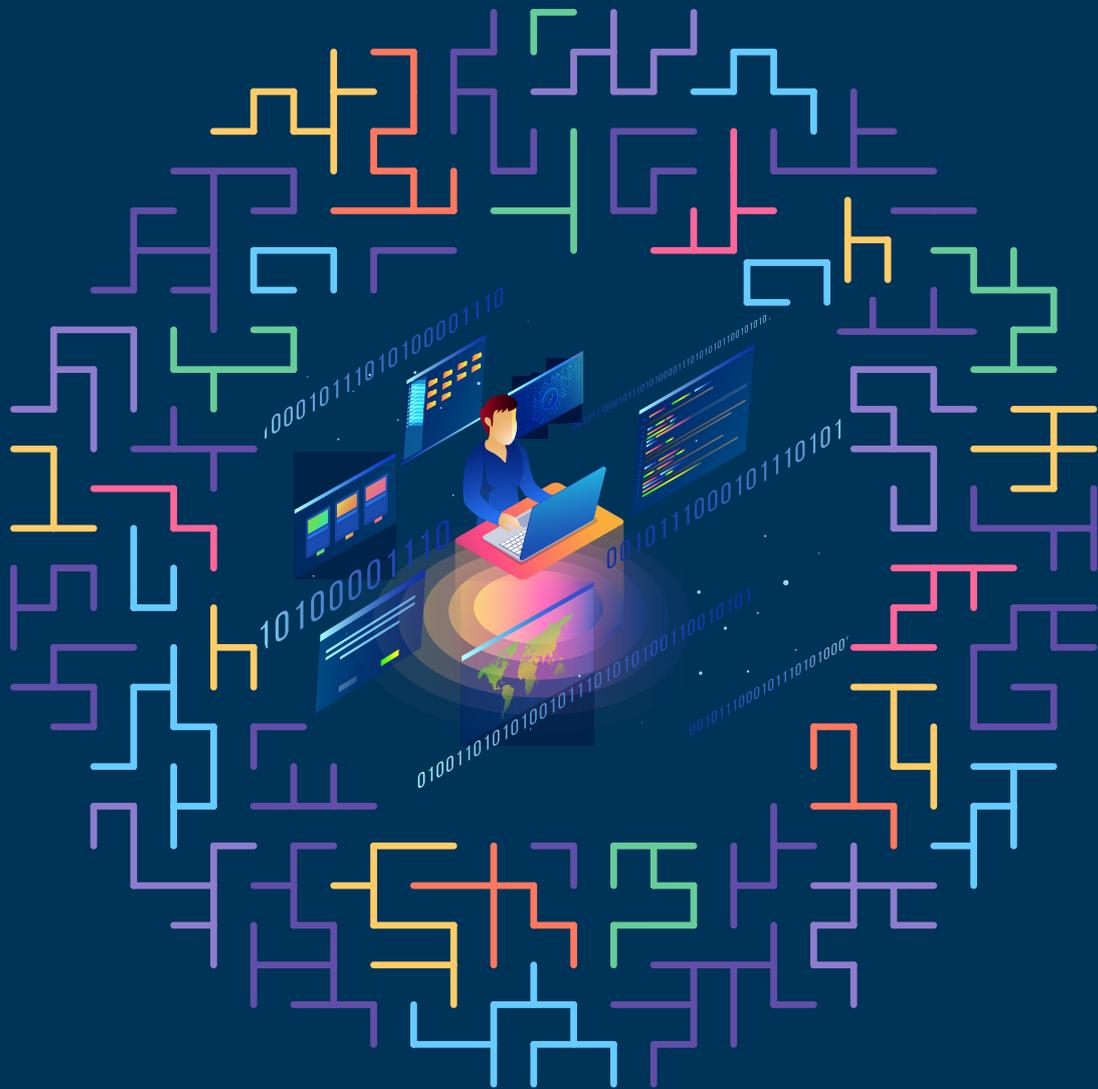




# RENEWAL AND TRANSITION FOR JAVA TECHNOLOGY

**SHOWCASING IMPROVED OPPORTUNITIES  
WITH IBM SEMERU RUNTIMES**





## Executive Summary

Since the mid-1990s Java has grown into one of the most popular programming languages in the world and a stalwart technology for enterprise development and operational runtime systems. In 2021, the Java ecosystem saw the culmination of ongoing change and progression, particularly in its community leadership and the direction of the technology platform.

However, for too many people, navigating the maze of Java development and operating options and understanding the different operational implications remain a confusing process. This report is aimed at those working with or looking to Java — whether they remain Java technology strategists, Java developers, members of operations and procurement teams, or part of the senior technical leadership community. This report:

- 1** Exposes the Java development and runtime choices that organizations are now facing, along with important considerations to support future migrations.
- 2** Provides an overview of the transition of the AdoptOpenJDK consortium into the Eclipse Foundation as Eclipse Adoptium, outlining the advantages of the new community structure.
- 3** Shines a spotlight on the opportunities presented by the newly released IBM Semeru Runtimes, which form a competitive and meaningful alternative to the myriad enterprise support and maintenance licence packages on the market.

Java technology presents opportunities that come with stark choices and considerations. Organizations must actively engage with the topic and decide carefully if they are to maximize the benefits created by existing and future investments in Java.



## Java's Evolution

Originally released by Sun Microsystems, Java became popular with a broad range of software developers and suppliers thanks to its openness. In 2010, Oracle acquired Sun Microsystems and took on stewardship of Java standardization and the Java Community Process, a mechanism for developing Java technical specifications. Consequently, the Oracle Java Development Kit (JDK) became the dominant Java platform deployed in enterprises.

Oracle's decision to start charging for updates struck at the heart of the Java ethos and caused great consternation among developers, users and other suppliers. In an era of constant connectivity and aggressive threats to online security, businesses must be able to trust the platforms their operations are built on. Java environments without the necessary security updates and bug fixes present vulnerabilities and raise the likelihood of severe damage.

Of course, some organizations had already been paying for Java support from companies such as IBM for some time. Firms in heavily regulated industries with mission- or safety-critical Java applications were most likely to be covered by a support contract, enabling defects to be resolved and security updates and bug fixes to be continuously administered. The key change was that paid-for licences were no longer going to be an option but a requirement of using the leading Java distribution.

Oracle's licensing move caused a disruptive material change in the Java technology ecosystem. Equally, it allowed others to step in and provide the required updates and fixes for free or introduce more-competitive enterprise licensing support terms.

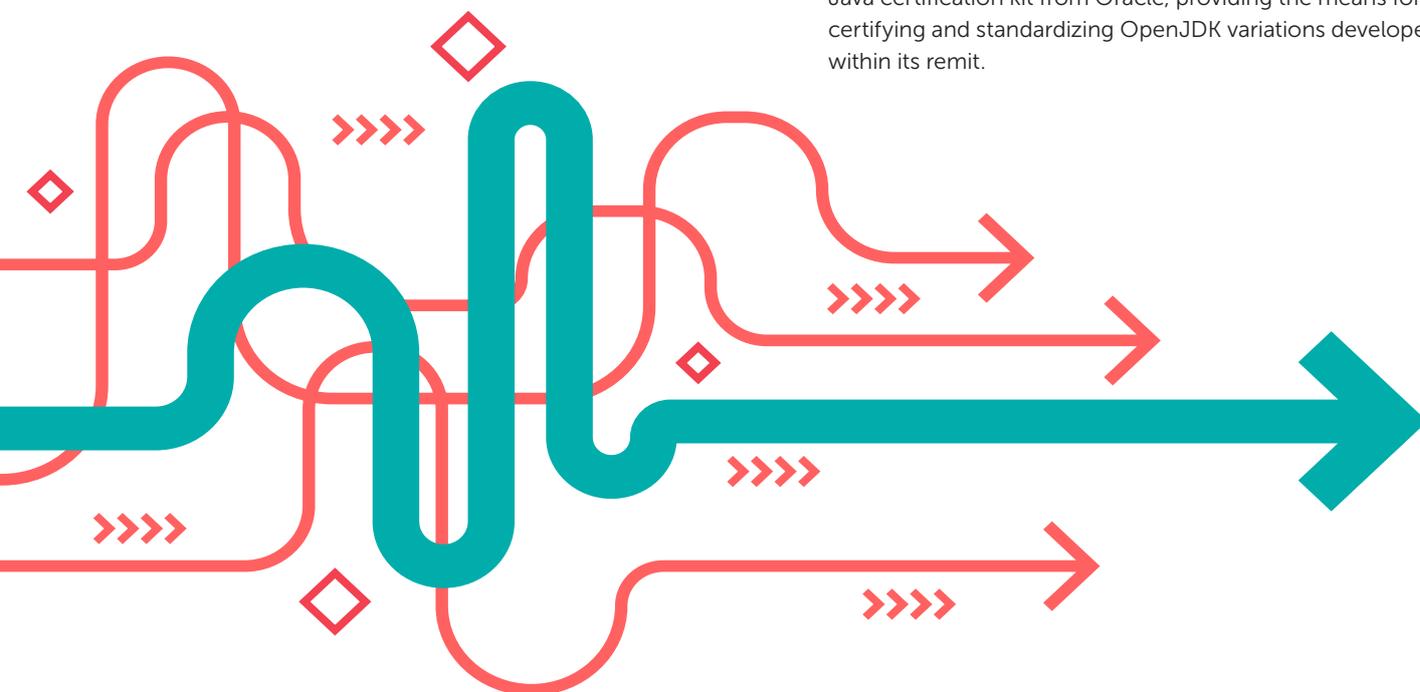
One of the most significant outcomes from the licensing changes has been to broaden the Java technology ecosystem, opening it up to a more diverse community of contributors. This has expanded the reach of OpenJDK, an open-source implementation of the Java platform specification, launched by Sun Microsystems in 2006 under the GNU General Public License (GPL) v2 with the classpath exception.

**One of the most significant outcomes from the licensing changes has been to broaden the Java technology ecosystem**

In 2018, Oracle shook up the platform's licensing terms, upending the way organizations obtained security patches and important bug fixes for the environments that served their Java applications. After the revised terms came into force in January 2019, new releases of Oracle's Java platform came with free security updates only during the first six months, reverting to a paid-for model beyond that period. New installations of Oracle Java platforms in business environments also required a new commercial licence.

In 2017, a consortium of companies formed AdoptOpenJDK, an open community group to promote OpenJDK. The success of this collaboration has delivered more than the goal of an alternative to the Oracle JDK platform. AdoptOpenJDK has spearheaded Java's progress into a brighter and more meaningful long-term future.

The transition of AdoptOpenJDK into the more formal structures of the Eclipse Foundation and its rebranding as Eclipse Adoptium bring the trust of a neutral home for collective cooperation among competing software services providers such as Alibaba, Amazon, IBM and Microsoft. Importantly, Eclipse Adoptium has licensed the Java certification kit from Oracle, providing the means for certifying and standardizing OpenJDK variations developed within its remit.



## Navigating the changed Java landscape

For the uninitiated, Java can be a complicated world to enter. The Java platform consists of many parts, with multiple parties that support a broad set of uses for the technology – from mobile applications to supporting cloud services and containers and serving enterprise operational demands.

One of the challenges that many have in navigating their way forward from Oracle's licensing changes has been the lack of clarity about the different flavours of Java development and runtime builds that form their specific Java investments as well as the wider Java ecosystem. Java's many abbreviations, components, providers and distributions are pitfalls that can trap the uninformed.

### MAKING SENSE OF THE JAVA PORTFOLIO

Although a product of its large community of developers, the Java language's primary custodian is Oracle, thanks to its purchase of Sun Microsystems in 2010. By owning and maintaining Java's standardization process, run by the Java Community Process, Oracle became the standard bearer for the JDK, a reference implementation of the Java Platform, Standard Edition (Java SE).

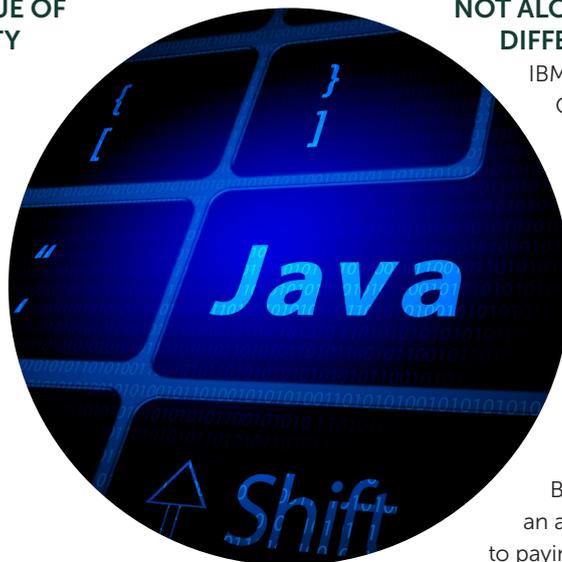
Those well-versed in Java will be aware of the trajectory the language specification has taken, along with the maze of suppliers that provide and support the different builds of the development and runtime environments that are available on the market. For those that are not, Table 1 summarizes the key features that form the basis of Java implementations.

**TABLE 1. NAVIGATING THE MANY FLAVOURS AND ACRONYMS OF JAVA**

<p><b>Java Language Specification</b></p>	<p>Java SE comes in several versions, although not all are active releases. More-recent versions number 8 through 17.</p>
<p><b>Long-Term Support</b></p>	<p>Versions 8, 11 and 17 have been earmarked as long-term support (LTS) releases. Red Hat is the steward and project leader of Java SE 8 and Java SE 11 in OpenJDK; Oracle leads Java SE 17 and other more-recent versions.</p> <p><b>Java SE 8/JDK 8 (LTS)</b></p> <ul style="list-style-type: none"> <li>• Released in March 2014</li> <li>• Oracle JDK 8 LTS has no free essential patch updates</li> <li>• A support licence is required for continuation of essential updates and commercial production use or distribution</li> </ul> <p><b>Java SE 11/JDK 11 (LTS)</b></p> <ul style="list-style-type: none"> <li>• Released in September 2018</li> <li>• Oracle JDK 11 LTS has no free essential patch updates</li> <li>• A commercial support licence is required for use in production environments and continuation of essential updates</li> </ul> <p><b>Java SE 17/JDK 17 (LTS)</b></p> <ul style="list-style-type: none"> <li>• Released in September 2021</li> <li>• Oracle JDK 17 LTS is free to use for all users (including commercial and production use) until a full year after the next LTS release (Java 21), expected in September 2023</li> <li>• Quarterly security updates will be free during this period</li> <li>• Redistribution is allowed during this period, providing no fee is charged</li> <li>• After this period, paid licensing (like with Java 8 and 11) is required</li> </ul>
<p><b>Java Development Kit</b></p>	<p>A set of development tools, application programming interfaces (APIs) and classes for creating Java applications. The kit usually includes a runtime environment for running Java applications. Each version of Java has a reference implementation, from which suppliers derive their own JDKs that are equivalent in the Java APIs and classes they implement.</p>
<p><b>Java Runtime Environment</b></p>	<p>The Java Runtime Environment (JRE) is a software layer that loads class libraries and other resources needed for Java applications to run on a given operating system.</p> <p>Suppliers differentiate their JDK builds through the capabilities that are unique to their JRE and its utilization of the underlying operating system.</p>
<p><b>Java Virtual Machine</b></p>	<p>The Java Virtual Machine (JVM) is the engine that runs Java applications in the JRE. Virtually all OpenJDK distributions, including Oracle's JRE, include the HotSpot JVM. IBM Semeru Runtimes, also an OpenJDK distribution, instead include the Eclipse OpenJ9 JVM.</p>
<p><b>Java Development Kit Build</b></p>	<p>A JDK build is made up of a JDK and other software that supports the development process, a particular environment, or other products offered by a build supplier.</p> <p>There are uses of Java that do not include a JDK. However, most Java customers will require a JDK to create their applications, and users will need a JRE to run the applications.</p> <p>Suppliers may choose to distinguish the licensing requirements and obligations of Java technology used in the context of a JDK differently to its use in the JRE.</p> <p>For a JRE or JDK build to be referred to as "certified Java SE", a licence from Oracle is required and the builds must pass the required certification tests. An uncertified build may be the result of no licence being available, rather than failure to pass the certification tests.</p>

## STRENGTHENING THE VALUE OF OPEN-SOURCE COMMUNITY ENGAGEMENT

There is much to be said for the flexibility, opportunity and choice offered by solutions delivered through the open-source community. However, progress and sustainability are better secured with community engagement that is underpinned by the committed support of companies that can draw on the operational experience and technical expertise of their commercial offerings and market presence.



## NOT ALONE, BUT A VALID DIFFERENTIATION

IBM is not alone in its endeavours. Others, such as IBM's Red Hat business and Azul, are also well-known for delivering compatible JDK builds, and just as committed to developing security and core bug fixes. Along with other suppliers, both have launched OpenJDK builds with support offerings and opportunities for free security and bug updates.

However, the IBM Runtimes for Business support package offers an alternative cost-effective option to paying other suppliers for commercial support to run Java workloads. Together with

IBM's strategy in sponsoring and supporting Eclipse Adoptium builds and providing the Semeru Runtimes, it is evidence of the broader business value on offer.

IBM's offer is one of scale, longevity and proven commitment to the technology. IBM is drawing on its decades of experience and expertise in delivering a sizeable portfolio of Java language-based products, solutions and services. It has also supported organizations on the Java platform and contributed extensively to the ecosystem and open-source community. As a result, the company's stance and value proposition demands deeper investigation.

## STEPPING UP WITH IBM SEMERU RUNTIMES

AdoptOpenJDK held a Technology Compatibility Kit (TCK) licence from Oracle. This enabled it to maintain a compliant quality assurance process for releasing updates to builds of OpenJDK that included the HotSpot JVM. When Oracle clarified that the licence did not apply to builds based on the OpenJ9 JVM, AdoptOpenJDK chose not to certify any of its builds. The licence and its limitations have transferred to the Eclipse Adoptium project, which now offers TCK-certified builds with the HotSpot JVM, but not those with the OpenJ9 JVM.

However, OpenJ9 has much to recommend it. Compared with the HotSpot engine, OpenJ9 is a more efficient runtime with a smaller memory footprint, faster start-up time and achieves peak performance three times faster in a constrained environment. In addition, these performance improvements are obtained without sacrificing the overall throughput and can be experienced across the whole application lifecycle.

As a major backer of the AdoptOpenJDK community group, IBM is rallying support for the transition to Eclipse Adoptium. To ensure continuity in support for OpenJ9-based builds, the company has stepped into the breach with Semeru Runtimes, a set of binaries that ensure organizations using OpenJDK with OpenJ9 implementations can continue to do so.

In this regard, IBM is continuing its role of providing a more expansive quality assurance process that promotes confidence in the operational robustness of the JRE for development teams, especially those serving enterprises. Through IBM Semeru Runtimes, the company will continue creating and delivering free security updates and essential bug fixes for OpenJ9-based OpenJDK binaries, particularly those marked for long-term support.

**IBM's offer is one of scale, longevity and proven commitment to the technology**

## OPENJDK — DELIVERING OPEN COMMUNITY-BASED CHOICE TO JAVA SUPPORT

Although Oracle remains the main custodian of Java SE, OpenJDK is the open-source community project that provides the OpenJDK codebase, which underpins most of the JDK builds used around the world. Any supplier can develop an OpenJDK build, and add specific runtime characteristics and utilities that differentiate their build capabilities, performance and support strategies. To be called Java SE certified, a build must pass Oracle's TCK test to determine that it accurately implements the entire Java SE specification.

## LIMITING LOCK-IN

Crucially, OpenJDK offers the opportunity for organizations to broaden their scope of options.

OpenJDK is supported by a broad spectrum of leading industry contributors and supporters, all drawing on the same codebase, delivering the same APIs and class extensions. The availability of compatible OpenJDK builds ensures that developers have a choice, not only when first creating an application, but over the life of the application as well. This helps reduce the likelihood of vendor lock-in, and allows for greater flexibility in selecting the most appropriate support licences for those Java applications that require dedicated defect resolution. The opportunity to look beyond Oracle's licence support can result in more favourable commercial terms and costs.

With their OpenJDK builds, both Red Hat and Azul have committed to delivering free security and critical bug fix patches back to the OpenJDK community project to support the continuation of free patches, at least for OpenJDK builds based on Java 8 until May 2026, and for Java 11 until October 2024.

There are differences between the OpenJDK codebase and Oracle's JDK codebase, especially for builds based on versions older than Java 11, which can affect application behaviour. From Java 11 onward, equivalence between the OpenJDK and Oracle JDK builds was asserted.

Subsequent updates to OpenJDK since the Java 11 LTS release in September 2018 have seen several Java Enhancement Proposals put forward with each new version release of Java. Many of these proposals represent updates to the Java APIs, improving features, adding new API capabilities, and removing or deprecating some services and other capabilities. The range of early developmental versions of new or modified API services, previews and HotSpot-specific updates or additions point to active community engagement and a desire to strengthen and expand Java technology and platforms.

## REPOSITIONING INFLUENCE AND DIRECTION THROUGH ADOPTOPENJDK

The AdoptOpenJDK open community group offers a lifeline to those organizations with no desire, reason or ability to be bound by Oracle's update cadence for obtaining free security patches for installed JDK builds not already

supported by a licensing agreement.

Since its inception, the group's goal has been to continue to deliver free security patch releases for OpenJDK Java 8 builds and higher for considerably longer than the six-month free support cycle available with each new Java version release.

The group has further strengthened its position with collective commitment and support from the cohort of commercial suppliers and others in the open community to continue providing update binaries for production-ready OpenJDK builds based on HotSpot and OpenJ9. The mix of open community and established commercial vendor support has provided reassurances and confidence for organizations committing to AdoptOpenJDK builds.

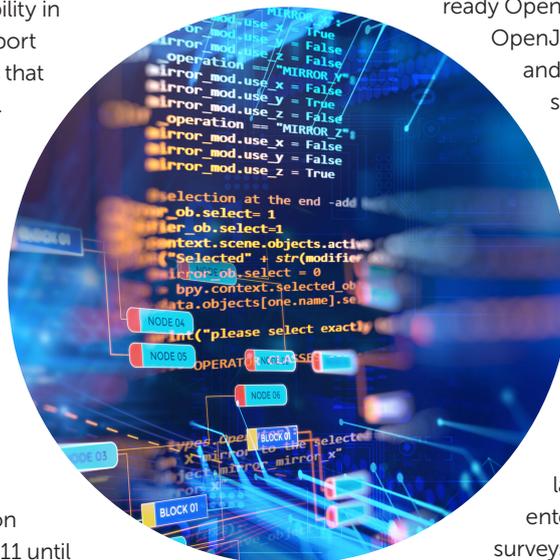
## AN UNCERTAIN FUTURE TURNED AROUND

AdoptOpenJDK's success has proven a turning point for Java technology, which had slipped from being the number-one language among developers of enterprise applications, according to surveys such as the annual Stack Overflow developer poll.

The AdoptOpenJDK consortium has a charter of providing a comprehensive vendor-neutral build and test system for production-quality OpenJDK platform variants, so that they can be used with confidence. Over the past few years, AdoptOpenJDK has matured to become an accepted alternative to the Oracle JDK.

Prior to Oracle's licence changes, about 80% of Java deployments in enterprises were based on the Oracle JDK 8 build. AdoptOpenJDK's cross-supplier support and open community engagement has heralded a level of stability and confidence that has resulted in more than 300 million downloads of AdoptOpenJDK packages in four years. It now accounts for 44% of JDK builds in production. This accolade, outlined in Snyk's JVM Ecosystem Report 2021, reflects the powerful draw of a multi-vendor collaboration. Equally important is the cornerstone it provides in adapting Java technology to meet the changing requirements of the digital market.

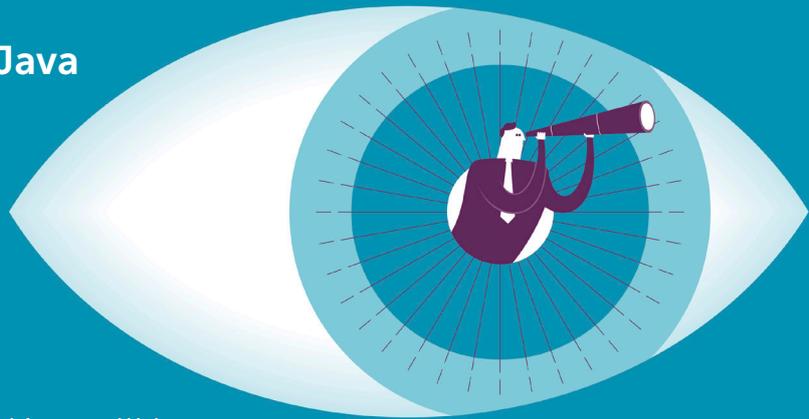
According to surveys by Snyk and JRebel in 2021, usage of Oracle's JDK has fallen to 50% and potentially as low as 30%. Oracle offers both its traditional JDK and its own OpenJDK offering, which can create confusion.



## Foundations for a brighter future for Java

The AdoptOpenJDK consortium has demonstrated the breadth of support for Java not just among traditional stalwarts such as IBM, but among companies that many would consider antithetical to Java, such as Microsoft.

The growth of Microsoft Azure and Amazon Web Services could have spelled the end of Java. Instead, Microsoft, Amazon and other cloud service providers have come together in their commitment to support the technology. Such a diverse collection of companies making this commitment sends a message to the Java ecosystem and beyond. It is one that reinforces the importance of Java and that it is served with strong and long-term support.



### ECLIPSE ADOPTIUM: EVOLUTION FOR THE ADOPTOPENJDK COMMUNITY

Java's neutrality and continued relevance and growth are protected by the transition of AdoptOpenJDK into Eclipse Adoptium.

The initiative continues to provide a collaborative, neutral environment and platform for enhancing and cementing the ratification processes for the Java ecosystem. The value of Eclipse Adoptium in strengthening the Java ecosystem is backed by the reassurance and confidence provided by high-level cross-supplier collaboration, including continued input from a diverse community that encompasses the likes of Alibaba, Amazon, Azul, IBM, Microsoft, Red Hat and many others.

Eclipse Adoptium's charter is bound by the discipline of a standards-driven environment that focuses on:



Providing trusted, high-quality, well-tested OpenJDK-based binaries that can be used with confidence by enterprises on servers, modern cloud platforms and embedded systems.



Developing comprehensive user-friendly functional and system-validation test suites comprising production-ready build scripts, test automation tools, continuous integration and continuous delivery test runs.



Additional quality assurance and test services through IBM-contributed AQAvit, which provides functional, stress and performance test suites aimed at validating operational robustness. These complement the Java SE certification testing provided by Oracle's Java TCK.



Nurturing working groups capable of promoting and supporting technologies derived from the Adoptium project itself.



Establishing a marketplace for vendor members of the Adoptium working group to showcase their OpenJDK variations that have been certified by the test certification process.

Within the rigorous workings and framework of the Eclipse Foundation, the Adoptium project will be able to compete even more effectively against Oracle and others. Importantly, the foundation has a history of managing open-source projects successfully. It is a body that is well-equipped with processes for managing standardization, driving the adoption of standards and for ensuring compliance and confidence in the generation of standardized software.

## FIXING THE LIMITATIONS

However, the move to Adoptium comes with some implications. Most noticeably, the importance of standards in the Eclipse Foundation means that certification of the JDK is essential. However, Eclipse Foundation's TCK licence with Oracle permits certification of only builds containing the HotSpot JVM. Those wishing to use an alternative JVM and runtime environment will need to look elsewhere.

As long-term stewards of OpenJ9, IBM will continue to provide an OpenJDK version that contains the OpenJ9 JVM. This distribution is available directly from IBM, and forms the basis of the new IBM Semeru Runtimes. Clearly, with IBM's commitment to an open edition of its runtimes supporting OpenJ9 environments, a viable path remains for continued access to free security and bug fix patches.

Table 2 outlines the migration path for AdoptOpenJDK open-source builds; Table 3 outlines attributes of Eclipse and IBM OpenJDK builds.



**TABLE 2. ADOPTOPENJDK MIGRATION PATH**

AdoptOpenJDK build	New Supplier	New JDK Name
OpenJDK with HotSpot	Eclipse Adoptium	Eclipse Temurin
OpenJDK with OpenJ9	IBM	IBM Semeru Runtimes (Open Edition and Certified Edition)

**TABLE 3. ECLIPSE AND IBM OPENJDK BUILDS**

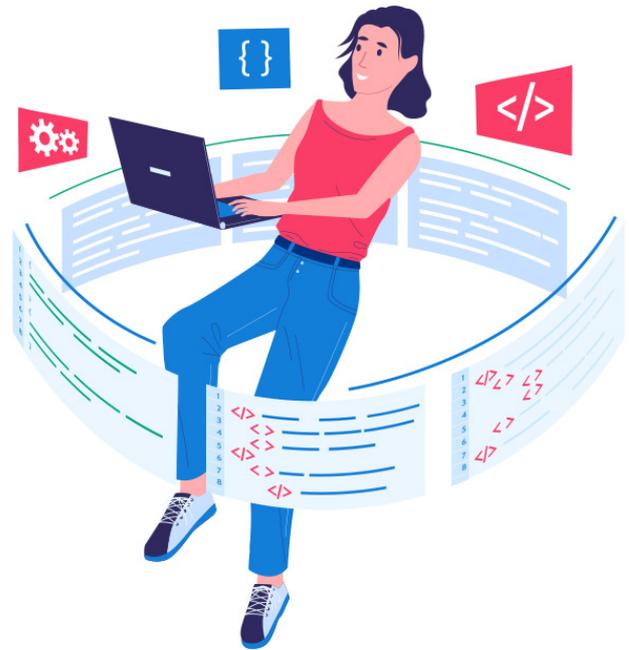
	Eclipse Temurin (JDK 8, 11, 17+)	IBM Semeru Runtime Open Edition (JDK 8, 11, 17+)	IBM Semeru Runtime Certified Edition (JDK 11, 17+ LTS only)
<b>Platform support</b>	Windows, macOS, Linux, AIX, Solaris	Windows, macOS, Linux, AIX	Linux, AIX
<b>Licence</b>	GPLv2 + Classpath Exception	GPLv2 + Classpath Exception	IBM
<b>Java SE Certified</b>	Yes	No	Yes
<b>No-cost personal use</b>	Yes	Yes	Yes
<b>No-cost commercial use</b>	Yes	Yes	Yes
<b>No-cost security updates</b>	Yes	Yes	Yes
<b>Download location</b>	Eclipse Adoptium website and working group marketplace	IBM Semeru Runtimes website	IBM Semeru Runtimes website and Eclipse Adoptium working group marketplace
<b>Optional IBM support for LTS versions</b>	Yes, through IBM Runtimes for Business	Yes, through IBM Runtimes for Business	Yes, through IBM Runtimes for Business

## JAVA'S BROAD APPEAL THAT STILL MATTERS

We are in a time of great change within the software development industry. New platforms and paradigms, such as mobile, cloud and the Internet of things, have presented developers with new possibilities, new requirements, new technologies and architectures. Developers themselves have changed in recent years, evolving into even greater polyglots who move between different programming languages. Traditional languages such as Java, along with traditional development tools and environments, face competition.

Despite competition from alternative software development languages, Java's portability and support from the open-source community, as demonstrated by the OpenJDK project, along with its ecosystem of industry-wide contributors, is why this 26-year-old software development and delivery language continues to be widely deployed and popular.

The Java programming model remains one of the most widely used programming languages, with millions of developers and a sizeable and vibrant ecosystem. The Java language regularly polls highly in surveys of popular programming languages conducted by the Cloud Native Computing Foundation and Stack Overflow, a public



question-and-answer website for professional and hobbyist programmers.

Many of the benefits that underpin the Java programming model explain its widespread use in organizations across the market landscape:

A large and open community-driven ecosystem of widely adopted supporting tools, frameworks and integrated development environments.

A vibrant developer community – perhaps the largest for any single language.

Committed contribution and support from many of the leading industry software vendors and service providers.

Support from many new technologies and platforms, including public cloud platforms; most modern services will offer software development kits (SDKs) for easy integration using Java.

The language is easy to learn and read, unlike alternatives such as C++.

A good fit for object-orientated programming, breaking applications into small functions that can be reused to create more maintainable code.

It can be used on multiple platforms from desktop PCs to infrastructure servers, cloud platforms and edge devices such as connected products and wearables. Java has run on nearly every mobile phone from the device's inception.

The Java programming language continues to be part of the core curriculum of most computer science degree courses.

With Java now a mature language supporting many common development requirements, especially in enterprise settings, there are many Java developers with significant years of experience, making hiring easy whatever the organization or its location. Given its benefits and level of adoption, Java-based programming will remain relevant for many decades to come.

The Eclipse Adoptium community is driving innovation and sustainability for the Java platform and limiting the lock-in

that can come from using a proprietary environment. And with major supporters collaborating within the working structures of Eclipse Adoptium, there will continue to be long-term support for Java on both traditional platforms and new emerging environments. This only serves to re-enforce the necessity for organizations to carefully consider the opportunities open to them for maintaining and progressing their Java investments.

## IBM's Java credentials underpinning IBM Semeru Runtimes

IBM has been a supporter of the Java programming language and technologies since it was released and has offered numerous products for customers to run and build Java applications. Its WebSphere Application Server, first released in 1998, has been a well-known Java web server and a stalwart middleware platform for running Java applications. Much of IBM's software portfolio has been built on or supports Java.

This has not changed as the world has moved to cloud. IBM has continued to not only support Java in its own cloud offerings, but has enabled traditional Java environments such as the WebSphere platform to move to the cloud through initiatives such as IBM Cloud Paks, which simplify the migration process, running WebSphere in a containerized environment on cloud platforms.

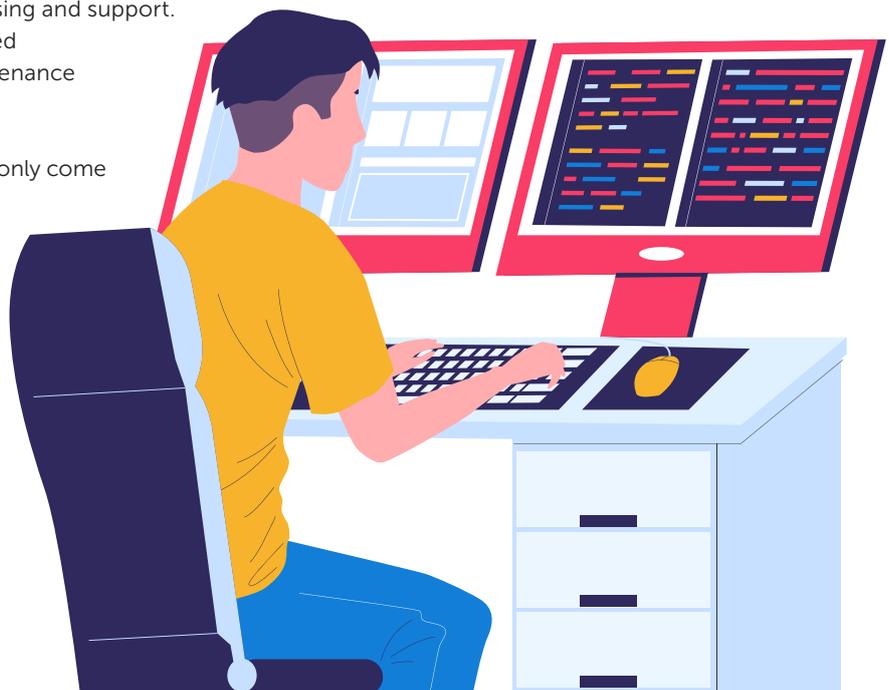
### IBM RUNTIMES FOR BUSINESS: A COMPETITIVE ALTERNATIVE COMMERCIAL SUPPORT PROGRAMME

IBM Runtimes for Business was launched in 2018 to combat Oracle's changes to Java licensing and support. It continues to offer competitively priced and favourable Java support and maintenance licensing terms.

Reassurances of support capability can only come from those with the credentials for delivering support services that reflect expert insights and community influence for resolving technical problems in a timely manner. In this regard, IBM's heritage in contributing to the open-source community demonstrates proven commitment, but also sage insight into the commercial opportunity and benefits that can be delivered through such a strategy.

Enterprises need to see that there is a sustainable business model to ensure that the support services continue to be

maintained. Crucially, IBM Runtimes for Business reflects a supplier that understands how enterprises in particular need more than the promise of free software.



## A VALUED ALTERNATIVE

In providing an alternative offering to Oracle's support services, IBM is taking the opportunity to present to those organizations not willing or able to subscribe to Oracle's new licensing directives, scope for choice and continuation.

Specifically, it features the following sought-after attributes:

**1 Flexible** — It offers the ability to pay only for the environments where defect support is required, but also retain free access to security updates and critical bug fixes.

- IBM Semeru Runtime comes in Open Edition and Certified Editions; both have a paid-for option within Runtimes for Business support services, which provides commercial defect support licences. Clients need only purchase support for those mission-critical instances where they require a range of support offerings (defect, phone, and so on), for which they buy IBM Runtimes for Business support.

- Licensing is priced differently for desktops and for servers, along with access to "perpetual" licensing that front-ends support in the first year with a lower recurring cost, which means a lower overall cost after three to four years. There is also provision for term licensing, and the number of licences can be adjusted at certain times of the year to account for varying workloads.

- Licences are not tied to a particular Java release or even Java runtime: each licence can be used to support a deployment using Eclipse Temurin or IBM Semeru Runtime Open Edition or IBM Semeru Runtime Certified Edition with Java 8, 11 or another version.

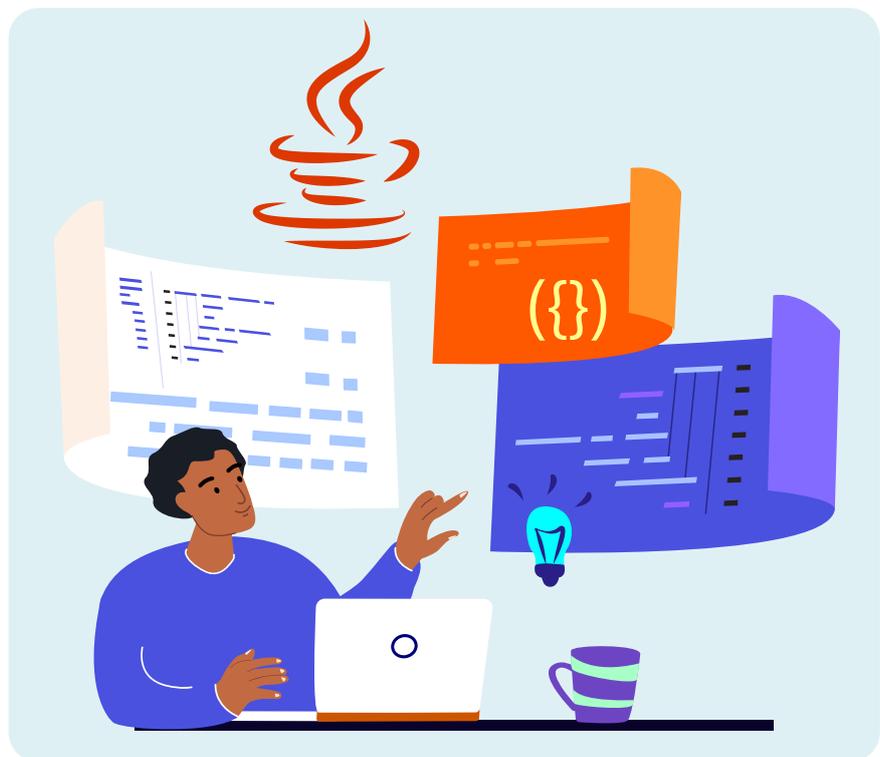
**2 Open** — It is based on open-source OpenJDK binaries from the Adoptium project's Eclipse Temurin 8+ (OpenJDK HotSpot build) or IBM Semeru Runtime Open Edition (open-source OpenJ9 build).

- IBM makes Semeru Runtimes updates and releases available on a quarterly basis at no cost, for Open Edition as well as Certified Edition.

- Customers are able to replace Oracle Java JDK with Eclipse Temurin or IBM Semeru Runtime Open Edition across their entire deployment. Clients get the benefits of free updates without incurring significant costs for something that was free before.

**3 Efficient** — It uses the high-performance runtime characteristics of the OpenJ9 engine with the ability to monitor and manage Java application resources. IBM promotes the OpenJ9 engine because:

- It has a 66% smaller footprint, is 42% faster at start-up, is three times faster to peak performance in a constrained environment, and achieves this without sacrificing overall throughput. This ensures a 100% throughput performance so that developers and enterprise IT teams can experience performance improvements across the whole application lifecycle.



- It supports cloud-focussed features such as container awareness. It offers a range of shared cache capabilities for Docker-based images and layers, as well as support and accelerators for IBM Power and z15 hardware.

- The support of a just-in-time (JIT) server separates the JIT compiler component from the JVM and operates it as an independent service for use in all kinds of Java

deployments. However, it is especially suited for running microservices in Kubernetes pods, where an independent JIT server can be used to increase application density and therefore reduce the cost of larger-scale Java deployments.

- There are plans to support Apple silicon using the ARM64 architecture, as well as the CRIU capability of Linux to snapshot and restore application processing, allowing “instant on” without constraining the user experience or limiting programming operations.

**4 Backward compatible** — IBM is offering an impressive backward compatibility pledge, which will see it ensure that from Java 8 onward all versions of the underlying JRE based on OpenJ9 will have the latest capabilities implemented.

- This important value proposition provides a level of stability and flexibility that ensures customers can move when they feel ready to do so.

**5 Support** — IBM offers access to a comprehensive support package that goes beyond runtime support, bundling in IBM’s Application Performance Management software for monitoring and managing the Java application.

- This significant value-add gives enterprises the ability to not only obtain runtime support but also monitor how their OpenJDK-based Java applications are performing. It includes application resource usage, allowing them to take proactive measures in how their customers are experiencing the capabilities offered by their Java applications. With the additional performance monitoring software, organizations can safeguard against outages in customer services and experience.

- The support services benefit from IBM’s many years of experience in supporting Java for Fortune

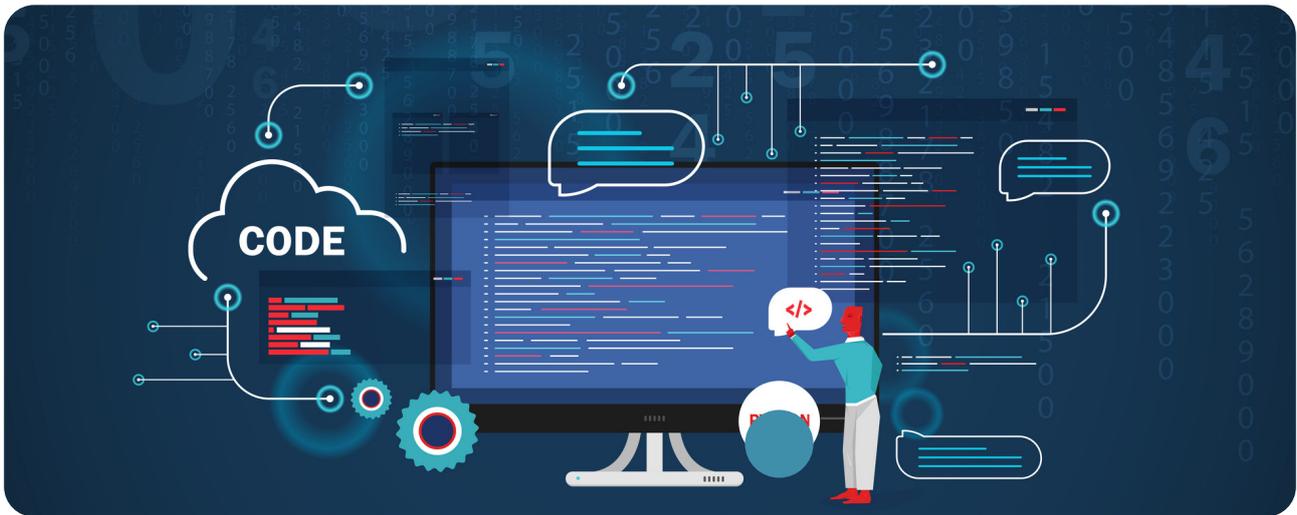
500 clients and enterprise IT teams. The company is well-versed in the nuances of support, with over 3,000 IBM products shipping with IBM SDK for Java technology. IBM Runtimes for Business offering includes consultation and guidance services to help people shift their Java workloads to IBM Semeru Runtimes or Eclipse Temurin, as well as to tune for the OpenJ9 JVM.

- IBM platforms and software products that bundle IBM SDK for Java (or IBM Semeru Runtimes) are not affected by Oracle’s licence changes and will continue to operate with no additional cost. This applies to IBM products such as Power, AIX, LinuxOne and z/OS servers along with WebSphere, SPSS, CICS and other products. All will obtain supported security updates and fixes at no additional cost.

**6 Cost-effective** — IBM offers free Java with security updates and bug fixes, coupled with the option of paying for support only where it is required.

- IBM’s pricing structure is like Oracle’s, but can work out costing less. An important differentiator is that Oracle requires a licence fee for every installation of Oracle Java, except development usage; IBM allows a subset of supported installations, with others enjoying community-level support.





## Conclusion

Many organizations are going through a digital transformation that includes an audit of their applications to see which may be suitable for migrating to cloud platforms, which are no longer needed, and which could be replaced. These audits can identify Java applications that are no longer required or that can be replaced by alternatives that use OpenJDK offerings, for which there is no licence fee.

Reducing the number of applications affected by licensing changes may help organizations to select more cost-efficient support licensing terms and pave the way for a move to OpenJDK and community-delivered choices.

That said, many enterprises will require some form of commercially licensed dedicated support. The urgency of some business operations and a need for stability and resiliency means that they cannot rely on the community to meet their support needs.

Organizations need a clear understanding of the Java build and certification process, along with the community engagement model, if they are to select appropriately from the different open Java development and runtime options available. Just as important, they must ensure that their

selection offers the flexibility and sustainability to continue to make best use of their Java investments. It will be an opportunity to safeguard and maximize the technology's capability and make use of developer skills in a wider digital transformation framework and strategy.

IBM's heritage of supporting and contributing to open-source software communities highlights its commitment to sharing expertise and insights in order to strengthen and progress a technology's capability and value to the market.

The company has long provided its own JDKs. However, as a key contributor to and member of the AdoptOpenJDK community, IBM has supported that community's OpenJDK builds using the HotSpot and OpenJ9 JVMs. In supporting AdoptOpenJDK's transition to the Eclipse Adoptium project, IBM understands the different priorities of enterprise customers. Most want not only the reassurance of familiarity through standardization, but also a path toward improved performance and innovation.

Having helped establish Java from its early days, IBM has demonstrated an influential role in helping Java solidify its future both through Eclipse Adoptium and its own IBM Semeru Runtimes.

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