (https://openjdk.java.net/jeps/321)
- JEP 323: Local-Variable Syntax for Lambda Parameters (https://openjdk.java.net/jeps/323)
- JEP 324: Key Agreement with Curve25519 and Curve448 (https://openjdk.java.net/jeps/324)
- JEP 327: Unicode 10 (https://openjdk.java.net/jeps/327)
- JEP 328: Flight Recorder (https://openjdk.java.net/jeps/328)
- JEP 329: ChaCha20 and Poly1305 Cryptographic Algorithms (https://openjdk.java.net/jeps/329)
- JEP 330: Launch Single-File Source-Code Programs (https://openjdk.java.net/jeps/330)
- JEP 331: Low-Overhead Heap Profiling (https://openjdk.java.net/jeps/331)
- JEP 332: Transport Layer Security (TLS) 1.3 (https://openjdk.java.net/jeps/332)
- JEP 333: ZGC: A Scalable Low-Latency Garbage Collector (Experimental) (https://openjdk.java.net/jeps/333)
- JEP 335: Deprecate the Nashorn JavaScript Engine (https://openjdk.java.net/jeps/335)
- JEP 336: Deprecate the Pack200 Tools and API (https://openjdk.java.net/jeps/336)

A number of features from previous releases were dropped; in particular, Java applets and Java Web Start are no longer available. JavaFX, Java EE and CORBA modules have been removed from JDK.[331]

Java 11 updates

Table of Java 11 updates

Release	Release date	Highlights
Java SE 11[332]	2018-09-25	Initial release
Java SE 11.0.1[333]	2018-10-16	Security & bug fixes
Java SE 11.0.2[334]	2019-01-15	Security & bug fixes
Java SE 11.0.3[335]	2019-04-16	New features, Security & bug fixes
Java SE 11.0.4[336]	2019-07-16	New features, Security & bug fixes; HotSpot Windows OS Detection Correctly Identifies Windows Server 2019
Java SE 11.0.5[337]	2019-10-15	New features, Security & bug fixes
Java SE 11.0.6[338]	2020-01-14	New features, Security & bug fixes
Java SE 11.0.7[339]	2020-04-14	New features, Security & bug fixes
Java SE 11.0.8[340]	2020-07-14	New features, Security & bug fixes
Java SE 11.0.9[341]	2020-10-20	New features, Security & bug fixes
Java SE 11.0.10[342]	2021-01-19	New features, Security & bug fixes
Java SE 11.0.11[343]	2021-04-20	New features, Security & bug fixes
Java SE 11.0.12[344]	2021-07-20	New features, Security & bug fixes

Java SE 12

JDK 12 was released on March 19, 2019. Among others, Java 12 includes a number of new features, such as:[345]

Java SE 12	
Released	March 19, 2019
No. of JEPs	8
Preview features	Enhanced switch statements

- JEP 189: Shenandoah: A Low-Pause-Time Garbage Collector (Experimental) (https://openjdk.java.net/jeps/189)
- JEP 230: Microbenchmark Suite (https://openjdk.java.net/jeps/230)
- JEP 325: Switch Expressions (Preview) (https://openjdk.java.net/jeps/325)
- JEP 334: JVM Constants API (https://openjdk.java.net/jeps/334)
- JEP 340: One AArch64 Port, Not Two (https://openjdk.java.net/jeps/340)
- JEP 341: Default CDS Archives (https://openjdk.java.net/jeps/341)
- JEP 344: Abortable Mixed Collections for G1 (https://openjdk.java.net/jeps/344)
- JEP 346: Promptly Return Unused Committed Memory from G1 (https://openjdk.java.net/jeps/346)

The preview feature Jep 325 extends the `switch` statement so it can also be used as an expression, and adds a new form of case label where the right hand side is an expression. No break statement is needed. For complex expressions a `yield` statement can be used. This becomes standard in Java SE 14.

```
int ndays = switch (month) {
    case JAN, MAR, MAY, JUL, AUG, OCT, DEC -> 31;
    case APR, JUN, SEP, NOV -> 30;
    case FEB -> {
        if (year % 400 == 0) yield 29;
        else if (year % 100 == 0) yield 28;
        else if (year % 4 == 0) yield 29;
        else yield 28; }
};
```

Java 12 updates

Release	Release date	Highlights
Java SE 12[346]	2019-03-19	Initial release
Java SE 12.0.1[347]	2019-04-16	New Japanese Era Name & Security fixes
Java SE 12.0.2[348]	2019-07-16	Removed some root CA certificates

Java SE 13

JDK 13 was released on September 17, 2019. Java 13 includes the following new features, as well as "hundreds of smaller enhancements and thousands of bug fixes".[349]

Java SE 13	
Released	September 17, 2019
No. of JEPs	5
Preview features	Enhanced switch statements, text blocks

- JEP 350: Dynamic CDS Archives (https://openjdk.java.net/jeps/350)
- JEP 351: ZGC: Uncommit Unused Memory (https://openjdk.java.net/jeps/351)
- JEP 353: Reimplement the Legacy Socket API (https://openjdk.java.net/jeps/353)
- JEP 354: Switch Expressions (Preview) (https://openjdk.java.net/jeps/354)
- JEP 355: Text Blocks (Preview) (https://openjdk.java.net/jeps/355)

JEP 355 *Text Blocks* allows multiline string literals:

```
String html = """
            <HTML lang="en">
                <body>
                    <p>Hello, world</p>
                </body>
            </html>
            """;
```

Java 13 updates

Release	Release date	Highlights
Java SE 13[350]	2019-09-17	General Availability Release
Java SE 13.0.1[351]	2019-10-15	Security & bug fixes
Java SE 13.0.2[352]	2020-01-14	Security & bug fixes

Java SE 14

JDK 14 was released on March 17, 2020. Java 14 includes the following new features, as well as "hundreds of smaller enhancements and thousands of bug fixes".[353]

- JEP 305: Pattern Matching for instanceof (Preview) (https://openjdk.java.net/jeps/305)
- JEP 343: Packaging Tool (Incubator) (https://openjdk.java.net/jeps/343)
- JEP 345: NUMA-Aware Memory Allocation for G1 (https://openjdk.java.net/jeps/345)
- JEP 349: JFR Event Streaming (https://openjdk.java.net/jeps/349)
- JEP 352: Non-Volatile Mapped Byte Buffers (https://openjdk.java.net/jeps/352)
- JEP 358: Helpful NullPointerExceptions (https://openjdk.java.net/jeps/358)
- JEP 359: Records (Preview) (https://openjdk.java.net/jeps/359)
- JEP 361: Switch Expressions (Standard) (https://openjdk.java.net/jeps/361)
- JEP 362: Deprecate the Solaris and SPARC Ports (https://openjdk.java.net/jeps/362)
- JEP 363: Remove the Concurrent Mark Sweep (CMS) Garbage Collector (https://openjdk.java.net/jeps/363)
- JEP 364: ZGC on macOS (https://openjdk.java.net/jeps/364)
- JEP 365: ZGC on Windows (https://openjdk.java.net/jeps/365)
- JEP 366: Deprecate the ParallelScavenge + SerialOld GC Combination (https://openjdk.java.net/jeps/366)
- JEP 367: Remove the Pack200 Tools and API (https://openjdk.java.net/jeps/367)
- JEP 368: Text Blocks (Second Preview) (https://openjdk.java.net/jeps/368)
- JEP 370: Foreign-Memory Access API (Incubator) (https://openjdk.java.net/jeps/370)

Java SE 14	
Released	March 17, 2020
No. of JEPs	16
Notable features	Helpful NullPointerExceptions, enhanced switch statements
Notable removals	Remove Concurrent Mark Sweep garbage collector
Preview features	Pattern matching for instanceof, records, text blocks
Incubating features	jpackager, Foreign memory access

JEP 305, *Pattern Matching for instanceof* simplifies the common case of an `instanceof` test being immediately followed by cast, replacing

```java
if (obj instanceof String) {
    String s = (String) obj;
    System.out.println( s.length() );
}
```

with

```
if (obj instanceof String s) {
    System.out.println( s.length() );
}
```

JEP 359 *Records* allows easy creation of simple immutable Tuple like classes.[354]

```
record Point(int x, int y) { }
Point p = new Point(3,4);
System.out.println( p.x() );
```

Java 14 updates

Release	Release date	Highlights
Java SE 14[355]	2020-03-17	General Availability Release
Java SE 14.0.1[356]	2020-04-14	Security & bug fixes
Java SE 14.0.2[357]	2020-07-14	Security & bug fixes

Java SE 15

JDK 15 was released on September 15, 2020. Java 15 adds e.g. support for multi-line string literals (aka Text Blocks). The Shenandoah and Z garbage collectors (latter sometimes abbreviated ZGC) are now ready for use in production (i.e. no longer marked experimental). Support for Oracle's Solaris operating system (and SPARC CPUs) is dropped (while still available in e.g. Java 11). The Nashorn JavaScript Engine is removed. Also removed some root CA certificates.

Java SE 15	
Released	September 15, 2020
No. of JEPs	14
Notable features	Hidden classes, ZGC (garbage collector), Shenandoah (garbage collector), text blocks
Notable removals	JavaScript engine, Solaris and SPARC ports
Preview features	Sealed classes, pattern matching of instanceof, records
Incubating features	Foreign-memory access

- JEP 339: Edwards-Curve Digital Signature Algorithm (EdDSA) (https://openjdk.java.net/jeps/339)
- JEP 360: Sealed Classes (Preview) (https://openjdk.java.net/jeps/360)
- JEP 371: Hidden Classes (https://openjdk.java.net/jeps/371)
- JEP 372: Remove the Nashorn JavaScript Engine (https://openjdk.java.net/jeps/372)
- JEP 373: Reimplement the Legacy DatagramSocket API (https://openjdk.java.net/jeps/373)
- JEP 374: Disable and Deprecate Biased Locking (https://openjdk.java.net/jeps/374)
- JEP 375: Pattern Matching for instanceof (Second Preview) (https://openjdk.java.net/jeps/375)
- JEP 377: ZGC: A Scalable Low-Latency Garbage Collector (https://openjdk.java.net/jeps/377)
- JEP 378: Text Blocks (https://openjdk.java.net/jeps/378)

- JEP 379: Shenandoah: A Low-Pause-Time Garbage Collector (https://openjdk.java.net/jeps/379)
- JEP 381: Remove the Solaris and SPARC Ports (https://openjdk.java.net/jeps/381)
- JEP 383: Foreign-Memory Access API (Second Incubator) (https://openjdk.java.net/jeps/383)
- JEP 384: Records (Second Preview) (https://openjdk.java.net/jeps/384)
- JEP 385: Deprecate RMI Activation for Removal (https://openjdk.java.net/jeps/385)

JEP 360 *Sealed Classes* adds sealed classes and interfaces that restrict which other classes or interfaces may extend or implement them. Only those classes specified in a `permits` clause may extend the class or interface.

```
package com.example.geometry;

public abstract sealed class Shape
    permits Circle, Rectangle, Square {...}
```

Together with records, sealed classes are Algebraic data types, records are product types and sealed classes are sum types. They work well with other recent features like records, switch expressions, and pattern matching for instance-of. They all form part of a system for "Pattern matching in Java" first discussed by Gavin Bierman and Brian Goetz, in September 2018.[358]

Java 15 updates

Release	Release date	Highlights
Java SE 15[359]	2020-09-15	General Availability Release
Java SE 15.0.1[360]	2020-10-20	Security & bug fixes
Java SE 15.0.2[361]	2021-01-19	Security & bug fixes

Java SE 16

JDK 16 was released on March 16, 2021. Java 16 removes Ahead-of-Time compilation (and Graal JIT) options.[362] The Java implementation itself was and is still written in C++, while as of Java 16, more recent C++14 (but still not e.g. C++17 or C++20) is allowed. The code was also moved to GitHub (dropping the Mercurial source control system).

Java SE 16	
Released	March 16, 2021
No. of JEPs	17
Notable features	Windows/AArch64 Port, jpackager, pattern matching for instanceof, records
Preview features	Sealed classes
Incubating features	Foreign linker, Foreign-memory access

- JEP 338: Vector API (Incubator) (https://openjdk.java.net/jeps/338)
- JEP 347: Enable C++14 Language Features (https://openjdk.java.net/jeps/347)
- JEP 357: Migrate from Mercurial to Git (https://openjdk.java.net/jeps/357)
- JEP 369: Migrate to GitHub (https://openjdk.java.net/jeps/369)
- JEP 376: ZGC: Concurrent Thread-Stack Processing (https://openjdk.java.net/jeps/376)

- JEP 380: Unix-Domain Socket Channels (https://openjdk.java.net/jeps/380)
- JEP 386: Alpine Linux Port (https://openjdk.java.net/jeps/386) – not yet stable
- JEP 387: Elastic Metaspace (https://openjdk.java.net/jeps/387)
- JEP 388: Windows/AArch64 Port (https://openjdk.java.net/jeps/388)
- JEP 389: Foreign Linker API (Incubator) (https://openjdk.java.net/jeps/389)
- JEP 390: Warnings for Value-Based Classes (https://openjdk.java.net/jeps/390)
- JEP 392: Packaging Tool (https://openjdk.java.net/jeps/392)
- JEP 393: Foreign-Memory Access API (Third Incubator) (https://openjdk.java.net/jeps/393)
- JEP 394: Pattern Matching for instanceof (https://openjdk.java.net/jeps/394)
- JEP 395: Records (https://openjdk.java.net/jeps/395)
- JEP 396: Strongly Encapsulate JDK Internals by Default (https://openjdk.java.net/jeps/396)
- JEP 397: Sealed Classes (Second Preview) (https://openjdk.java.net/jeps/397)

Java 16 updates

Release	Release date	Highlights
Java SE 16[363]	2021-03-16	General Availability Release
Java SE 16.0.1[364]	2021-04-20	Timezone database update, bug fixes, and security updates
Java SE 16.0.2[365]	2021-07-20	Security & bug fixes

Java SE 17

JDK 17 is the next long-term support (LTS) release now in Release Candidate Phase,[366] due out in September 2021 if the current 6-month release cycles continue. Java 17 is expected to be the 2nd long-term support (LTS) release since switching to the new 6-month release cadence (the first being Java 11).

- JEP 306: Restore Always-Strict Floating-Point Semantics (https://openjdk.java.net/jeps/306)
- JEP 356: Enhanced Pseudo-Random Number Generators (https://openjdk.java.net/jeps/356)
- JEP 382: New macOS Rendering Pipeline (https://openjdk.java.net/jeps/382)
- JEP 398: Deprecate the Applet API for Removal (https://openjdk.java.net/jeps/398)
- JEP 403: Strongly Encapsulate JDK Internals (https://openjdk.java.net/jeps/403)
- JEP 406: Pattern Matching for switch (Preview) (https://openjdk.java.net/jeps/406)
- JEP 407: Remove RMI Activation (https://openjdk.java.net/jeps/407)

Java SE 17	
LTS version	
Released	September 2021
No. of JEPs	14
Notable features	sealed classes
Notable removals	AOT compiler, RMI activation
Preview features	Switch pattern matching
Incubating features	Vector API, Foreign function & memory API

- JEP 409: Sealed Classes (https://openjdk.java.net/jeps/409)
- JEP 410: Remove the Experimental AOT and JIT Compiler (https://openjdk.java.net/jeps/410)
- JEP 411: Deprecate the Security Manager for Removal (https://openjdk.java.net/jeps/411)
- JEP 412: Foreign Function & Memory API (Incubator) (https://openjdk.java.net/jeps/412)
- JEP 414: Vector API (Second Incubator) (https://openjdk.java.net/jeps/414)
- JEP 415: Context-Specific Deserialization Filters (https://openjdk.java.net/jeps/415)

Java 17 updates

Release	Release date	Highlights
Latest Build[367]	2021-09-14	Release candidate: Build 35 (2021-08-06)

Java SE 18

JDK 18 is now under active development,[368] due out in March 2022 if the current 6-month release cycles continue.

Java 18 updates

Release	Release date	Highlights
Latest Build[369]	2022-03-xx TBC	Early-Access Builds: Build 2 (2021-06-17)

Java SE 18

Released	March 2022
No. of JEPs	TBC
Notable features	TBC
Notable removals	TBC
Preview features	TBC
Incubating features	TBC

Future features

- Project Valhalla (https://openjdk.java.net/projects/valhalla/): Value types, objects without identity but with an efficient memory layout.
- Project Panama (https://openjdk.java.net/projects/panama/): Improved interoperability with native code, to enable Java source code to call functions and use data types from other languages, in a way that is easier and has better performance than today.
- Project Loom (https://openjdk.java.net/projects/loom/): Virtual threads, a lightweight user-mode scheduled alternative to standard OS managed threads. Virtual threads are mapped to OS threads in a many-to-many relationship, in contrast to the many-to-one relationship from the original green threads implementation in early versions of Java.

Implementations

The officially supported Java platform, first developed at Sun and now stewarded by Oracle, is Java SE. Releases are based on the OpenJDK project, which is a free and open source project with an open development model. Other Java implementations exist, however—in part due to Java's early history as proprietary software, while some implementations were created to offer some

benefits over the standard implementation, often the result of some area of academic or corporate-sponsored research. Many Linux distributions include builds of OpenJDK through the IcedTea project started by Red Hat, which provides an easier build and integration environment.

Visual J++ and the Microsoft Java Virtual Machine were created as incompatible implementations. After the *Sun v. Microsoft* lawsuit, Microsoft abandoned it and began work on the .NET platform.

Other proprietary Java implementations are available, such as Azul's Zing; additionally, Azul offers certified open source OpenJDK builds under the Zulu moniker.

Prior to the release of OpenJDK, while Sun's implementation was still proprietary, the GNU Classpath project was created to provide a free and open source implementation of the Java platform. Since the release of JDK 7, when OpenJDK became the official reference implementation, the original motivation for the GNU Classpath project almost completely disappeared and its last release was in 2012.

The Apache Harmony project was started shortly before the release of OpenJDK. After Sun's initial source code release, the Harmony project continued, working to provide an implementation under a lax license, in contrast to the protective license chosen for OpenJDK. Google later developed Android and released it under a lax license. Android incorporated parts of the Harmony project, supplemented with Google's own Dalvik virtual machine and ART. Apache Harmony has since been retired, and Google has switched its use of Harmony components with equivalent ones from OpenJDK.

Both Jikes and Jikes RVM are open source research projects that were developed by IBM.

Several other implementations exist that started as proprietary software but are now open source. IBM initially developed OpenJ9 as the proprietary J9,[370] but has since relicensed the project and donated it to the Eclipse Foundation. JRockit is a proprietary implementation that was acquired by Oracle and incorporated into subsequent OpenJDK versions.

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