JVM Ecosystem Report 2018

A snapshot of the JVM landscape

snyk

Java magazine

By and for the Java community

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Introduction

Welcome to the largest survey ever of Java developers. The data presented in the following report was taken from more than 10,200 questionnaires. If you were one of those survey-takers, many thanks to you for putting aside the time to share your experience for the benefit of others.

The survey was conducted by publishing its availability to the Java community at large (via social media primarily), to Java User Groups around the world, including the Virtual JUG, and to subscribers of *Java Magazine*, the Java bimonthly publication from Oracle Corp. As an inducement to complete the survey, a contribution to Devoxx4Kids was promised by the sponsors of the survey, Snyk and Oracle.

Devoxx4Kids organizes events worldwide where children can develop computer games, program robots and also have an introduction to electronics.
Their goal is to introduce teenagers to programming, robotics and engineering in a fun way, to show teenagers that it is possible to do something more creative with computers.

Information regarding respondents, including geographical location, company size of their employer (if any), age, and experience with Java are presented at the end of this survey.

We appreciate constructive feedback and comments, especially regarding our analysis. If you would like to be contacted to participate in any future installments of this survey, please let us know. We hope you enjoy reading this report and can glean some useful insights from its findings.

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TL;DR: Report Highlights

Before we start, this is a fairly long report, so here's a TL;DR overview of the main highlights.

ORACLE

7 in 10 developers use the Oracle JDK in production

OpenJDK

2 in 10 developers use OpenJDK in production

Java 8

8 in 10 developers use Java SE version 8 in production

IntelliJ IDEA

9 in 20 developers now use IntelliJ IDEA

Maven

6 in 10 developers use Maven to build their main project

Jenkins

Almost **6 in 10 developers** use Jenkins in CI

git

Almost **3 in 4 developers** use Git as their SCM

JUnit

Almost **8 in 10 developers** use JUnit

spring

4 in 10 developers use Spring Boot

HIBERNATE

Over **1 in 2 developers** use Hibernate in their applications

4 in 10 developers use use Tomcat in production

19 in 20 developers use open source dependencies in their application

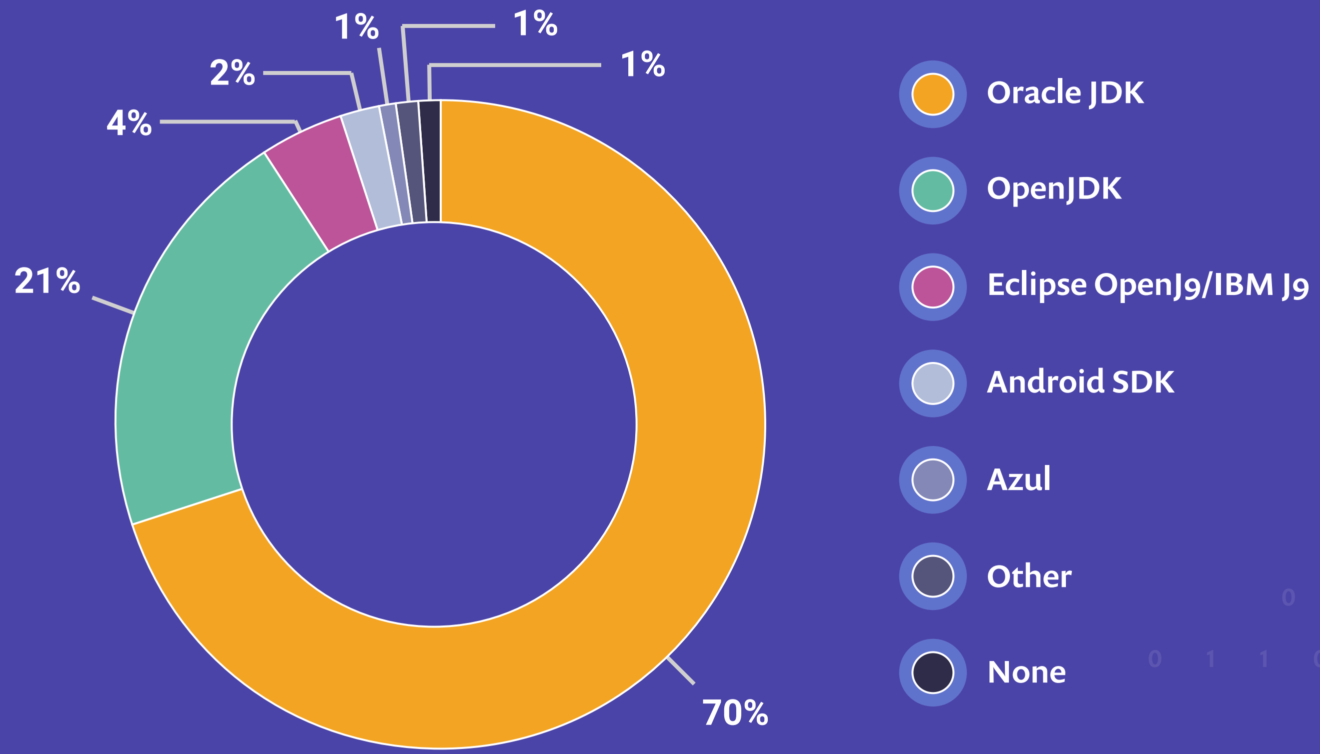
01

About your JDK

01. Which Java vendor's JDK do you use in production for your main applications?

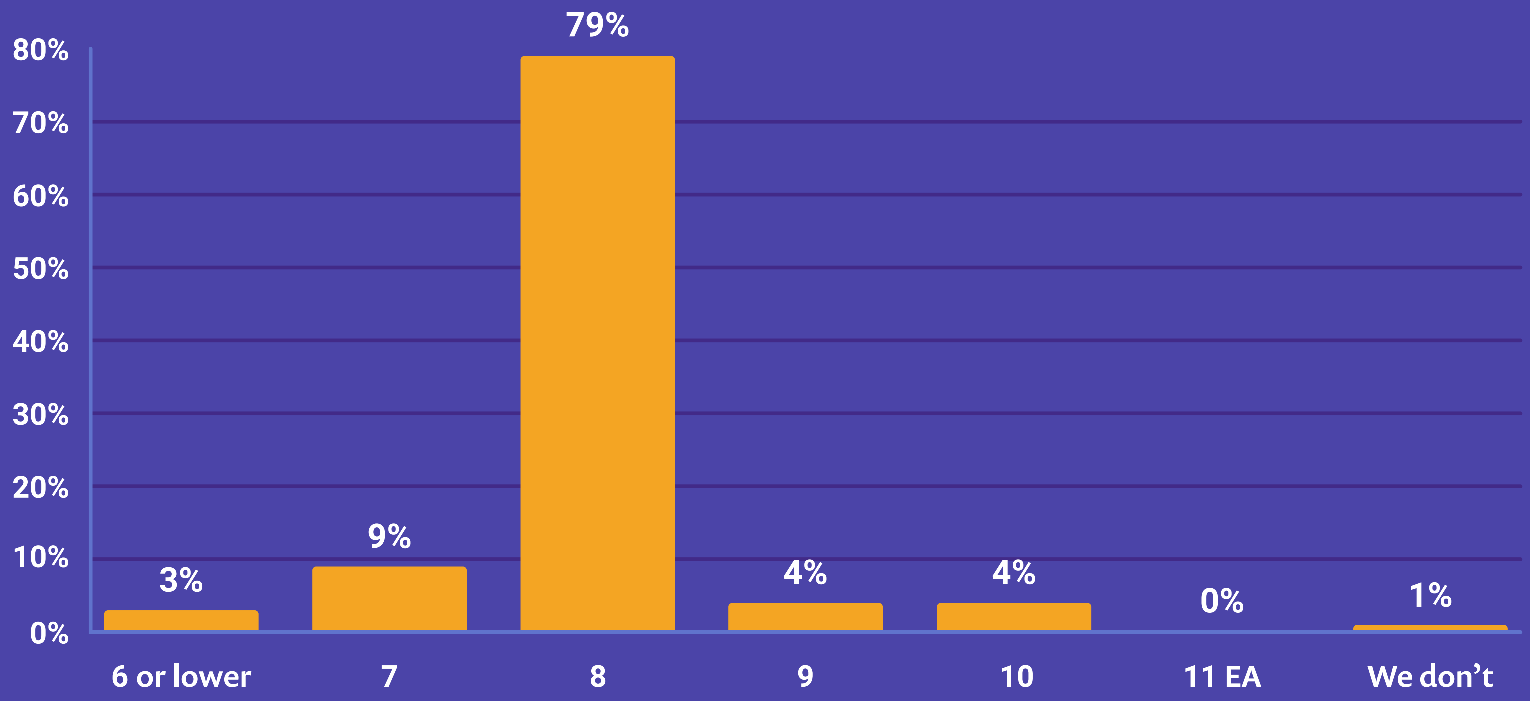
We start the report with a core question. With so many vendors providing their own JDK implementations, which offerings are developers using in production for their applications?

We can see the dominance that Oracle JDK and OpenJDK have over everyone else. With 7 in 10 developers opting to use the Oracle JDK and a further 2 in 10 opting for the OpenJDK, there isn't much competition. However, future licensing and support changes might cause these numbers to change in the future.



02. Which Java SE Version do you use in production for your main app?

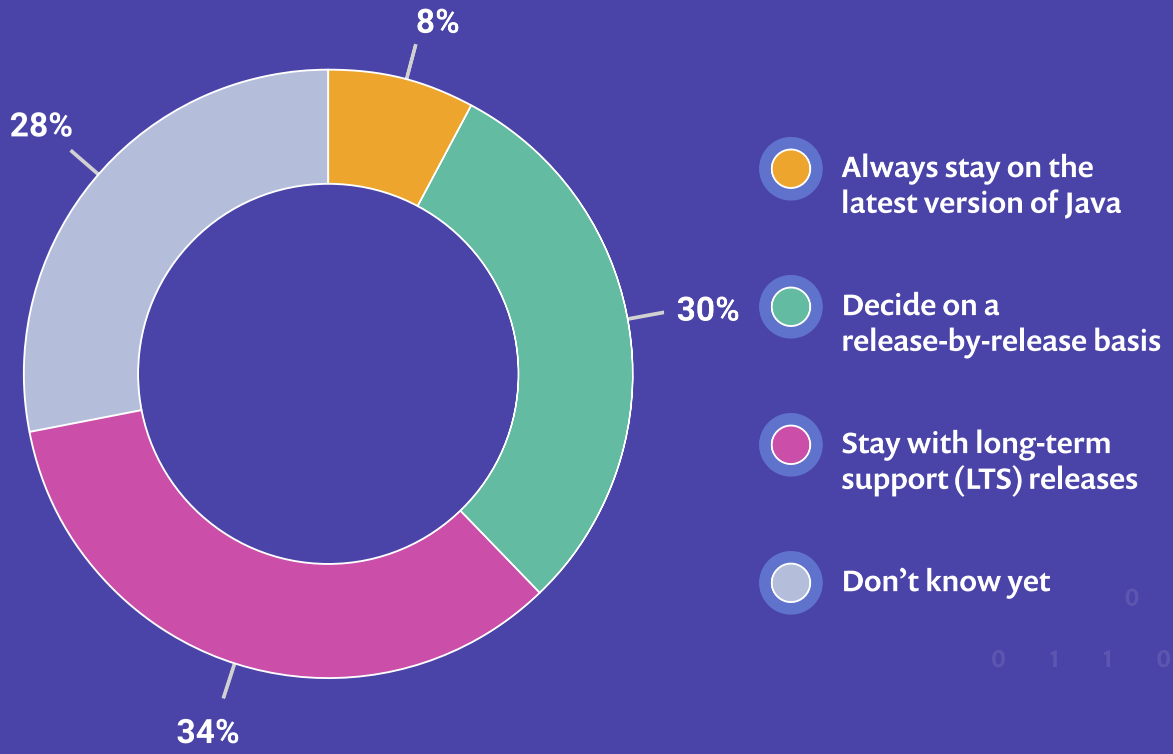
There were significant structural changes to the JDK in Java 9 which many predicted would affect migration and adoption. We can see from the results (note that the survey was open midway between the releases of Java 10 and Java 11) that Java 8 is still the most dominant version of Java--almost 8 in 10 respondents say their main applications use it in production. Equally significant is that fewer than half the remaining non-Java 8 respondents are on a more recent version.



03. How do you plan to respond to Java's new release cycle?

While the Java 9 release brought with it some major architectural changes, it also introduced a new release cadence in which Java SE versions ship every six months. Every two to three years, a Long Term Support (LTS) release offers longer-term support, such as security updates, and so forth. Note that Java 9 is not an LTS release. This question asks how development teams will respond to this new release cadence. The responses were varied, suggesting there is still some uncertainty about how to proceed. In fact, almost 1 in 3 developers don't yet know how they will respond to the new release cycle.

We expect that in the forthcoming year, best practices will emerge and companies will settle into a preferred migration cycle, which likely will vary considerably by industry. As a result, we expect that the "Don't know yet" figure will drop, but we don't know which of the other buckets will see increases.

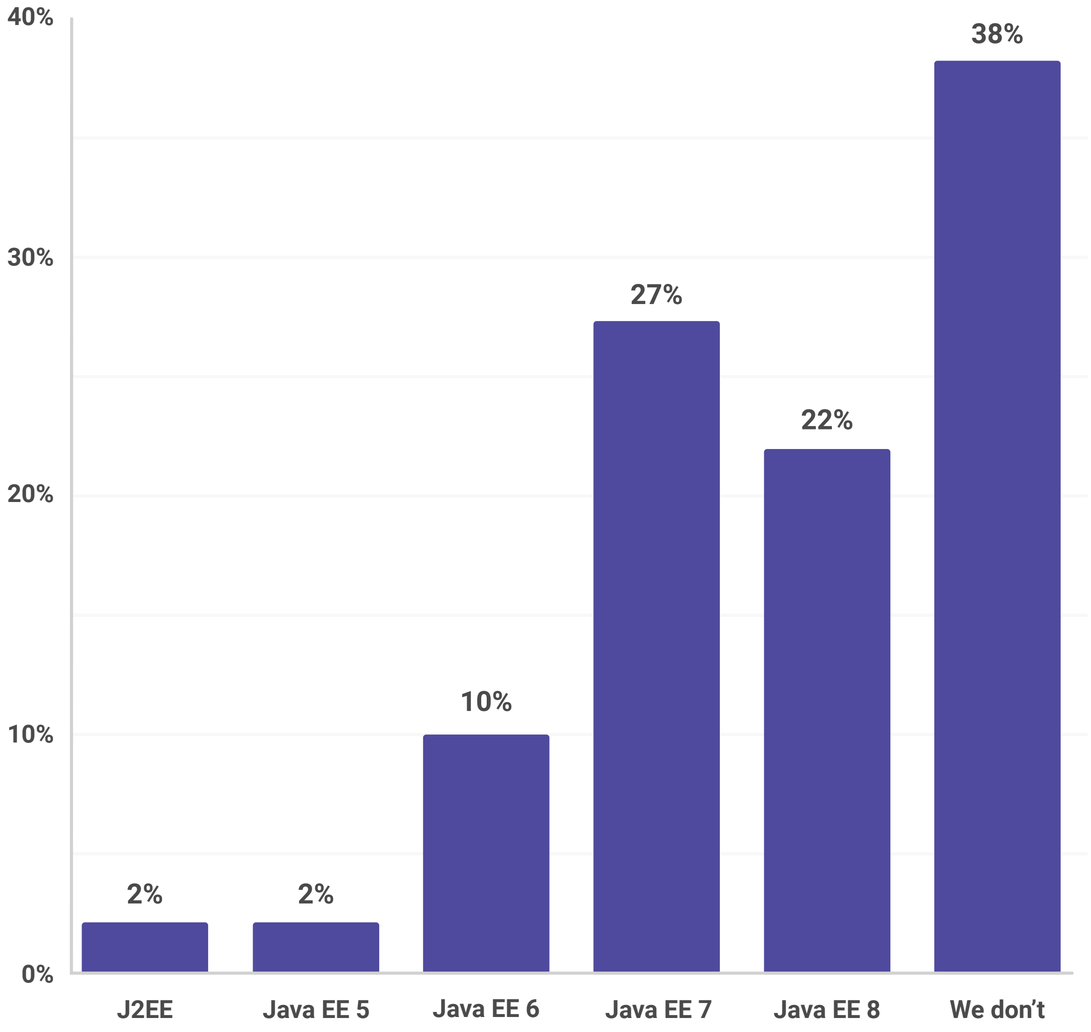


04. What Java EE version do you use for your main application?

Almost 4 in 10 respondents claim they do not use enterprise Java. Of those who do, the majority are on version 7. Java EE 8 was released in September 2017, so it's promising to see that within less than a year of release it is almost the most popular version.

Unlike Java SE, a release of Java EE takes a longer to be adopted because it takes longer for implementations to become available.
In addition, app server vendors require time to adopt and implement the specifications.

We'll be keen to see how these numbers shift as Jakarta EE 8 begins its rollout and adoption. We should spare a thought for the 2% who are struggling on J2EE--a version whose last major release was in 2003.

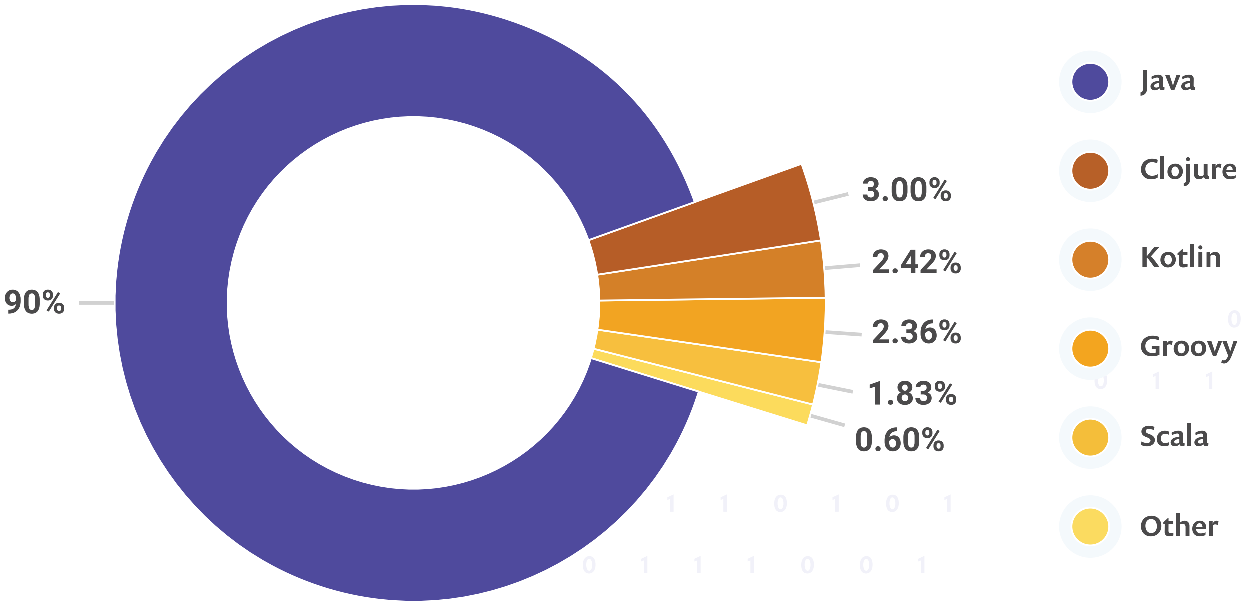


05. What is the main JVM language you use for your main application?

Exactly 9 in 10 JVM users are using Java for their main applications. While many projects today are defined as multilanguage or polyglot, the part on the JVM primarily runs Java.

Despite this strong preference for Java, JVM-based developers have consistently shown great interest in other JVM languages, as supported by the popularity of articles about them in Java Magazine and on major programming sites. For the last few years, the emerging and "hot" JVM language has been Kotlin, from JetBrains, which continues to make steady progress. It is now a supported language for development on Android, and it is the second major language for writing scripts for the build tool Gradle (behind Groovy). All this adoption has move Kotlin past Scala and just past Groovy in our survey.

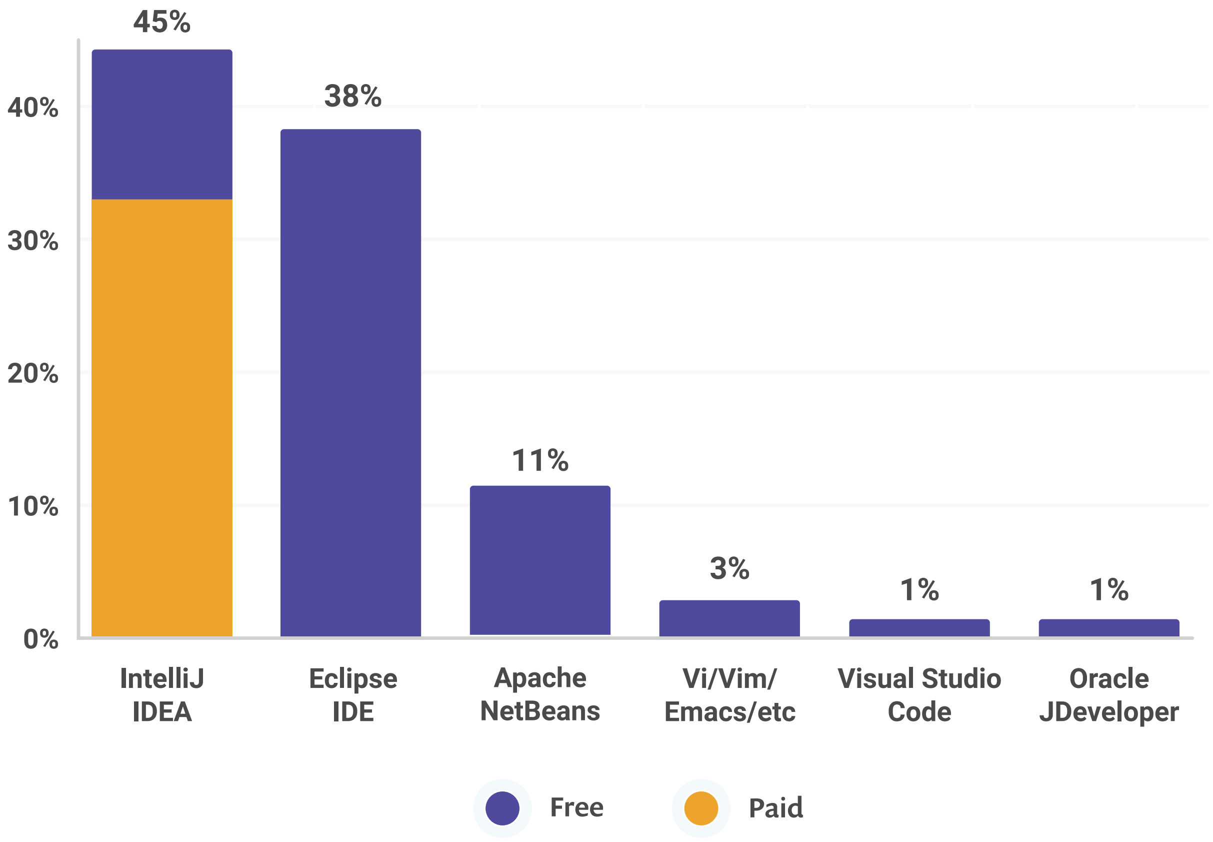
The 3.0% figure for Clojure is remarkably high and signals--to us at least--the continued interest in functional programming. The functional orientation of many Java 8 features shows the imprint of functional programming on Java itself.



02

About your tools

06. Which IDE do you develop with?



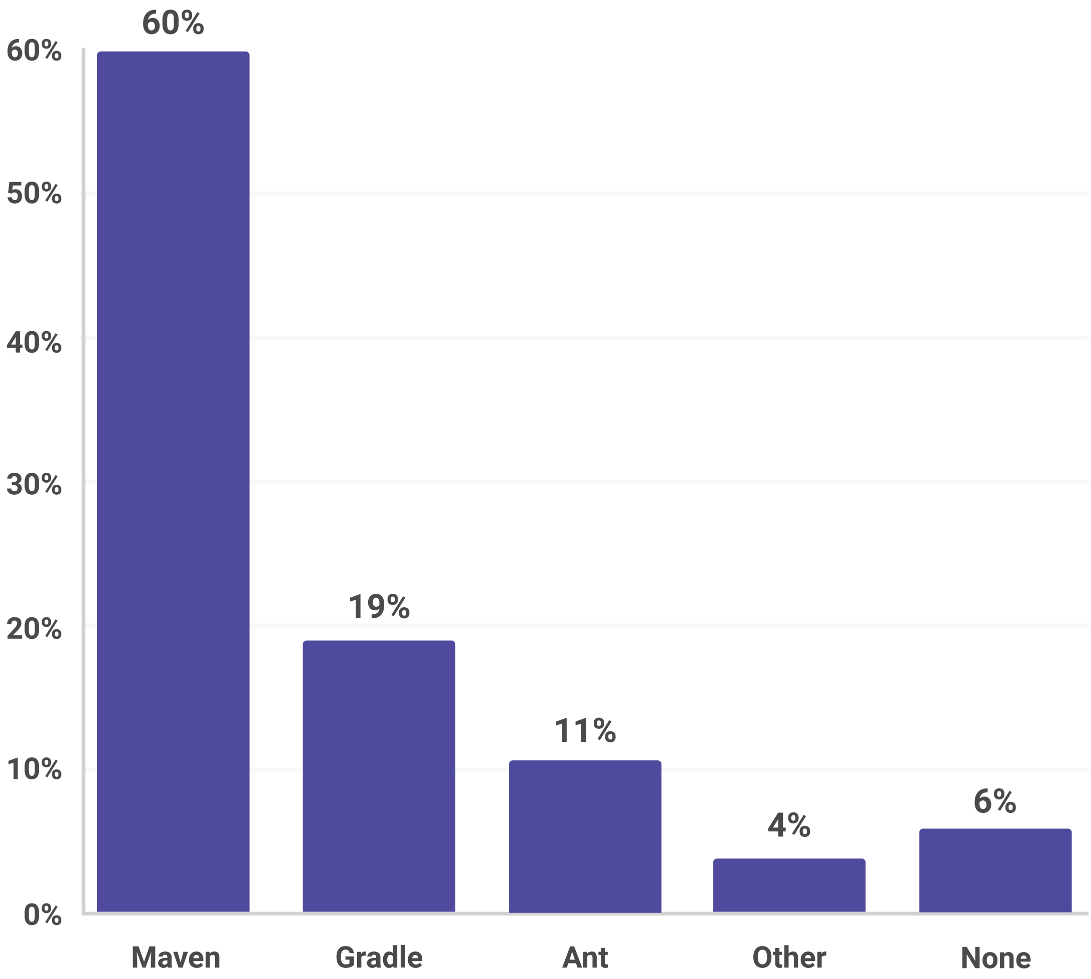
The graph here is consistent with other recent surveys: IntelliJ passing Eclipse in the last one to two years, and Apache NetBeans staying at around 10% of the market. The 45% total votes of IntelliJ consist of 32% IntelliJ IDEA Ultimate Edition (the paid version), 11% IntelliJ Community Edition (the free version), and 2% Android Studio users. The Eclipse category includes Eclipse STS, JBoss tools, Rational Application Developer and other Eclipse-based tools.

The numbers of Apache NetBeans users haven’t altered much which suggests that the migration from Oracle to the Apache Software Foundation hasn’t affected its user base. It’s also worth mentioning that Visual Studio Code has made an appearance, which although is only 1%, shows it’s starting to make its mark in the Java community. Also, a tip of the hat to the ‘vi/vim/emacs/etc’ group who are probably reading this report on a tablet (carved out of stone).

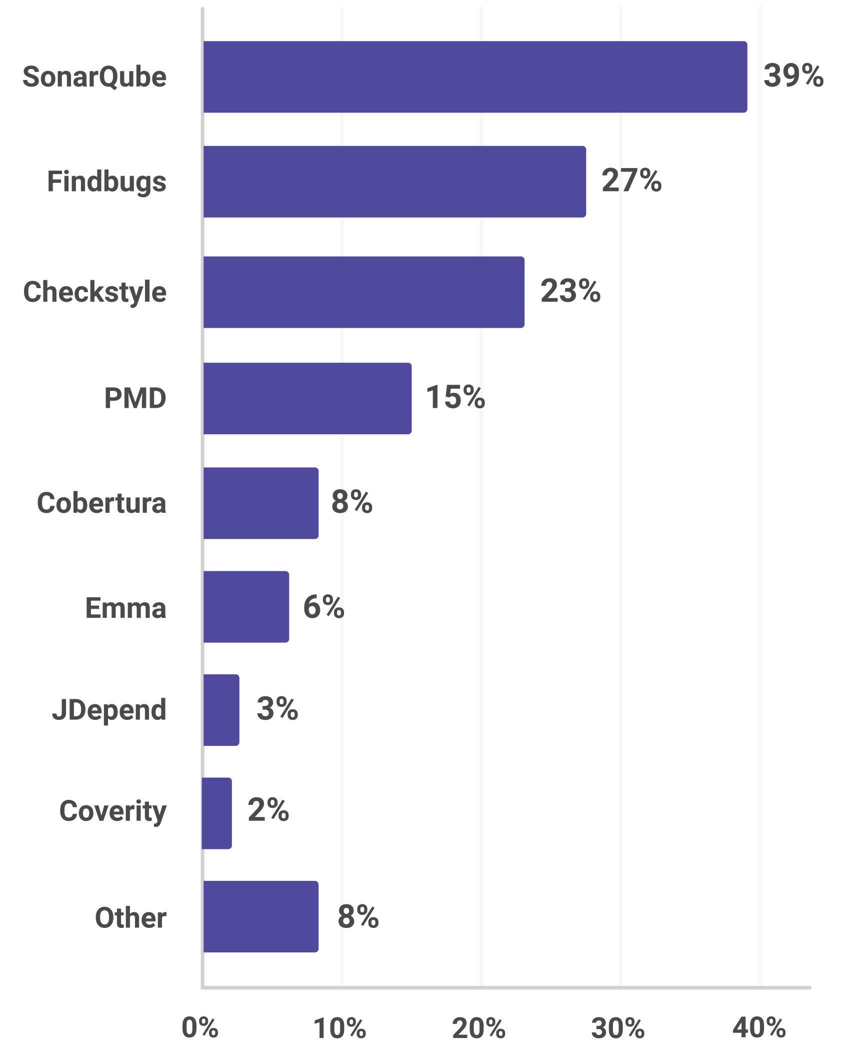
07. Which build tool do you use for your main project?

In examining the numbers, it's important to note that we asked for the principal build tool used. We want to know which build tool you rely on for your main project. It can also be interesting to know which build tools teams use across all their projects, but the plethora of answers tends to dilute the usefulness of the responses. As we can see here, Maven clearly dominates with a 3:1 ratio over it's closest rival, Gradle. Ant is still in use by 1 in 10 developers, whereas 1 in 20 use nothing!

In a 2016 version of a similar survey by RebelLabs (2,000 respondents), Maven stood at 68% and Gradle at 16%. Gradle's improved adoption rate is due perhaps to the addition of support for Kotlin as the scripting language. Gradle is also the default build engine for Android projects. However, its progress against Maven has been slow.



08. Which Static quality tools do you use?

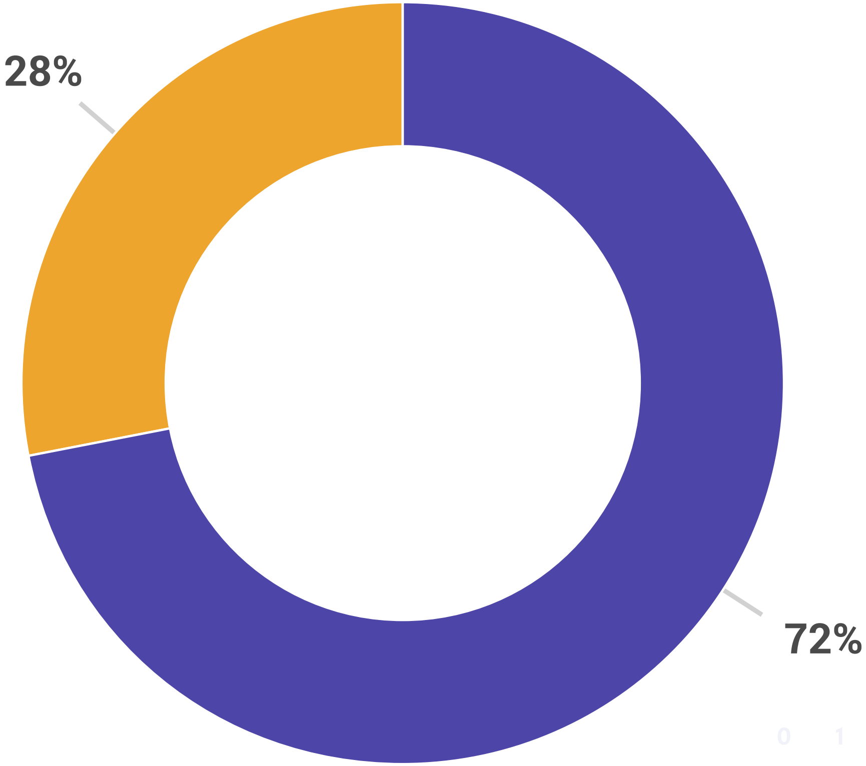


Before you send that email or tweet trying to fix the internet, note that this is a multiple choice question so numbers here are not do not add up to 100%. One take away from this data is that there are really only a handful of static quality tools in popular use, with no real surprises at the top: SonarQube, Findbugs, and Checkstyle dominate.

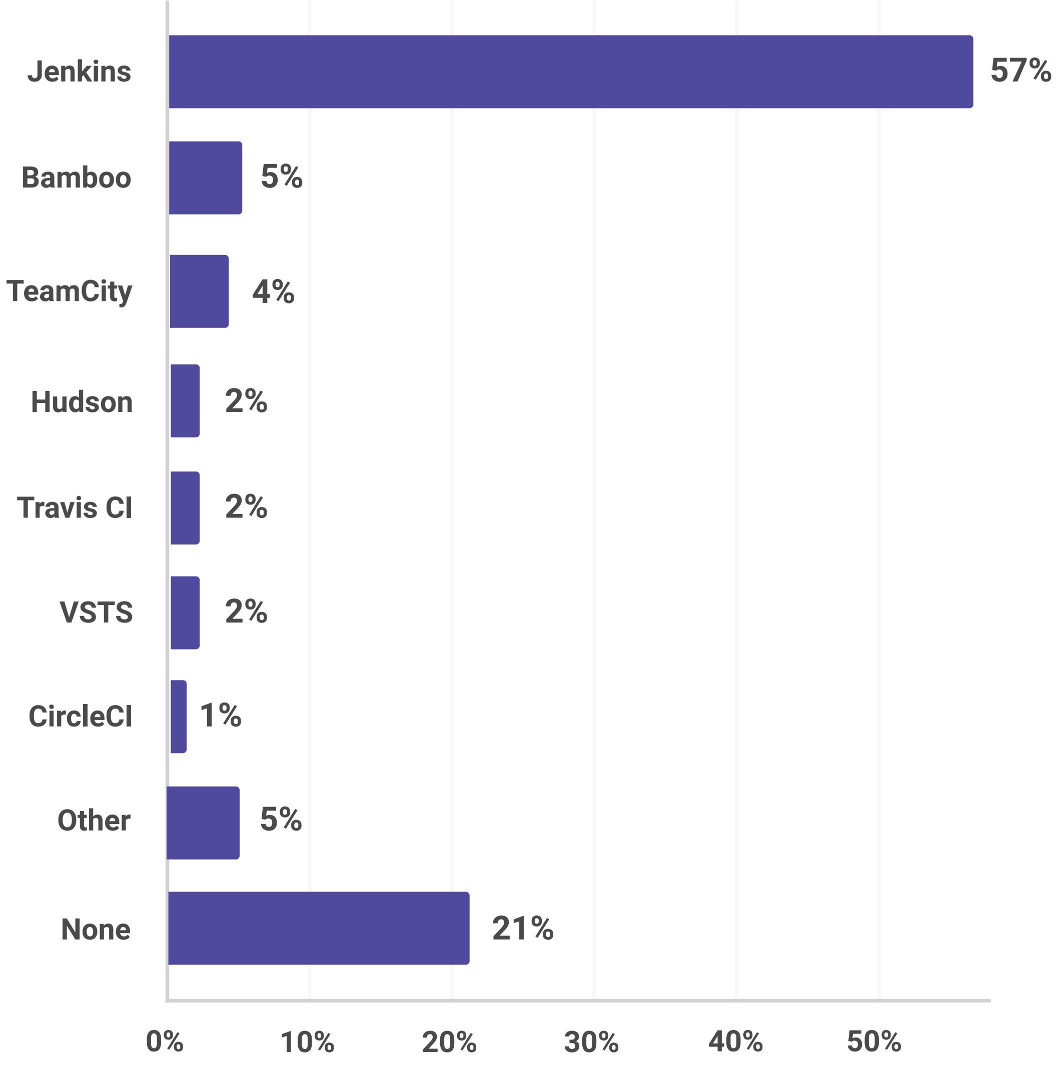
Possibly most surprising is that 36% of respondents don't use any static quality tool whatsoever. This is most surprising as we expect that static quality tools are the norm.

09. Do you use static security tools in your testing?

Security testing is becoming a hot topic, that is headlined by significant breaches across many different companies. Yet, still today, most sites do not use any static security tool whatsoever. In fact 72% of respondents, almost three-quarters, don't use any static tooling anywhere in their pipeline, potentially leaving them open to known vulnerabilities. We hope a wider adoption of security tools will appear in future surveys.



10. Which CI Server do you use?

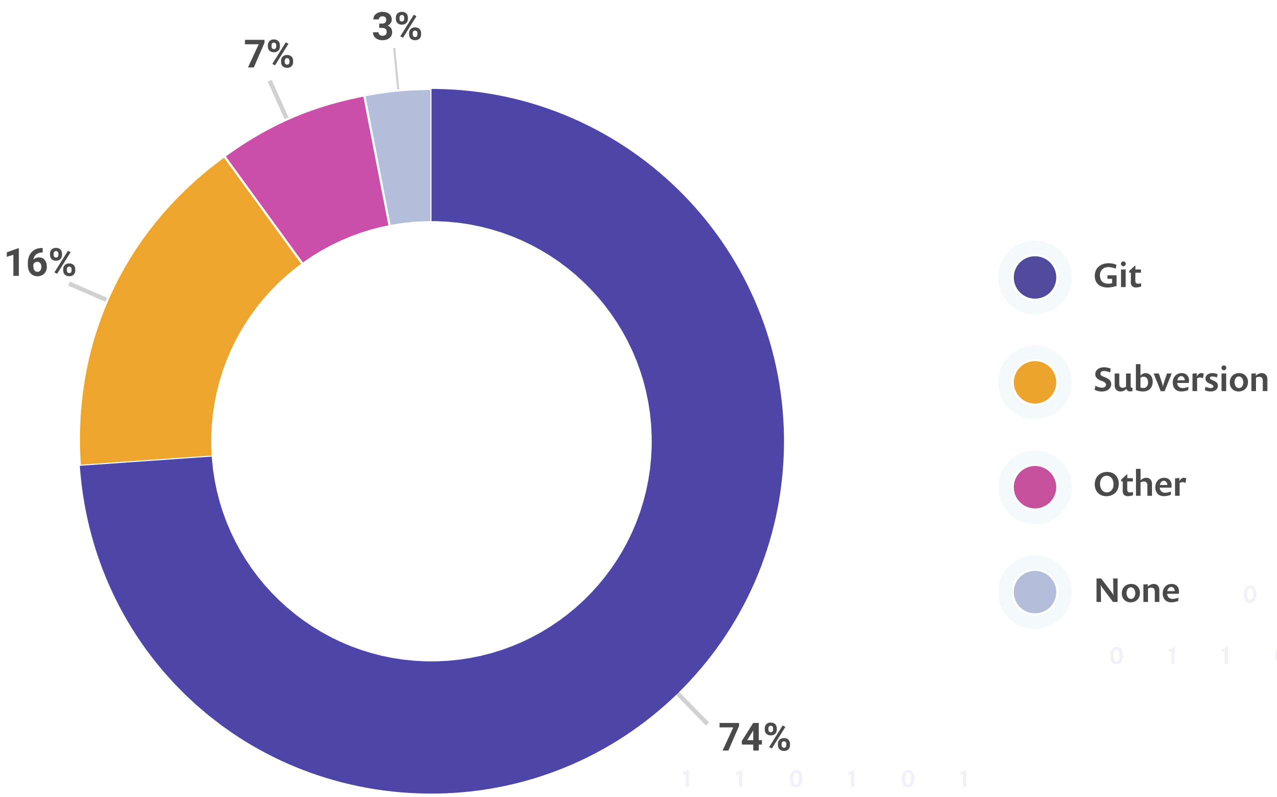


As most developers would expect, Jenkins wins the CI server race with a whopping 57% market share. It's closest competitor is "none" at 21% of the vote, which almost matches the rest of the competition combined (at 22%). The remaining CI servers have less than 5% of the market share each, with Hudson, the elderly relative of Jenkins, struggling on at 2%. It's worth mentioning VSTS, Microsoft VSTS (Visual Studio Team Server), which is not usually thought of in the Java/JVM space, clocks in at 2%.

Most developers, we believe, expect that nearly all sites today use continuous integration. So, it's startling to see that 1 in 5 applications do none at all. Even personal projects today use CI (such as Travis CI and CircleCI), which are made available on public project-hosting sites such as Bitbucket and GitHub. If you're one of the 21% who don't use CI on your projects, we'd love to hear why.

11. Which Source Code Management platform does your team use for your main project?

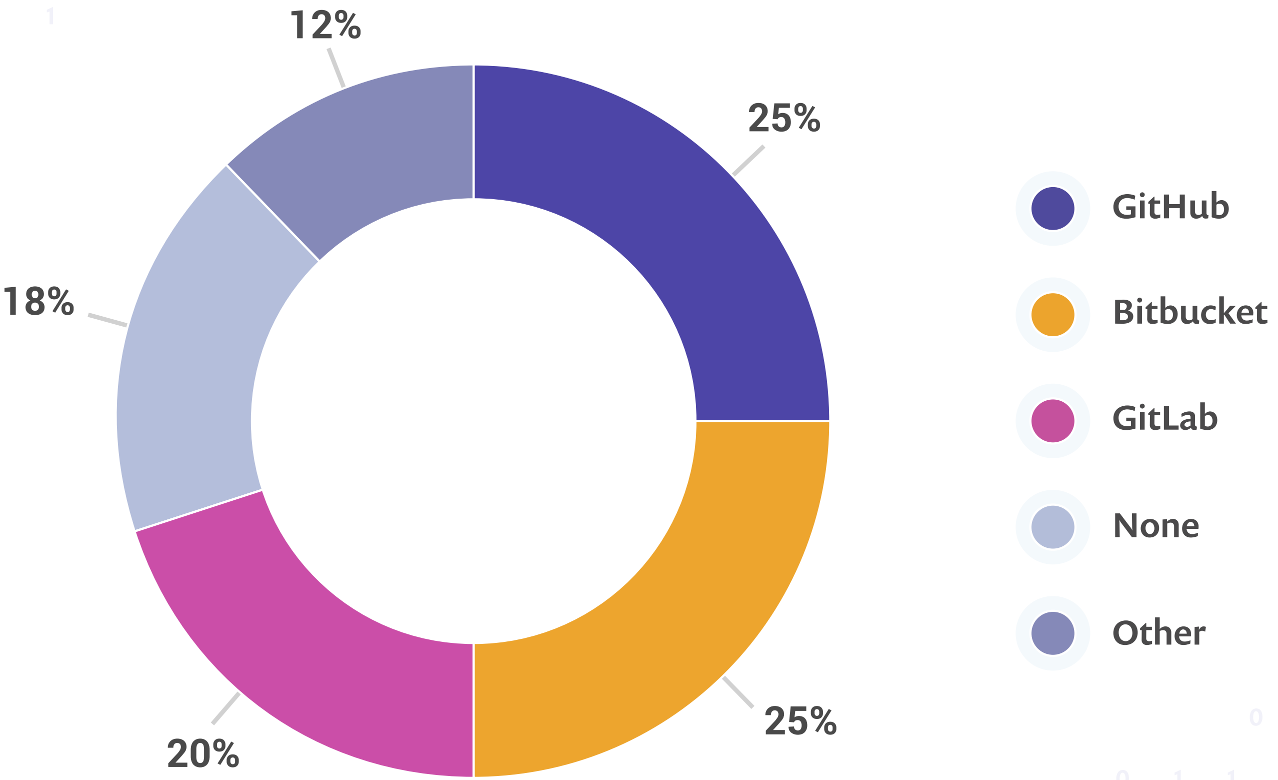
As expected, Git has convincingly won the horse race in source code management. If you were in any doubt as to the extent of its dominance, almost 3 in 4 of our respondents work in teams that use Git to manage their codebases. Subversion now covers the majority of the remaining respondents; and somehow in 2018, 3% of people still don't use source code management whatsoever. Sometimes, there are no words.



12. Which code repository do you use for your main project?

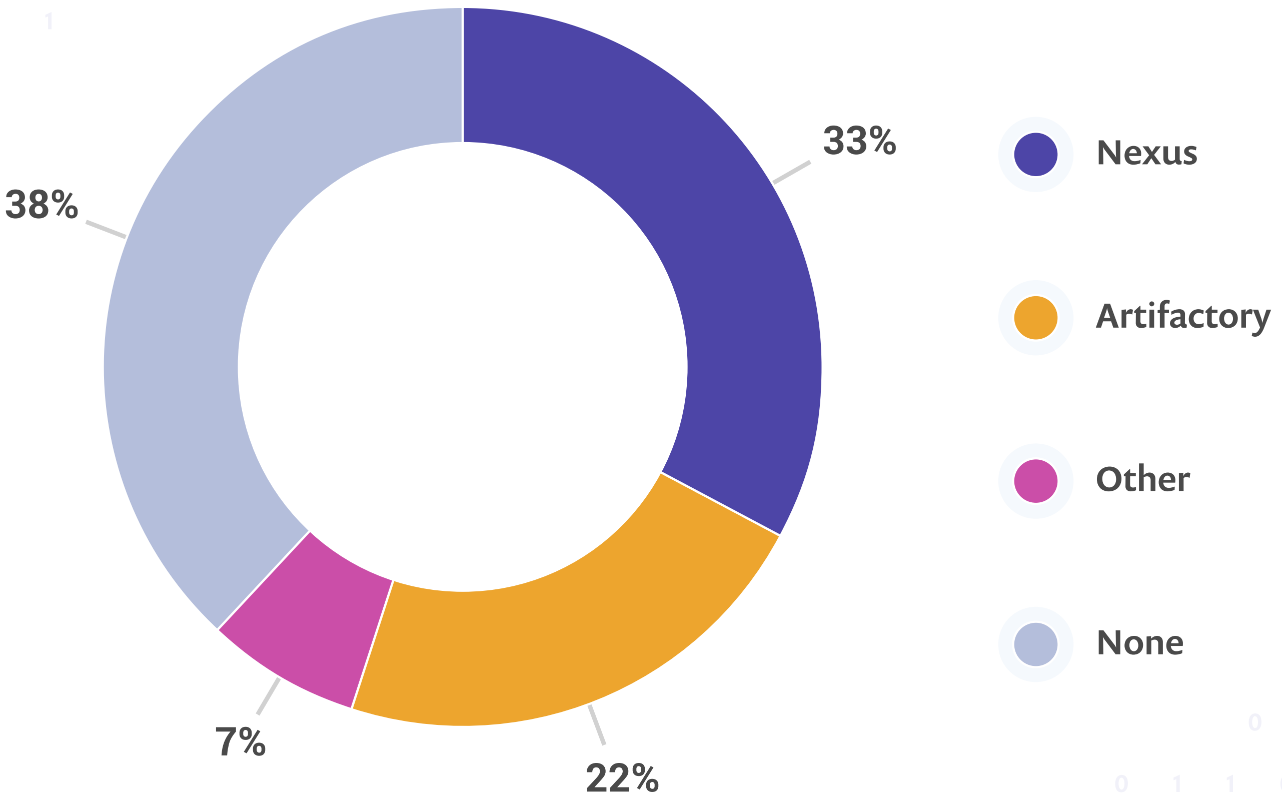
With code repositories, the story is quite different from SCM: much more spread out with GitHib and Bitbucket neck-and-neck at 25% each and GitLab close behind at 20%. We could call those, the "big three" of project hosting. Note that this question is not just for public projects (in which we expect GitHub would have a more significant lead), but also for public and private project hosting.

Microsoft's recent acquisition of GitHub might affect its future adoption rate and we'll know more in future surveys. Of the 25% share that GitHub has, just over half (52%) of those respondents are using the public version, whereas the remainder (48%) are using the private GitHub Enterprise on-premises offering. VSTS makes up part of the "other" bracket with 2%.

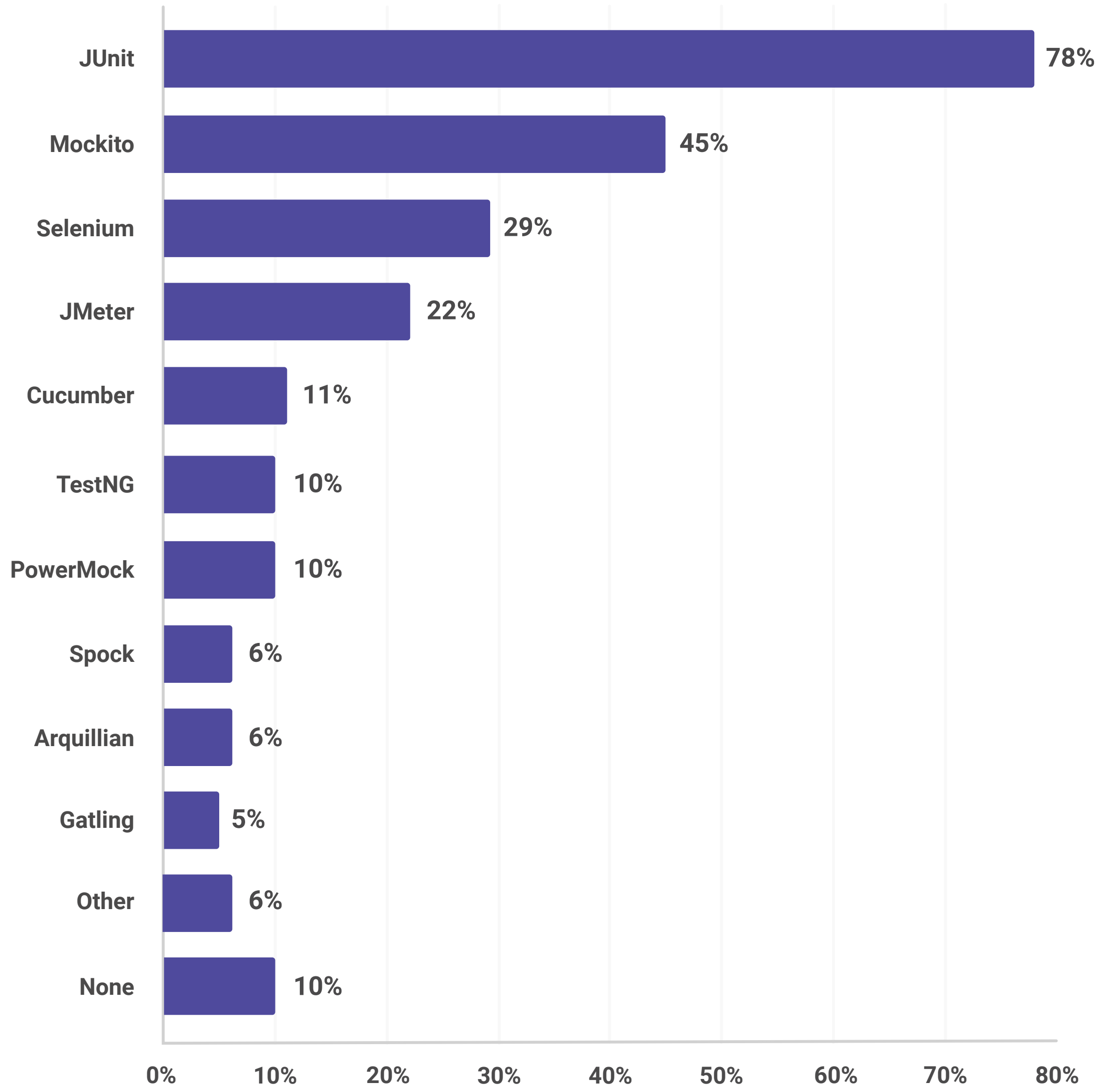


13. Which private binary/artifact repository do you use?

Most sites don’t use a packaged artifact repository--in theory because they don’t have the need. Those that like the convenience it offers choose the well established Nexus, which is heavily focused on the JVM ecosystem, followed by JFrog’s Artifactory, which is somewhat more popular across polyglot ecosystems.



14. Which testing technologies do you use?



With an amazing (almost) 4 in 5 people using JUnit and TestNG used by 10% more, it's clear that unit testing by far the most dominant testing practice in the JVM ecosystem. (Respondents could choose multiple answers, so totals exceed 100%.) As to mocking, it's now clear that Mockito has emerged as the preferred mocking framework.

With JMeter being used by almost 1 in 4 respondents and Gatling by 5%, we can see that the need for performance testing is becoming much better appreciated. Selenium takes an impressive 29%. Unlike the results for static quality tools, only 10% of respondents say they don't use any testing tool whatsoever.

Hang on… 1 in 10 people don't use a testing tool?! We should move on before we lose faith in humanity.

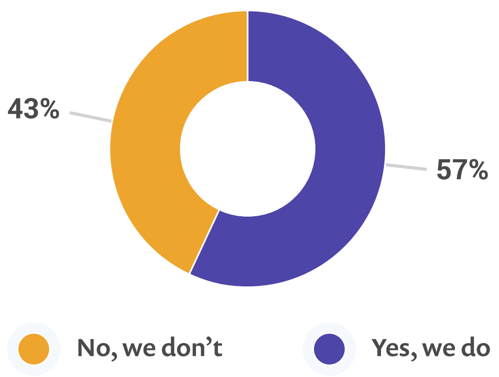
03

About your platform

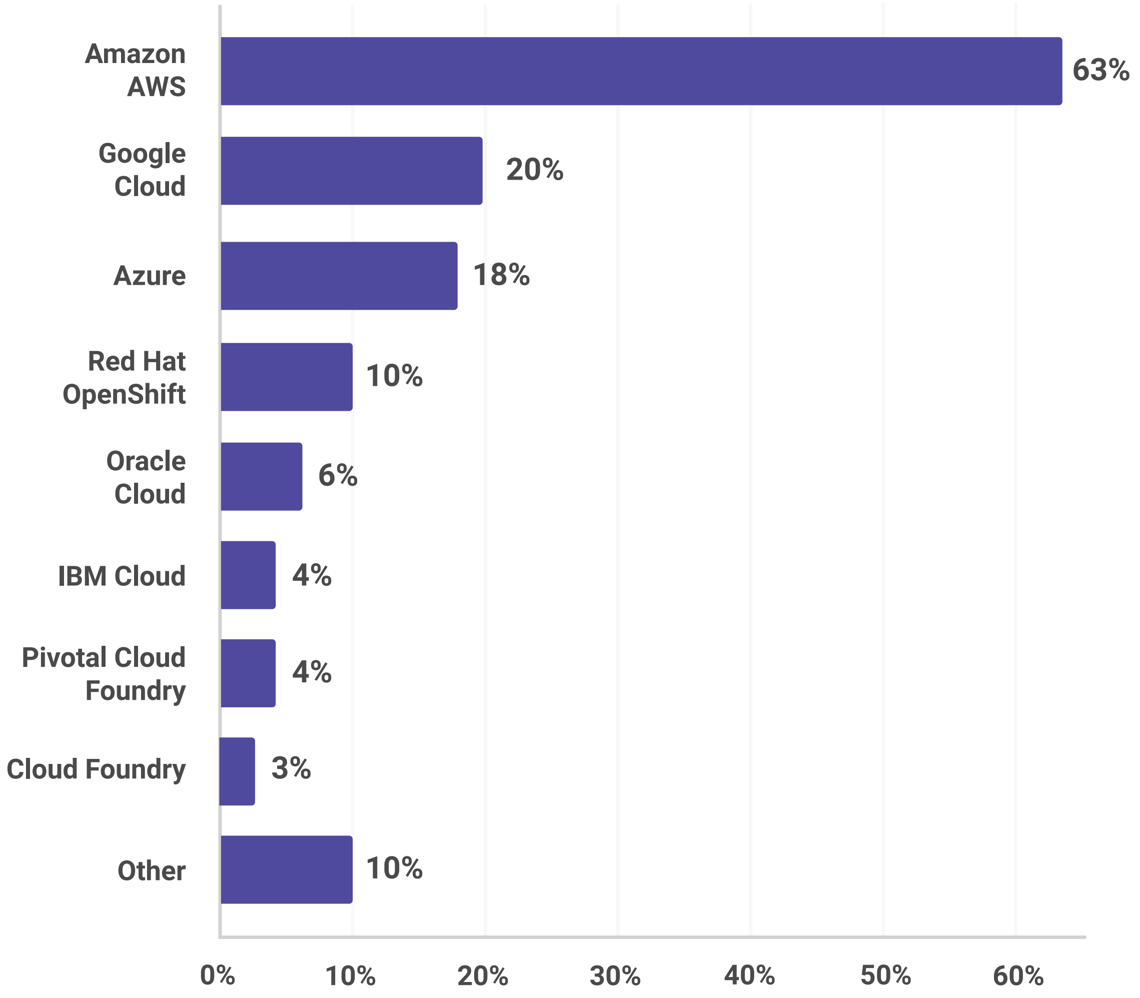
15. Which cloud platforms do you use?

From our data, we can say that 57% of respondents use a cloud platform of some sort.

Do you use cloud platforms?

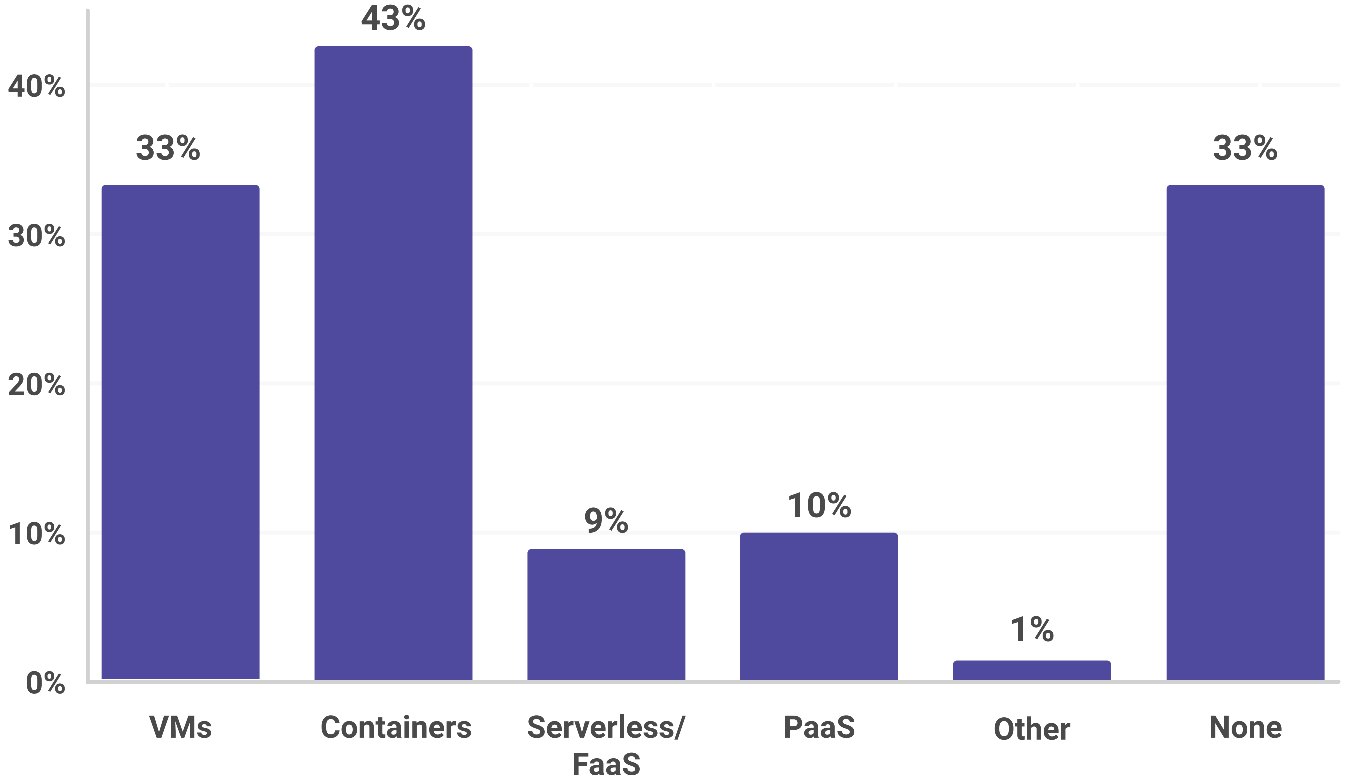


If we consider only the set of respondents who do use cloud platforms, we can see Amazon Web Services (AWS) leading the pack with almost two-thirds of the votes. Microsoft Azure and the Google Cloud Platform are next, taking 18% and 20% respectively; and Red Hat Openshift and Oracle Cloud are making inroads.



16. Which cloud approaches do you use?

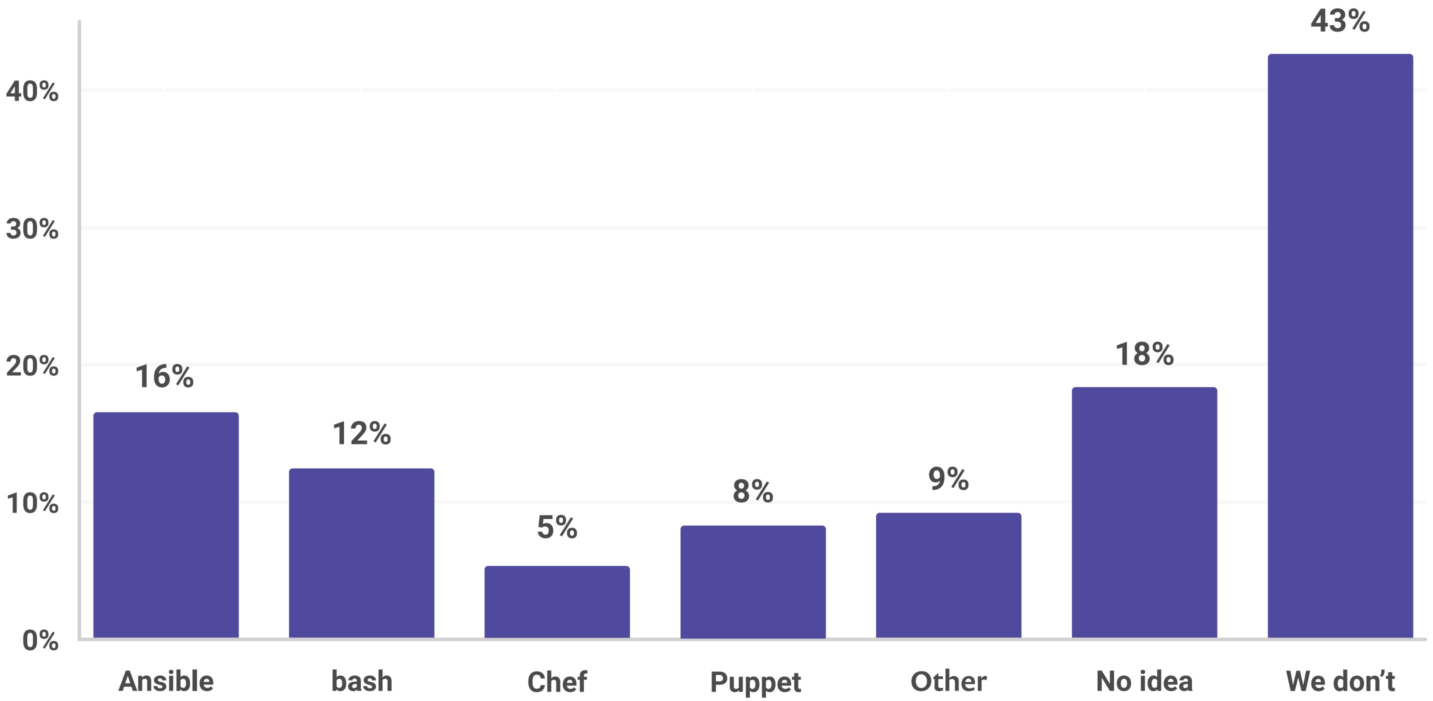
Containers lead the way on 43%, while VMs stay in the game pretty at 33%. As a relatively new technology, Serverless/Fass comes in strongly, with almost 1 in 10 respondents adopting this approach. PaaS, which has been around a lot longer, sits on a similar split at 10%. 1 in 3 respondents don't use any cloud approach at all.



17. Which continuous deployment or release automation tools do you use?

Almost 1 in 2 respondents don't use any continuous deployment or release automation tools whatsoever. This might even be higher, as almost 1 in 5 don't have any idea which tools are used in CD or release automation. It's somewhat surprising to see bash as popular as Chef and Puppet.

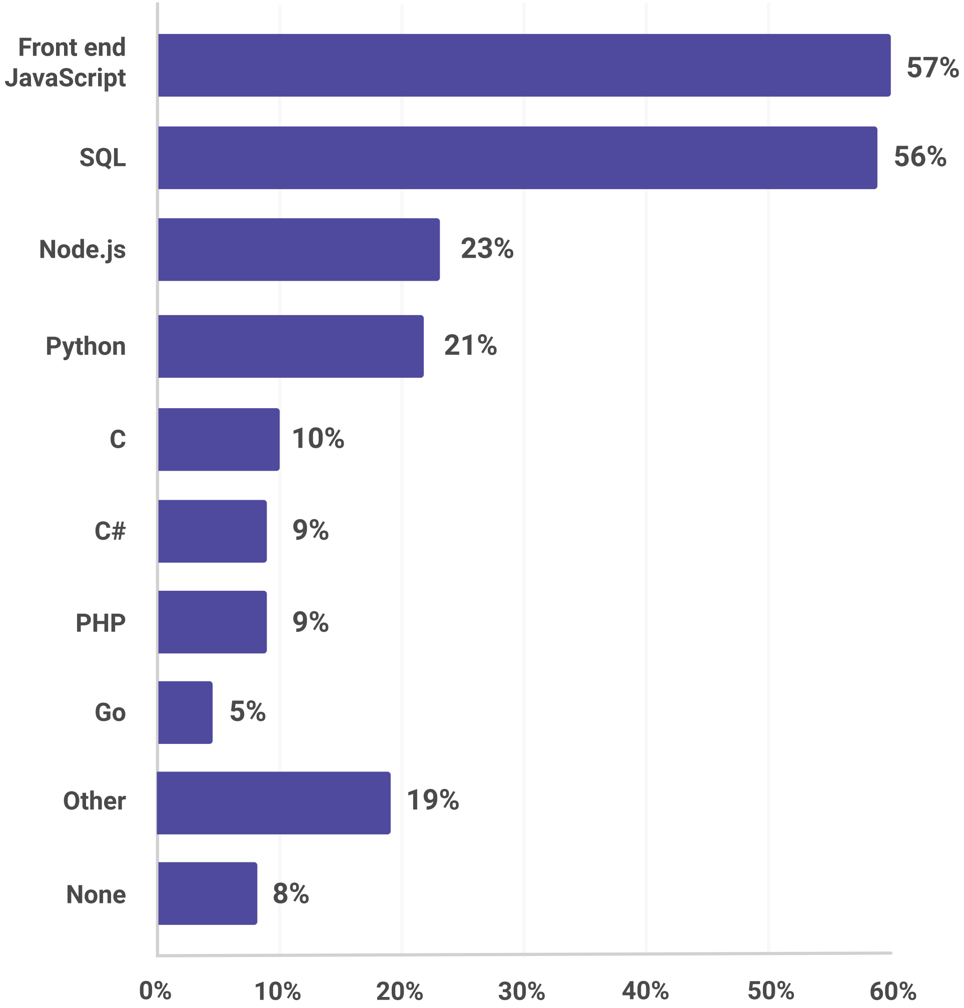
Actually, whom are we kidding?--Everyone loves bash! Ansible is the leading CD tool at 16%.



04

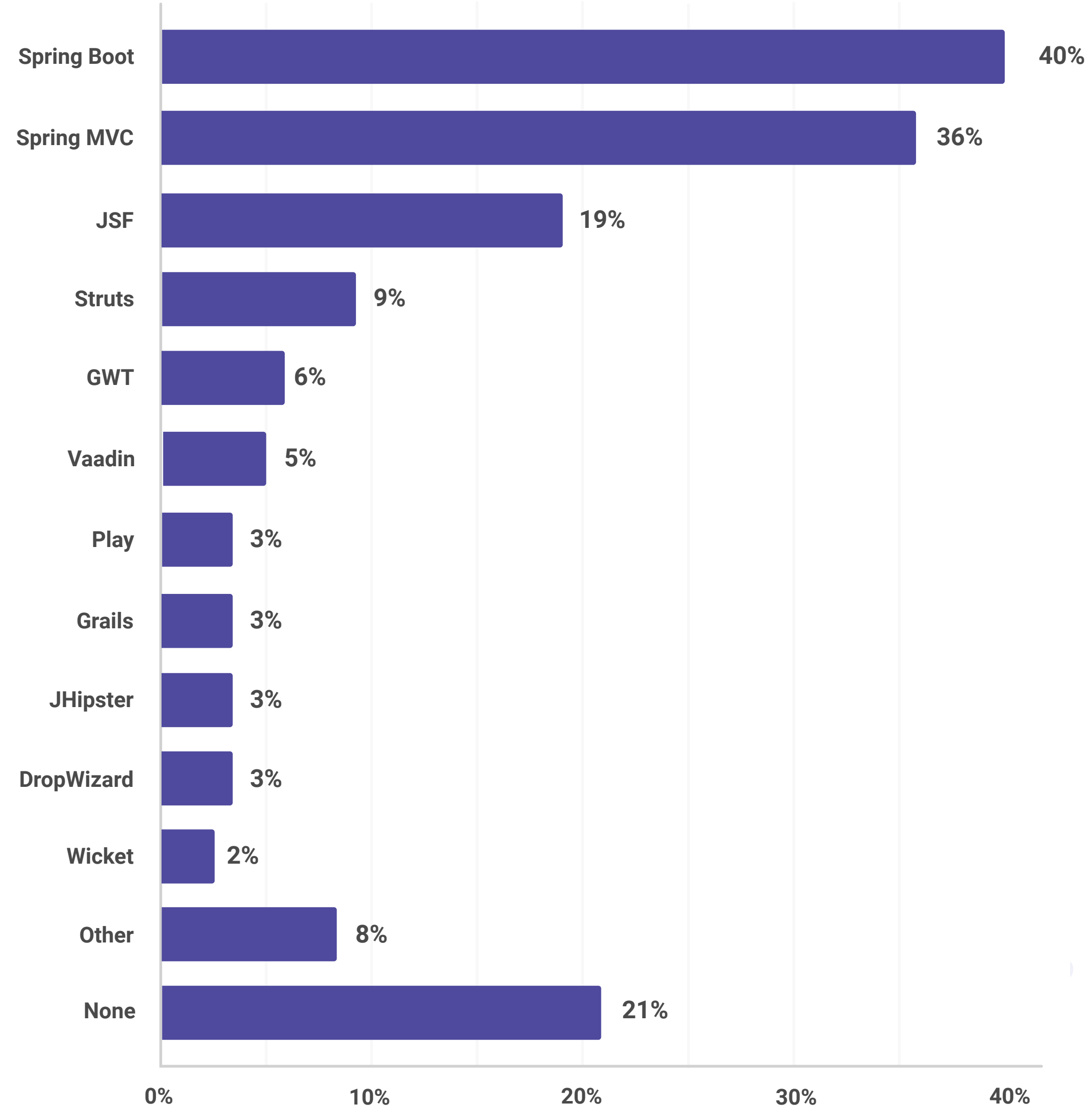
About your application

18. Which other (non-JVM) languages does your application use?



In today's polyglot world, it would be naive to assume that JVM languages are the only languages used in JVM apps. In fact, more than half of JVM applications use front-end JavaScript as well, 1 in 5 use Python, and almost 1 in 4 use Node.js. As you'd expect, many projects use SQL as well.

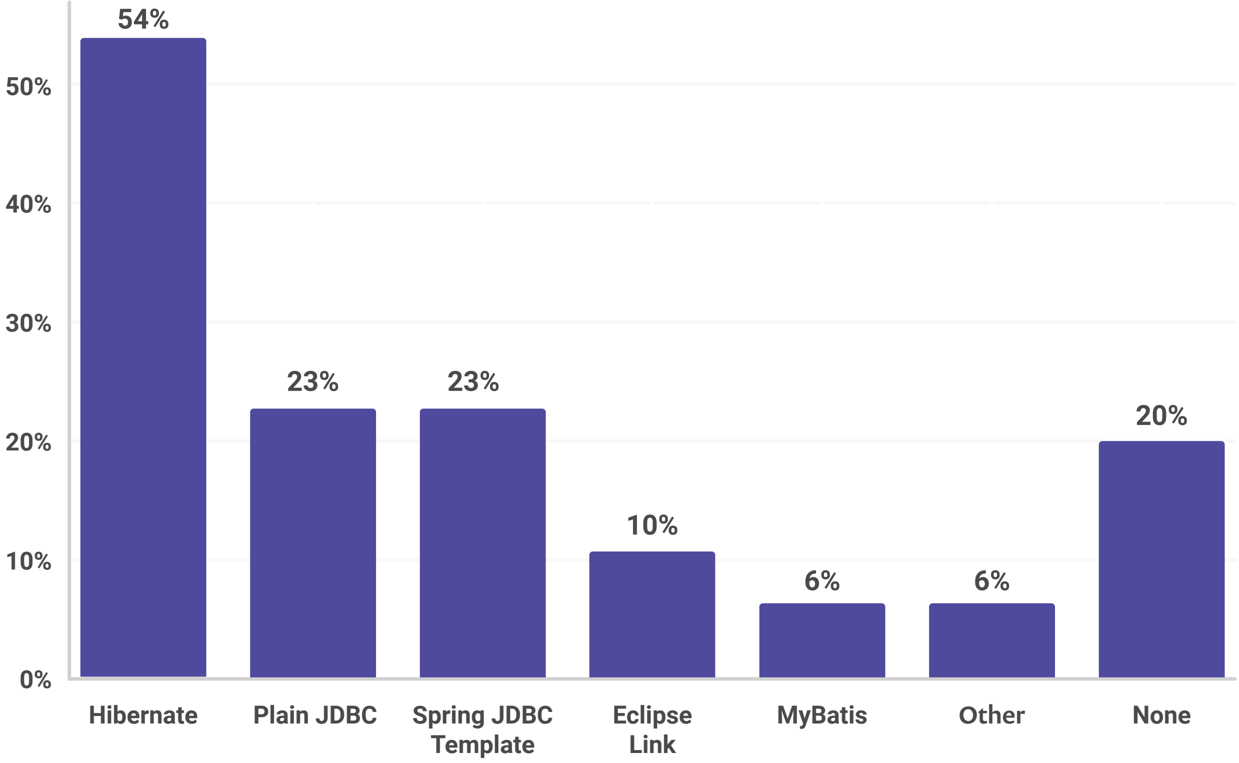
19. Which Web Frameworks do you use?



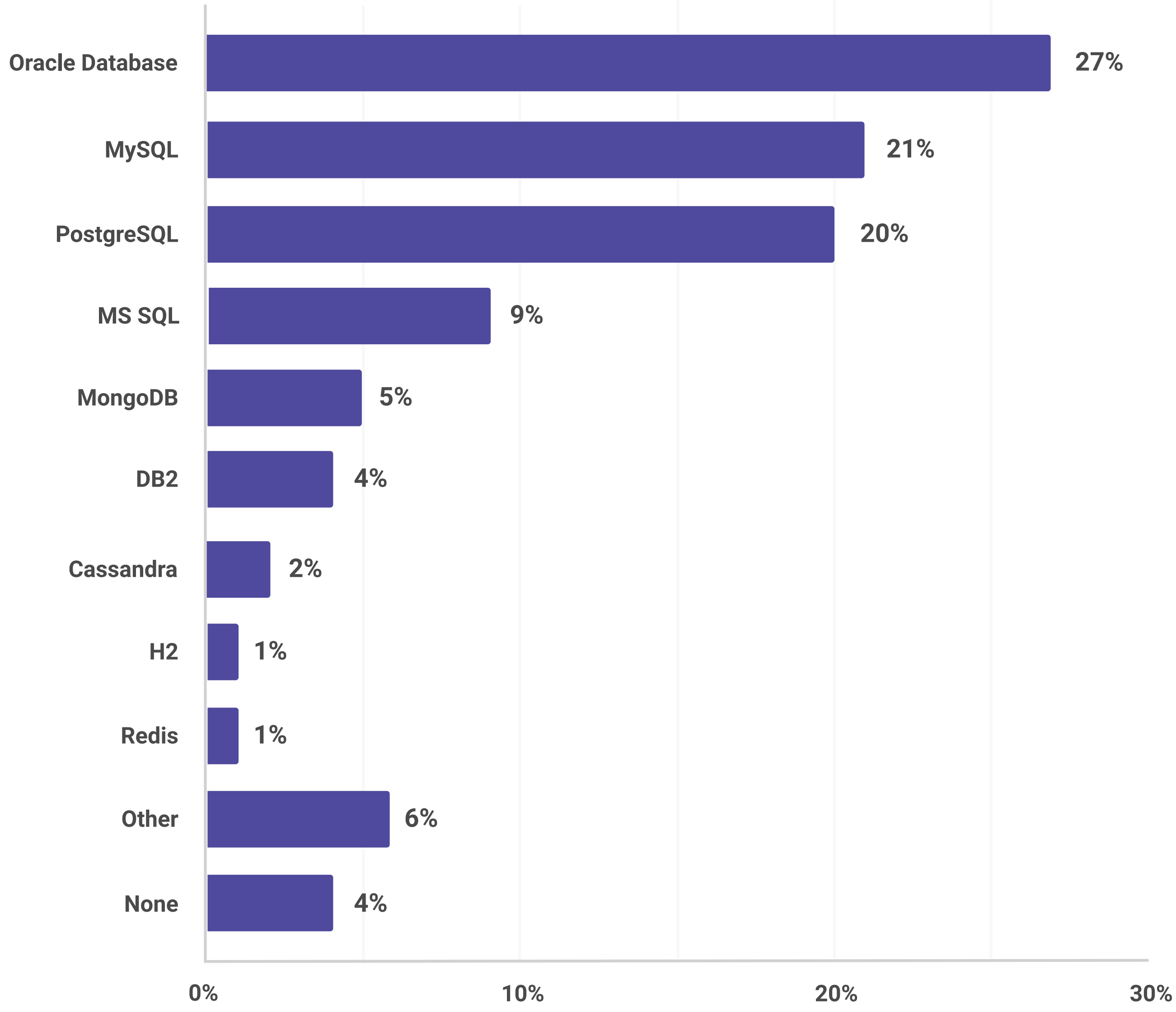
Few words can better express the Spring domination in the Java ecosystem than this graph. With 1 in 10 developers using Spring Boot in their applications, it's interesting to see it has overtaken the Spring MVC framework for the first time. JSF is the closest entrant with a respectable 19% and Struts, despite a constant stream of Remote Code Execution vulnerabilities in the news, is a strong fourth with almost 4 in 10 developers adopting it. More than 1 in 5 developers likely boast about how small their applications are, not needing a web framework at all.

20. Which ORM frameworks do you use?

More than 1 in every 2 developers use Hibernate in their applications. Almost 1 in 4 developers are happy with plain old JDBC, and Spring developers of course have the option of using Spring JDBC template, which is used by 23%. 1 in 5 developers don't use any ORM framework whatsoever to access their data. (Developers could choose more than one answer, so totals do not equal 100%).

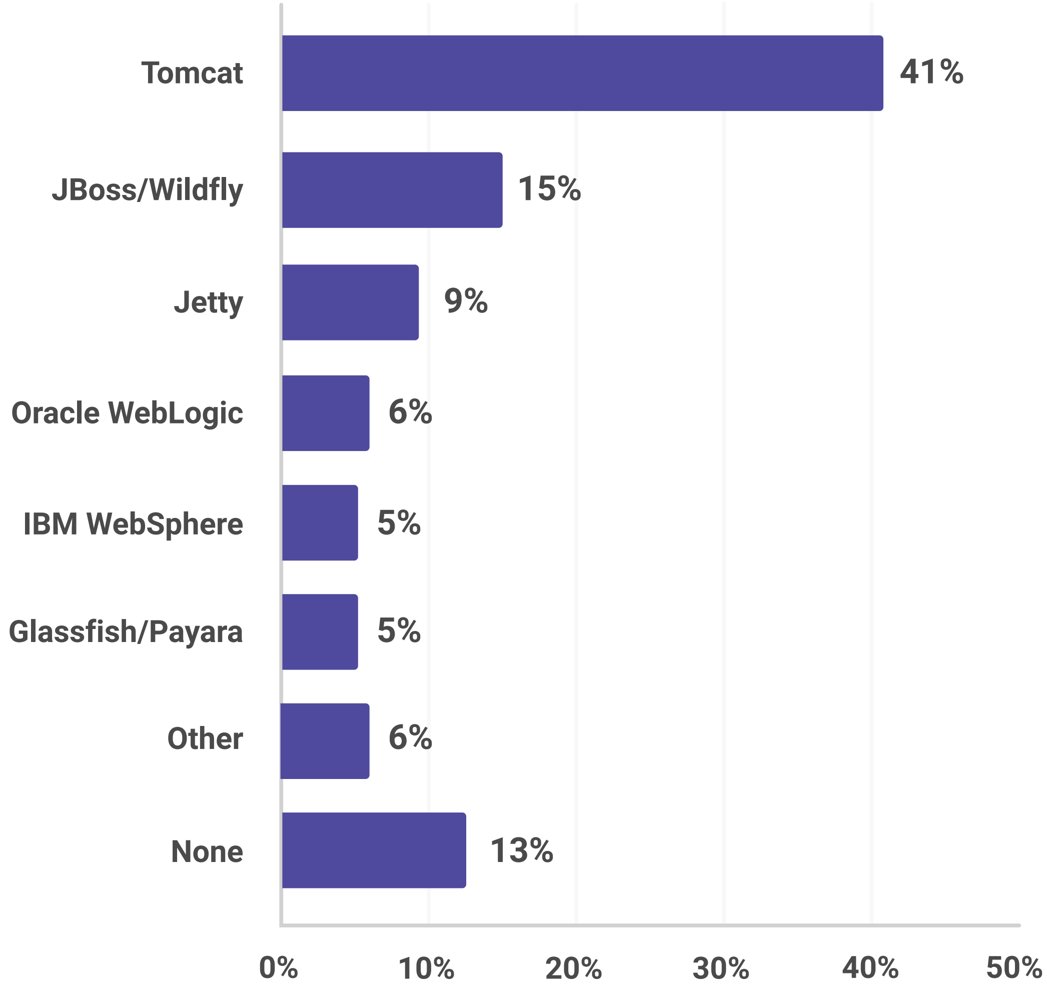


21. Which database do you use in production?



Once again, Oracle Database takes the top spot with almost 3 in 10 applications using it in production. MySQL and PostgreSQL are strong competitors taking 21% and 20%, respectively. MongoDB is the highest NoSQL database in use, with 5%.

22. Which application server do you use in production for your main application?

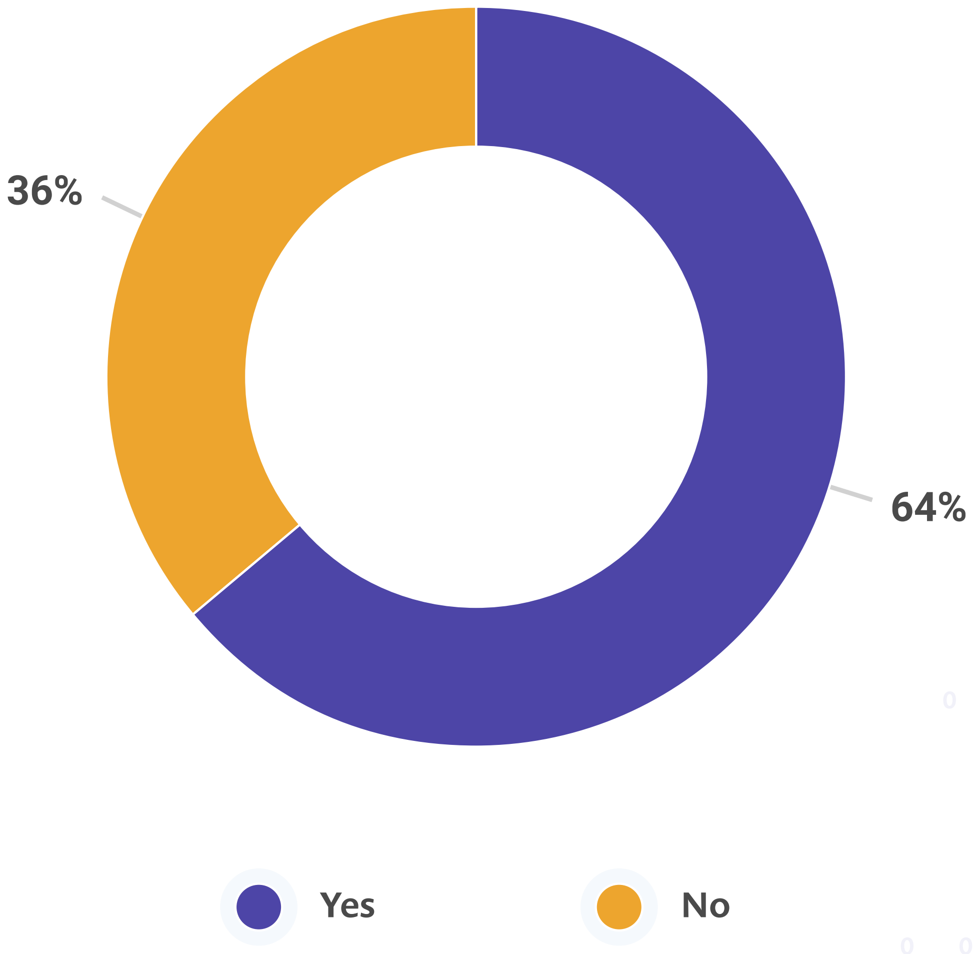


More than 4 in 10 respondents use Tomcat as their application server of choice. The fast, lightweight, open source, community favorite has led the pack for a long time now, and it doesn't look like that's going to change any time soon. JBoss and Wildfly are not too far behind at 15%. In the larger enterprise app server category, WebLogic has a slight lead over WebSphere.

The "Other" category contains TomEE and Liberty Profile at 1% each, which lead that group.

23. Do you develop on the same application server you use in production?

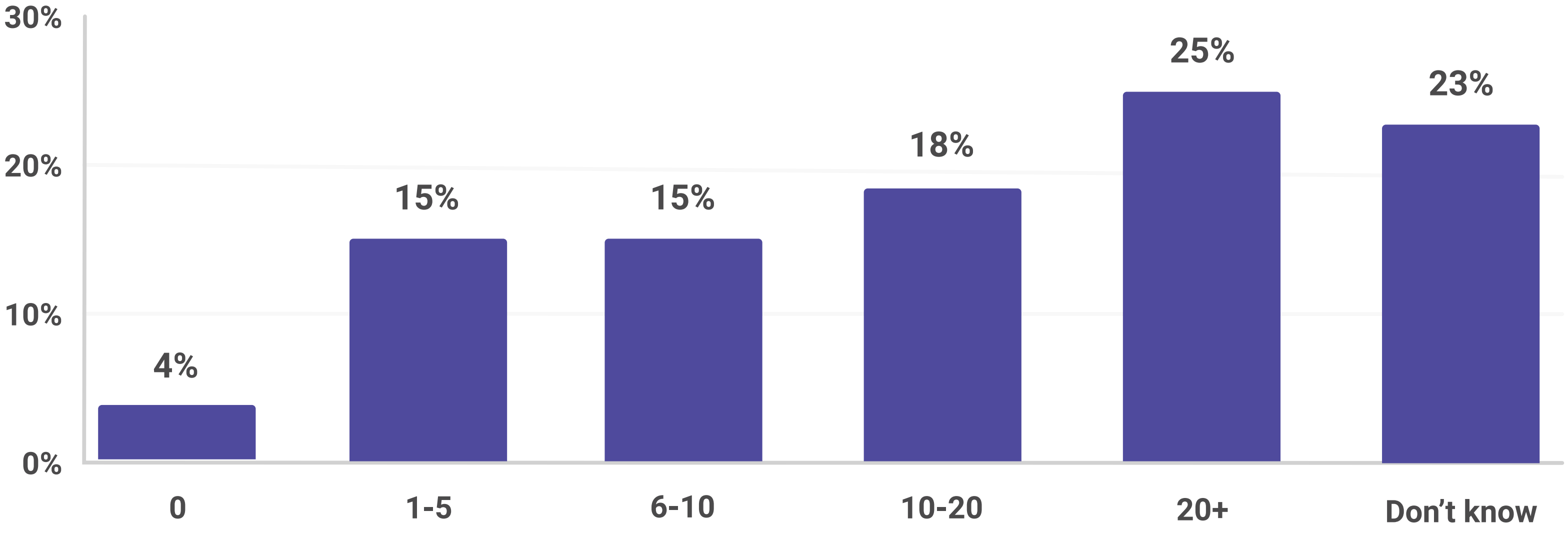
Despite the obvious dangers, more than one-third of respondents develop on a different server from the one they use in production--trading the possible cost of failures for the convenience. Surprisingly, those who state they use different application servers (or none) in development, actually have a wide variety of apps and servers in production. We were expecting mostly the larger monolith-suited app servers that could cause developers pain to use locally, but the ratios were comparable.



24. How many open source (direct) dependencies does your main application have?

It would be interesting to know how many people had to check to see how many direct dependencies their application has. I'd bet it was the vast majority of you! You're lucky I didn't ask for direct and transitive dependencies too! In fact almost 1 in 4 respondents openly state they don't know how many dependencies they have. This might be because of the way the application is distributed across a more complex build system.

We can see from the results that fewer than 1 in 20 respondents don't use any open source dependencies whereas the overwhelming 72% do. If we remove those who don't know, we can see that 95%, or 19 of 20 respondents, use open source dependencies in their applications. This shows how far open source adoption has come as well as the need for us to ensure these third-party libraries provide security, quality and availability we require from our application as a whole.

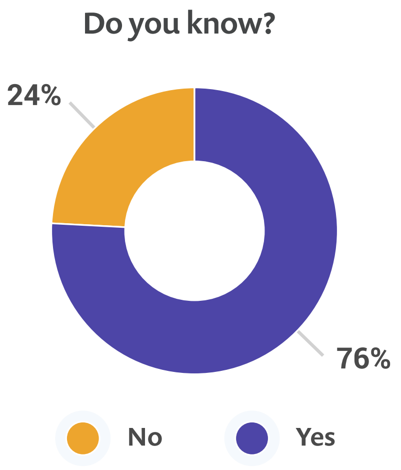


05

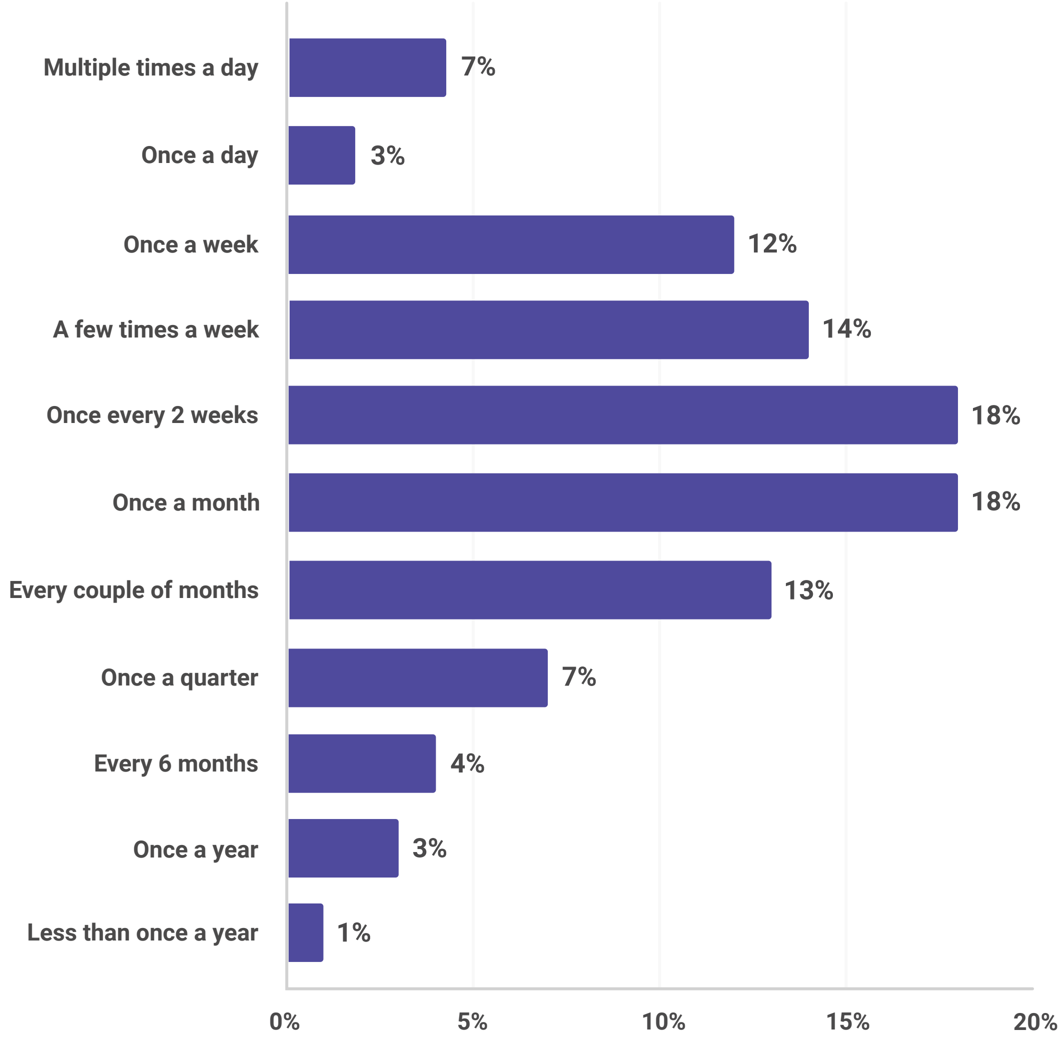
About your processes

25. How often do you release new versions of your code?

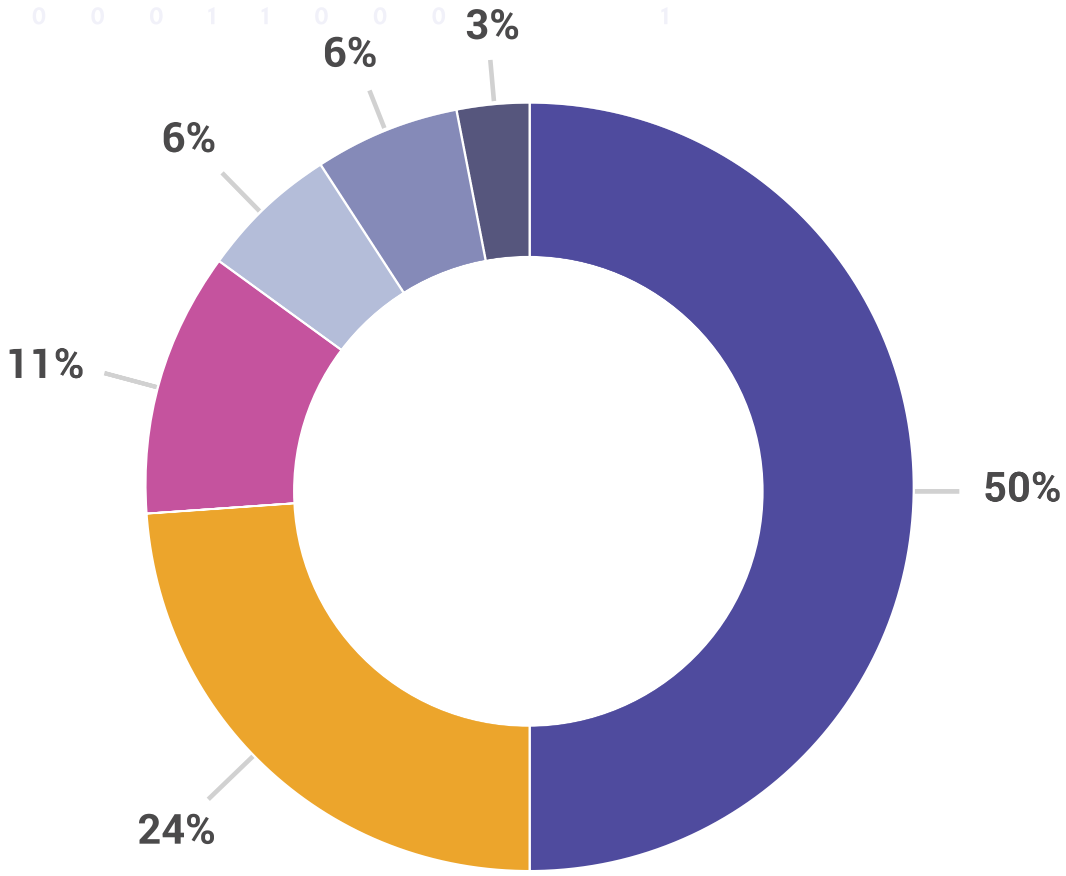
Worryingly, almost 1 in 4 respondents (24%) don't know how often their code is released! This again might be due to the complexity of the application and perhaps different services are being released at various times.



Almost 1 in 10 respondents are brave enough to release multiple times a day, but then again, when you release that often, bravery is replaced with consistency. The majority of respondents release once every couple of weeks to once a month. More than 1 in 10 respondents release once every six months or less. Better clear my plans for the week, we're releasing on Monday.



26. How often do you audit your code?

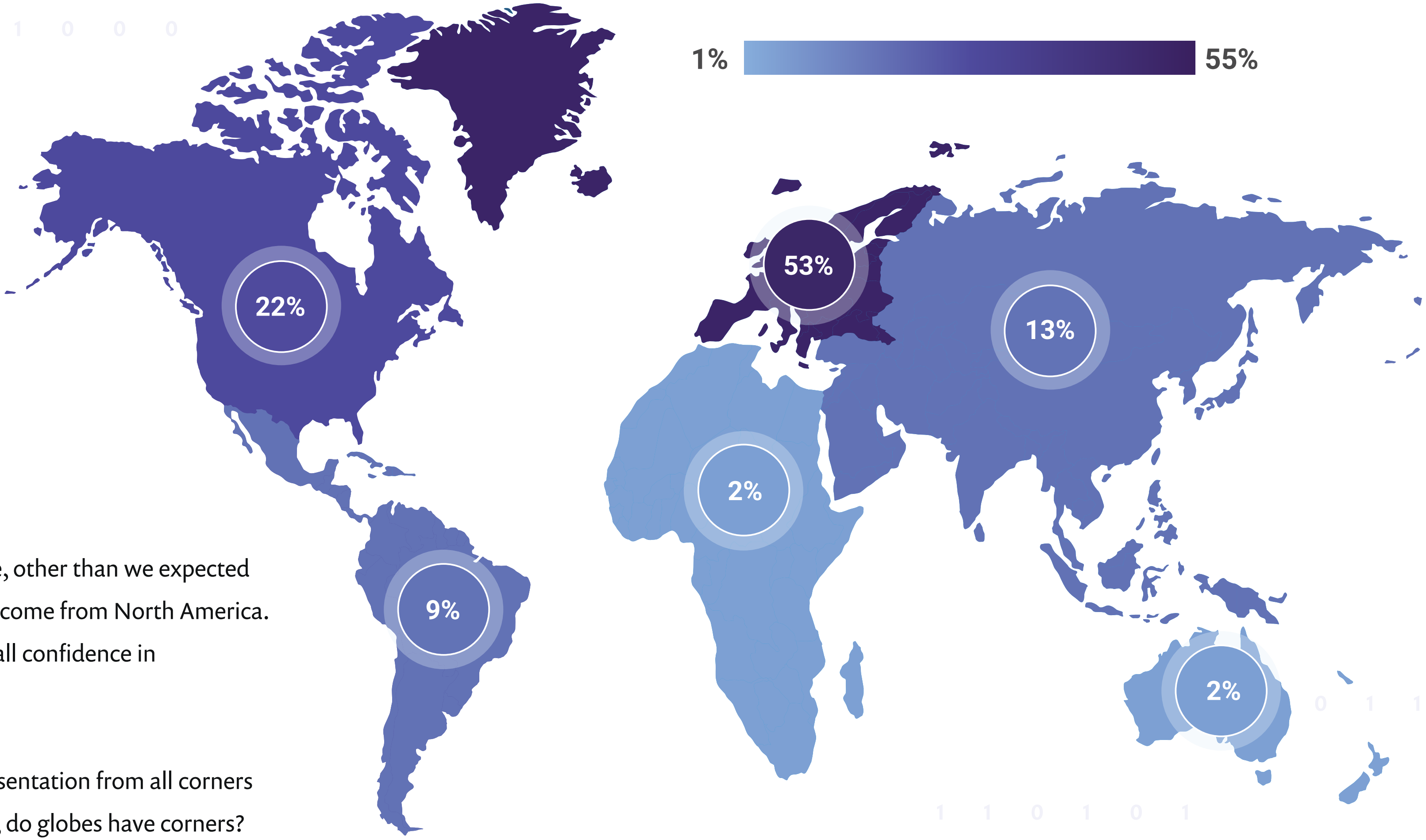


About half the sites audit their code. And only almost 1 in 4 do so more than once a quarter. Whether the audit be for security, performance or quality it's good to have a clear out. With half of the respondents not auditing their code whatsoever, just imagine the gremlins that could exist in those codebases!

06

About you

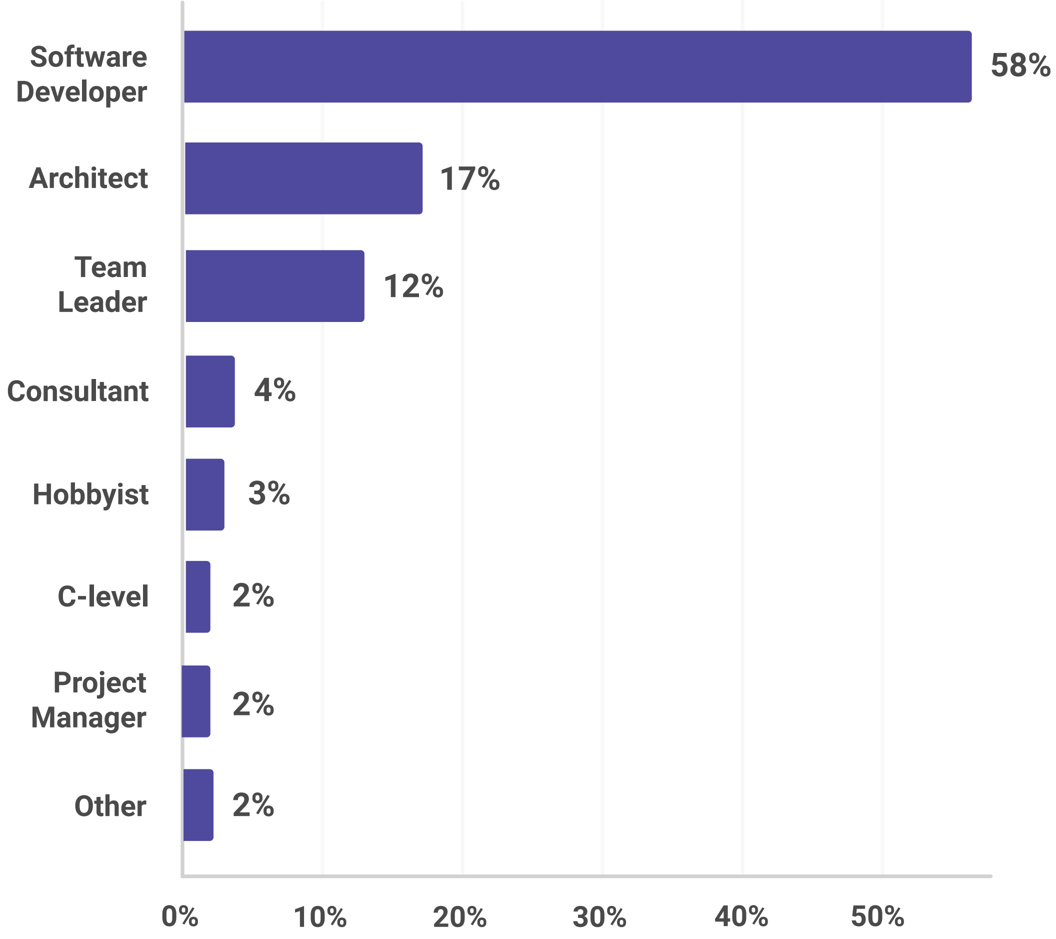
27. Where do you do your development work?



Not much to say here, other than we expected more respondents to come from North America. Perhaps they've lost all confidence in voting altogether!

It's great to see representation from all corners of the globe. Hmmm, do globes have corners?

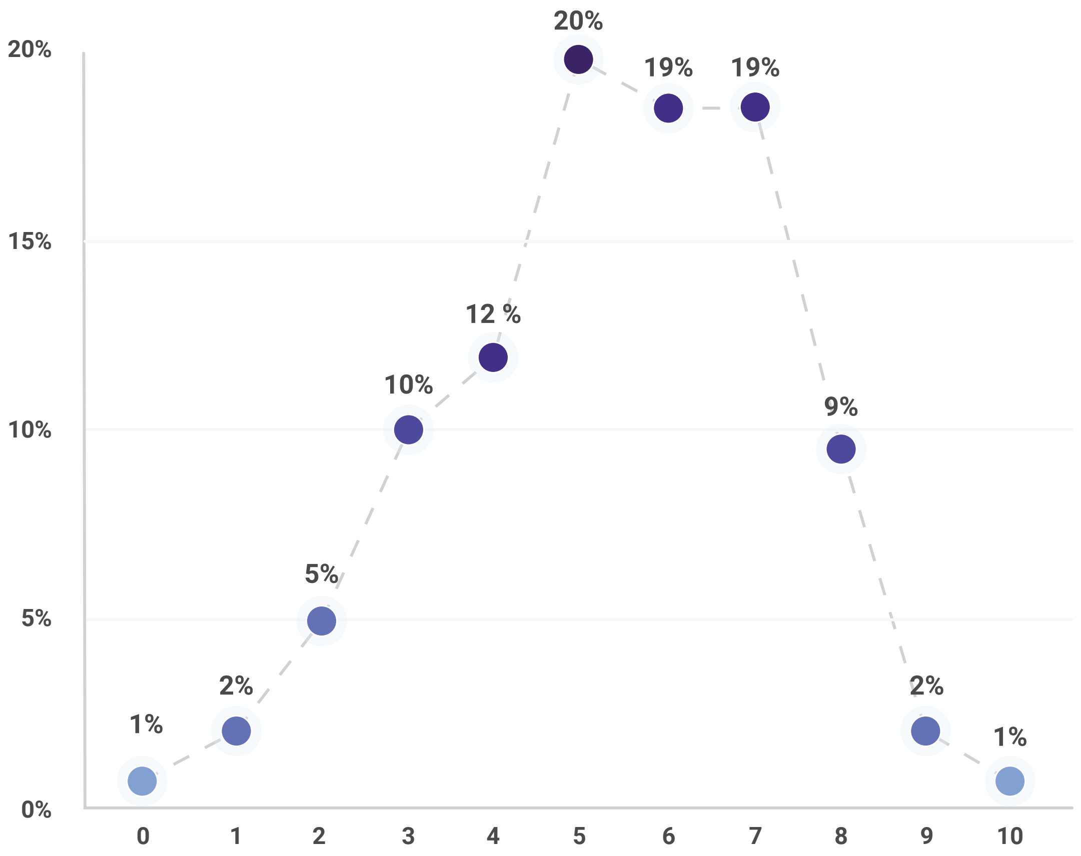
28. How would you describe yourself?



We can see the vast majority of respondents are technical with 87% either being developers, team leaders, or architects. More than half state they are software developers. And 2% of C-level respondents took the time out of their schedules to take our quiz.

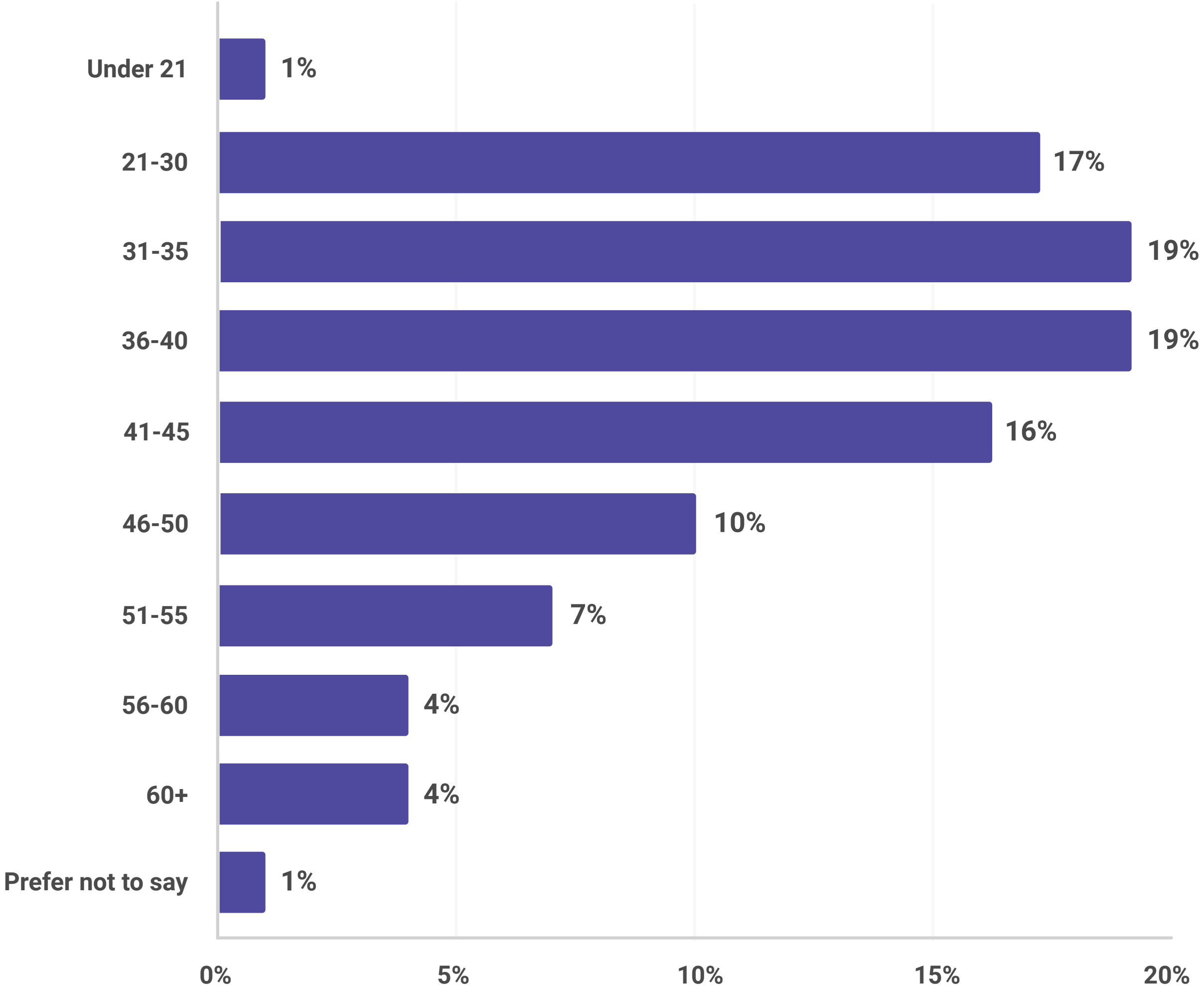
29. How do you rank your security expertise?

Security is often considered one of the dark arts. Many developers learn only 'just enough' to get by and allow them to deliver their feature work, meaning the real experts are those who have a dedicated security career. As developers are owning more and more application security responsibility being owned by developers, this is becoming a hot topic. In our survey,1% of respondents state they have zilch, none, zero out of ten security knowledge and are just happily writing their struts applications. Ok, we made that last bit up. The same number state they are true security experts, and modestly gave themselves 10 out of 10. The majority sit around the 5-7 mark with 6 in 10 respondents stating they're no expert, but certainly not novices.



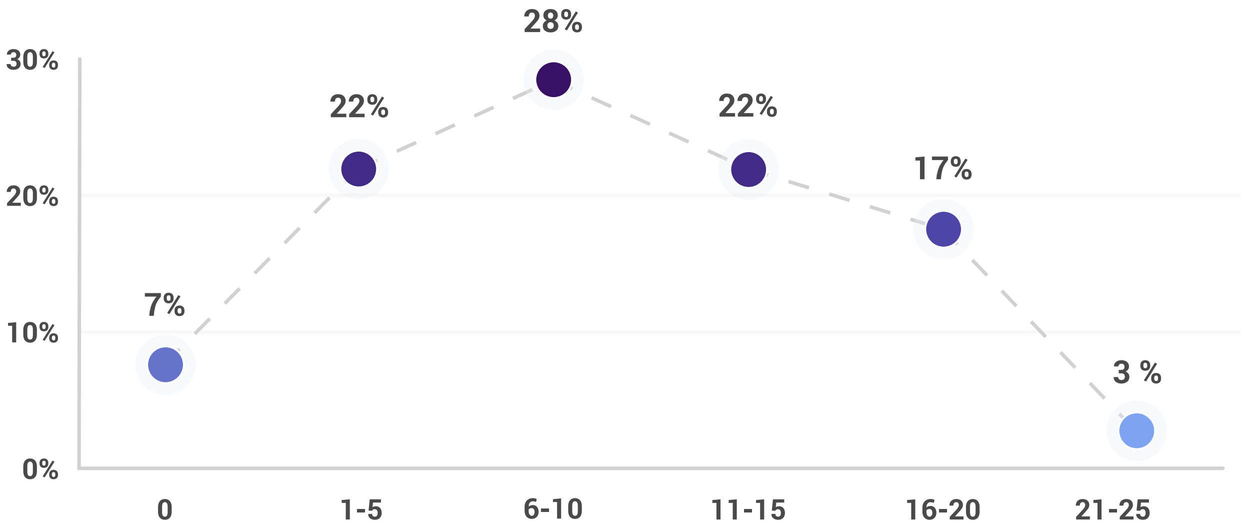
30. How old are you?

Programming remains a profession associated with the young and early middle-aged. 38% of readers are younger than 35, 35% are between 35 and 45, and only 25% are older than that. Survey data shows a correlation between positions of greater responsibility and age, suggesting that the lower numbers after middle age are in part due to programmers moving into management positions.



31. How many years of paid professional experience with Java do you have?

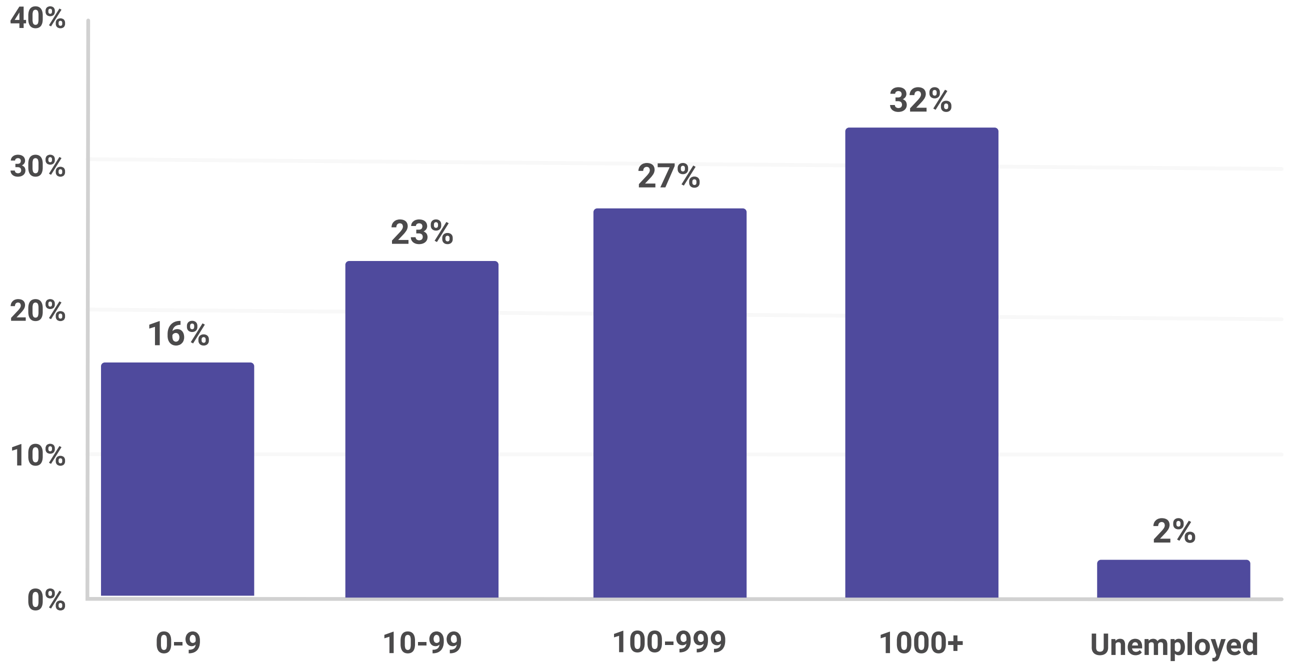
There was quite a range of experience among our respondents as you can see from the graph, but we wanted to also look at the median ages of our job roles back from question 28, to see when people typically receive promotions. The results are very interesting, with the median developer having 10 years' experience, team leaders 11 years' experience, architects with 14 years, and finally C-levels with 12 years' experience.



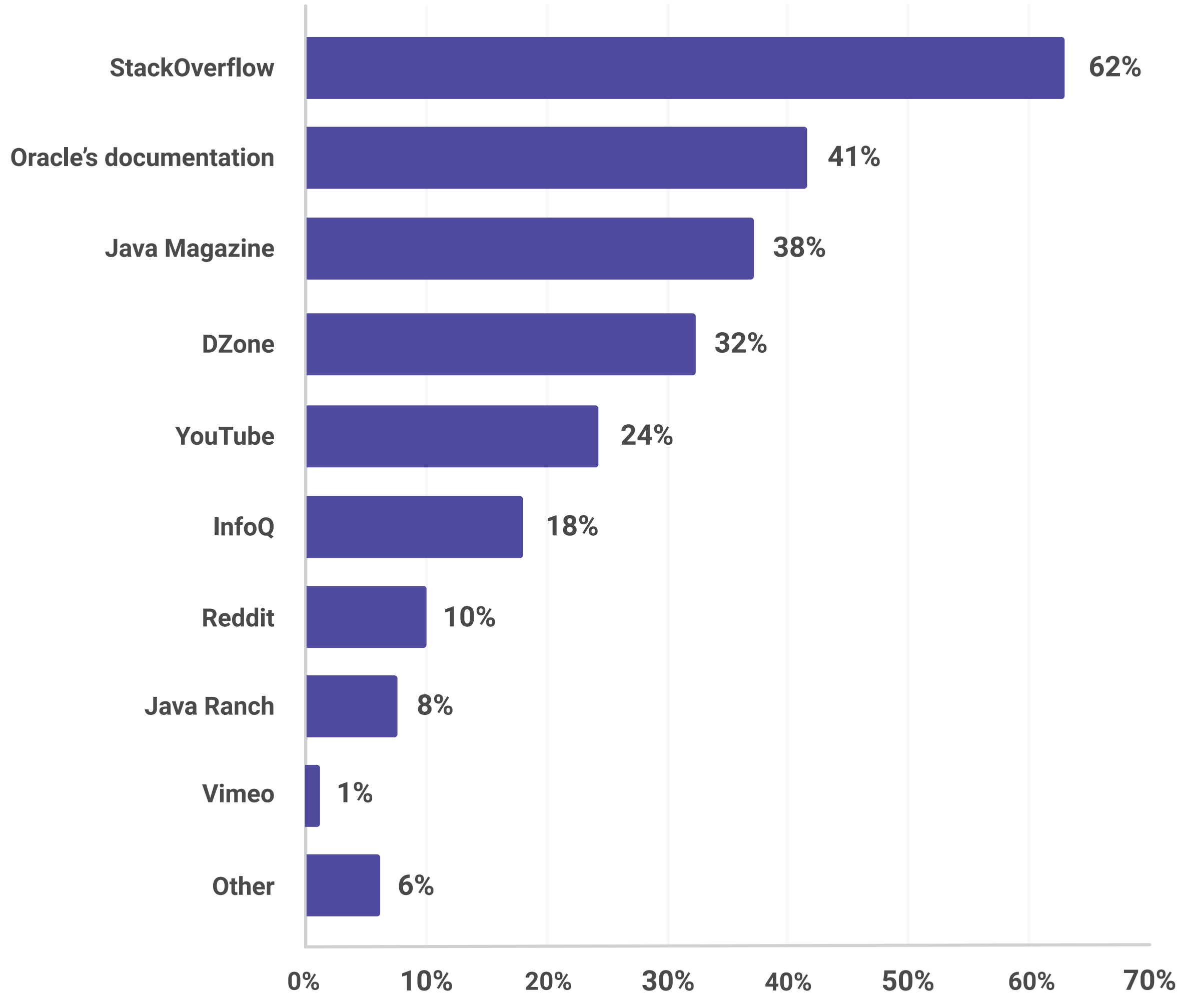
32. What is the size of your company?

With almost 40% of respondents working for companies that have less than 100 employees, we see that Java continues to have a significant role in startups and in small-to-medium businesses. This finding is at odds with the perception of Java being the language for enterprise apps.

It is that, certainly, but definitely not only that.



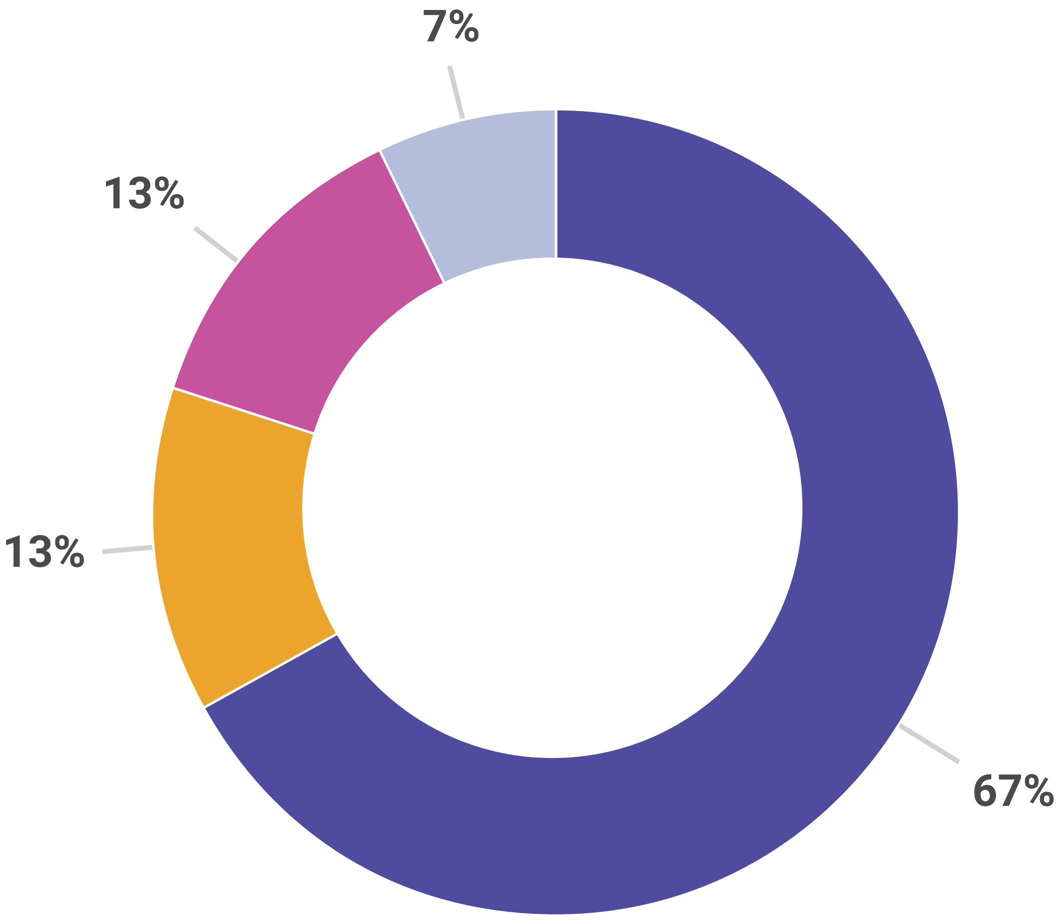
33. Where do you principally get information about Java online?



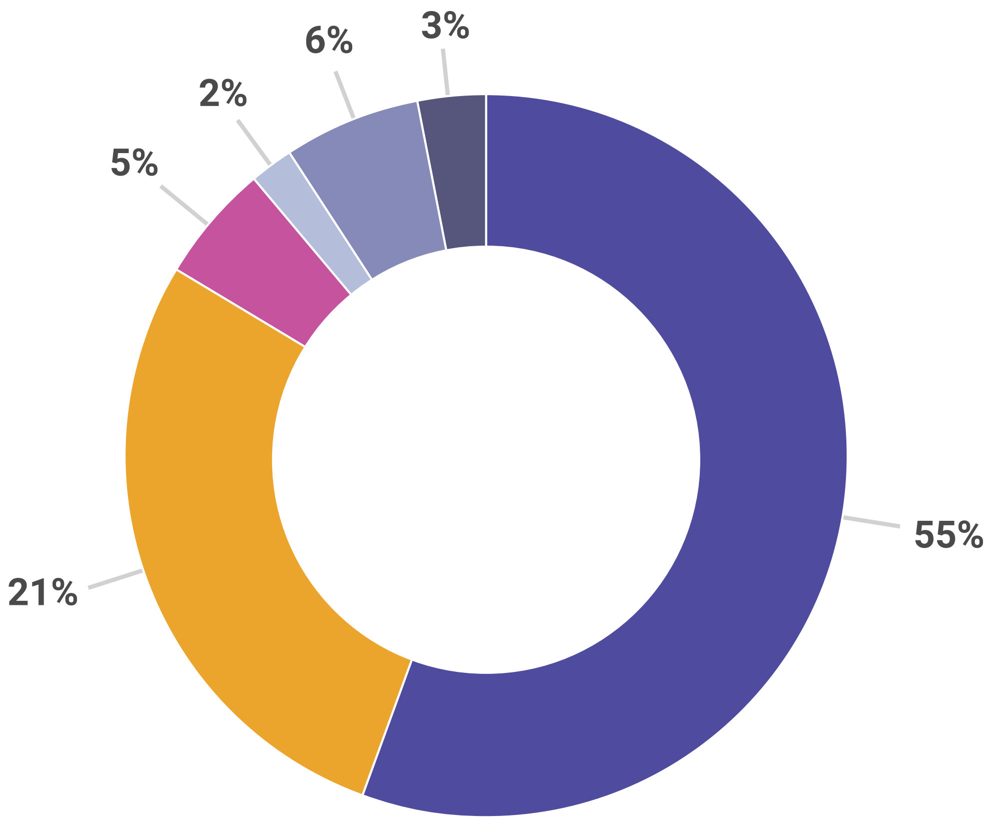
StackOverflow remains the preferred forum for asking one-off questions and grepping replies to previous answers for useful information. Oracle's excellent documentation is a natural place for reference. Java Magazine presents long-form, in-depth articles for readers wishing to fully understand a topic, and YouTube does the equivalent in video form. DZone and to a lesser extent InfoQ overlap all these areas. (Respondents could choose multiple answers.)

34. Are you a member of a Java User Group (JUG)?

JUGs remain an underused resource in the community with only 1 in 5 developers attending one meeting a year. The overwhelming two-thirds of respondents are not members of any JUG whatsoever. If geography is a factor for those developers, the Virtual Java User Group is an excellent solution.



35. How much do you contribute to open source?



Open source remains what it has primarily been from the start: the domain of a small minority of dedicated developers.

The existence of GitHub and other easily accessible code repositories has helped developers to contribute their code, but with more than 1 in 2 developers never having contributed to an open source project, there's still a lot of work to be done. You should want to contribute back so that rather than just being one of the 19 in 20 developers using open source, you can one day be one of the 19 in 20 developers contributing to open source.

Summary

About your JDK

- 7 in 10 developers use the Oracle JDK in production
- 2 in 10 developers use OpenJDK in production
- 8 in 10 developers are on Java SE version 8 in production.
- 1 in 10 developers have migrated to version 9 or higher
- Almost 3 in 10 developers don't know how to handle the new Java release cadence
- Over 3 in 10 developers plan to only stay on the LTS releases of Java
- Only 1 in 10 developers plan to stay on the latest version of Java
- Almost 5 in 10 developers are on Java EE 7 or 8
- Java EE 7 is still the most popular Enterprise version of Java with almost 3 in 10 developers using it
- 9 in 10 JVM developers use Java
- Kotlin edges past Groovy and Scala in language usage on 2.42%

About your Tools

- 9 in 20 developers now use IntelliJ IDEA
- 6 in 10 developers use Maven to build their main project
- Over 7 in 10 developers still don't use static security tools
- Almost 6 in 10 developers use Jenkins in CI
- Almost 3 in 4 developers use Git as their SCM
- GitHub, BitBucket and GitLab take an almost even share of the code repository market
- Almost 8 in 10 developers use JUnit

About your platform

- Over 6 in 10 developers who use cloud platforms deploy on AWS
- Over 4 in 10 developers use Containers
- Over 4 in 10 developers use no CD tools whatsoever

About your processes

- 1 in 10 developers release their code multiple times a day
- Half of developers don't have their codebases audited

About your application

- Almost 6 in 10 developers also have front-end JavaScript in their application
- Almost 1 in 4 developers also use Node in their application
- 4 in 10 developers use Spring Boot
- Over 1 in 2 developers use Hibernate in their applications
- Almost 3 in 10 developers use Oracle Database in production
- 4 in 10 developers use Tomcat in production
- 1 in 4 developers have no idea how many OS dependencies their application brings in
- 19 in 20 developers use open source dependencies in their application