
spring
The State of Spring 2022
Presented by: VMware
vmware

Introduction

Our State of Spring 2021 report focused on factors that have helped Spring become the Java framework of choice, from a thriving community to the diversity of Spring Projects to rapid introduction of new technologies. For 2022, we continue to explore important trends, while focusing on several areas for potential improvement. We see continued growth in modern architectures, with 55% of respondents reporting that they are using *mostly modern* architectural styles, an increase of 5 percentage points since last year. Three quarters (75%) like Spring because it is *stable, scalable, and secure*.

This report explores the adoption of modern architectures and APIs—including a check-in on modular monoliths—and looks at the progress around native compilation and Java concurrency. With technology innovations coming faster every year, we also double-click on how well the Spring community is handling software upgrades and the most popular sources for learning about new Spring features and Spring-related technology.

This report is divided into four sections:

Modern Architectures in Full Flower

Microservices, Reactive, and Serverless are blossoming

New Tech Gaining Ground

GraalVM and Project Loom are all the buzz

Upgrade and Flourish

Software rate of change has become a challenge

“Spring”ing Up (to Speed)

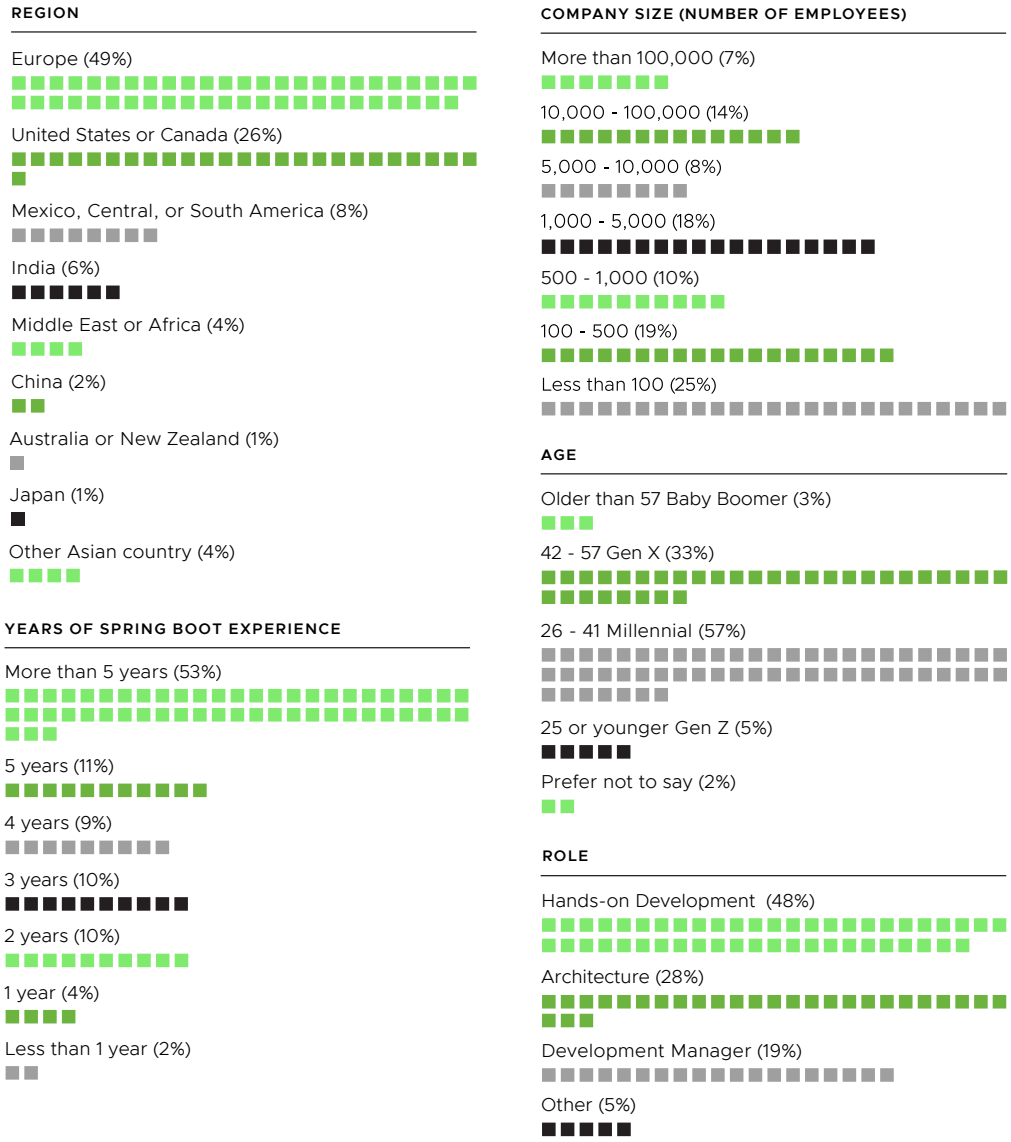
Plant seeds of knowledge to reap rewards

Demographics

VMware commissioned Dimensional Research to conduct this third annual study to understand the experiences and attitudes of individuals responsible for the adoption and use of Spring. Our study surveyed active Spring developers, architects, and development managers across organizations of different sizes. This year's survey repeated a number of questions from last year to identify trends, with new questions in emerging areas of interest.

Our 2022 survey reached a total of 1,421 qualified individuals. A wide range of roles, regions, and job levels are represented. In particular, 48% of respondents were hands-on developers, 28% were architects and 19% were development managers. The vast majority (83%) of stakeholders surveyed had 3 or more years of experience with Spring.

This research covers a wide range of Spring stakeholders in industries including technology (36%) and financial services and insurance companies (19%). All major sectors are represented, including retail (6%), services (6%), government (4%), and healthcare (4%).



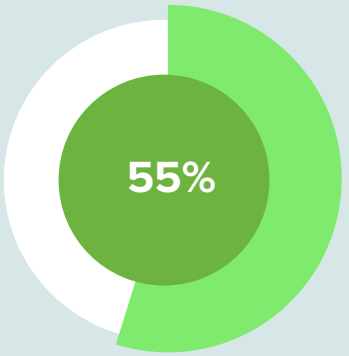
Modern architectures in full flower

The shift to modern architectures and APIs continues—with technologies like OpenAPI and GraphQL gaining momentum. Organizations are increasing adoption of Spring Projects to keep pace with demands on development teams, with almost half of stakeholders reporting they will use more Spring modules in the future. By streamlining development, Spring helps accelerate modern app delivery.

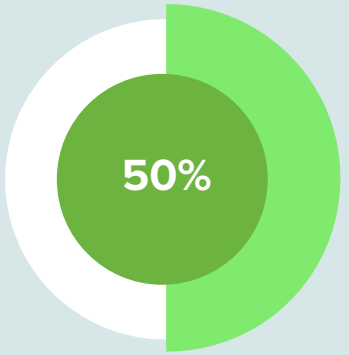
The shift to modern architectural styles continues

One of the benefits of Spring is that it helps developers stay up to date with modern technologies—without the need to learn new languages or frameworks. In 2022, the shift to modern architectural styles continued, with 55% reporting they now use *mostly modern architectural styles,* up 5 points since 2021.

Using mostly modern architectural styles



2022



2021

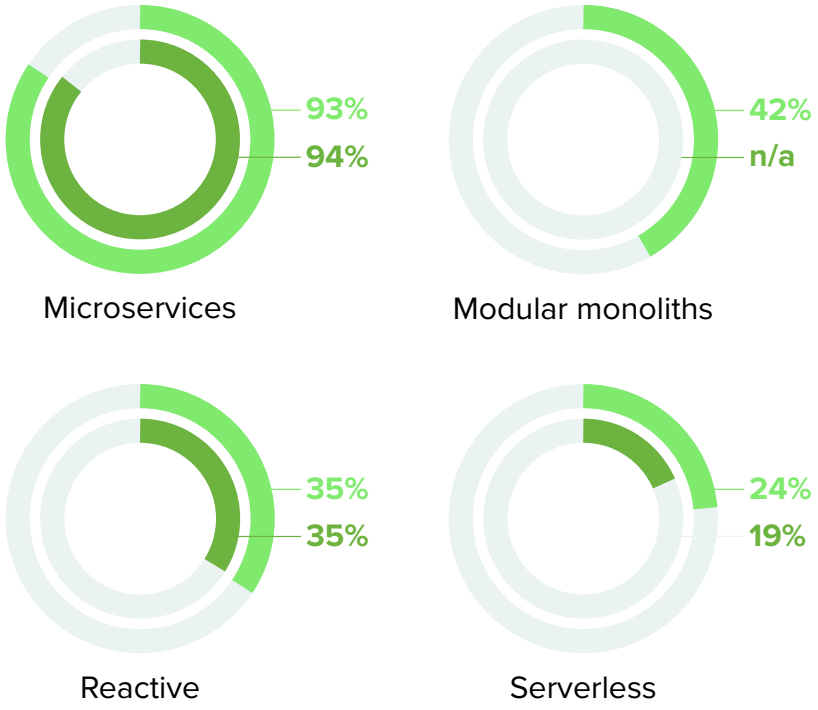
Microservices remain the dominant application architecture, with 93% of respondents using this style. Serverless expanded from just 19% last year to 24%. Reactive architectures (used by 35%) held steady as the ecosystem awaits to see when Project Loom comes out of preview and its impact on the broader ecosystem.

Modular monoliths debut

We added *modular monoliths* to the question about architectural styles for 2022. The idea of monolithic, modular systems has regained popularity, with a goal of enabling monolithic applications to evolve efficiently to accommodate changes in business requirements. Spring Modulith is an experimental Spring project that helps developers build well-structured applications.

While 42% reported using *modular monoliths*, we strongly suspect that many respondents who selected this style are, in fact, using traditional monoliths. This is borne out by the fact that those who report *using mostly modern architectures* were much less likely to report using modular monoliths (27%) than those who said *we use a mix of both modern and traditional* (69%). We'll follow this trend closely in our next survey.

Modern architectural styles used with Spring



APIs remain the top Spring use case

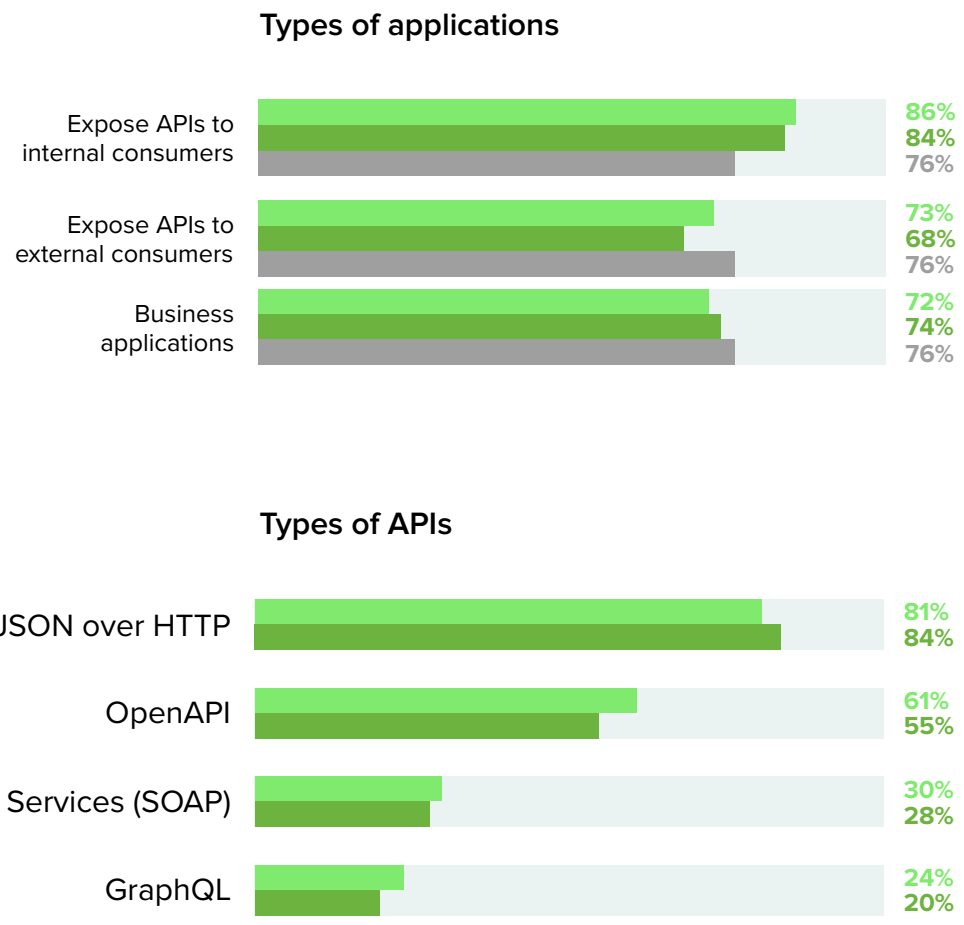
Use of Spring to expose APIs remained the dominant use case for 2022. *Expose APIs to internal consumers* has seen steady growth since this survey began and remains at number one with 86%. *Expose APIs to external consumers* moved into the number 2 position this year (73%), edging out *Business applications*.

OpenAPI and GraphQL are gaining ground

While *Plain JSON over HTTP* remained the dominant type of API in use, it lost a little ground—dropping from 84% usage in 2021 to 81%. *OpenAPI* and *GraphQL* took up the slack.

OpenAPI, a language-agnostic standard that enables humans and computers to discover and understand the capabilities of a service, gained 6 points (rising from 55% to 61%).

Last year we were surprised by the rapid adoption reported for *GraphQL*, an open source data query language for APIs. This year, *GraphQL* grew another 4 points—with almost a quarter (24%) of respondents now using the technology. Spring for GraphQL makes incorporating GraphQL into your Spring applications a snap. (Spring for GraphQL 1.0 was released in May 2022; 1.1.x is current as of this writing.)

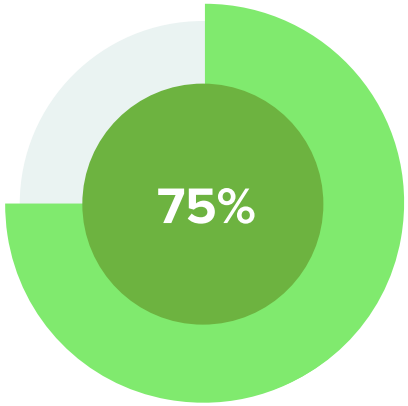


Spring Projects fruitful for developers

An important goal of the Spring team is to help developers deliver modern apps quickly and efficiently—even as they accelerate use of APIs, modern architectures, and new technologies. Whatever the needs of your application, there is a Spring Project to help you build it.

Almost half of stakeholders (47%) reported that they will be using *more Spring modules* in the coming years, an increase of 8 points. For 2022, the top three Spring Projects remain *Spring Security, Spring Data,* and *Spring WebMVC*. Given the continued increase in cyber threats—with impacts in virtually all industries—it's no surprise that Spring Security ranks number one. Three quarters say the main things they like about Spring is that *it's very stable, scalable, and secure*.

Notable gainers since last year include *Spring Kafka* (+4 points), *Spring Batch* (+4 points) and *Spring WebFlux* (+6 points), an alternative to Spring WebMVC which provides Reactive programming support for web applications.



of respondents like Spring because it's very stable, scalable, and secure

Kubernetes and Spring

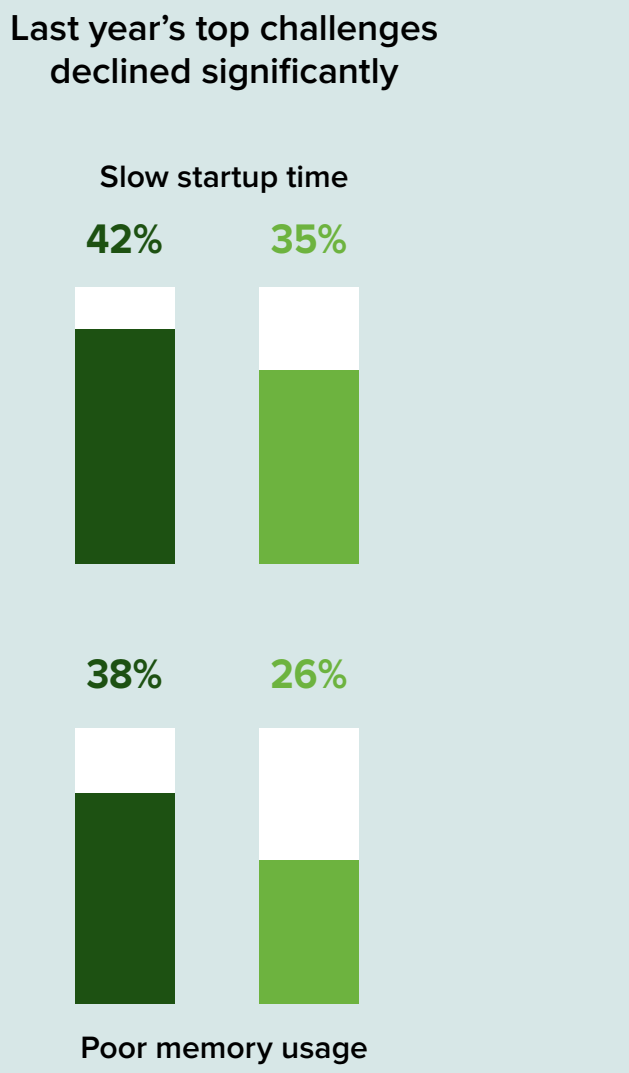
Use of Kubernetes in Spring environments continues to rise, jumping another 8 points in 2022 to 62%—after a 13% increase from 2020 to 2021. Almost half (45%) report running production Spring workloads on Kubernetes in the public cloud, while 34% run production on Kubernetes on-prem, making it the dominant platform overall. Spring users want new features to support Kubernetes. The number one ask is *compiling to native* (57%), followed by *management of Spring applications* (54%), and *Kubernetes-native service discovery* (52%). The Spring team has responded with Spring Framework 6 and Spring Boot 3, providing advanced support for generating native images. Both reached GA in November, 2022. We'll be looking at more ways to improve the Kubernetes experience for Spring users in the coming year. Be sure and read State of Kubernetes 2022 to learn what's happening with Kubernetes, and keep your eyes open for the State of Kubernetes 2023 report in a few months.

New tech gaining ground

The Spring team keeps a close eye on up-and-coming innovations. More than half (54%) of those surveyed this year like the fact that *new modules are consistently added to keep up to date with the latest technology*, and 49% say *the breadth of modules gives me confidence it [Spring] has what we need*. Of 16 new technologies, Project Loom and GraalVM jumped to the top of new tech people *plan to use* —each selected by 30% of respondents. Kotlin, dropped to third this year, selected by 16%.

GraalVM and native compilation remain hot

GraalVM and native compilation were big news in the Java world in 2021. This year, GraalVM is the number two hot technology, a close second to Project Loom. Almost a third (30%) *plan to use* GraalVM (versus 34% last year). Only 10% of respondents haven't heard of the technology. The majority (89%) have a positive view of the technology (versus 94% last year). 4% are making *extensive use* of GraalVM while 13% make *minimal use* of it. Concerns about startup time and memory footprint—the issues that GraalVM addresses—dropped significantly in 2022 as stakeholders gained greater exposure. Startup time concerns dropped 7 points while memory usage concerns dropped 12 points.

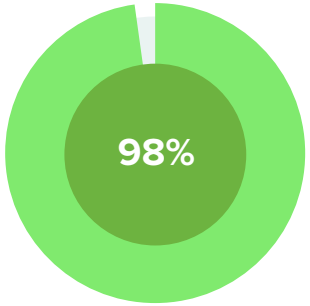


Adoption of Spring Native

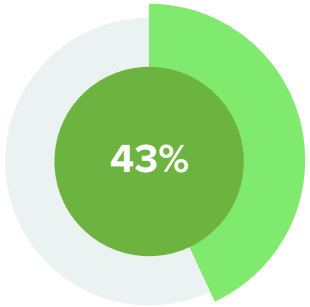
Spring Native and Spring Boot 3 support compilation of Spring applications to native executables using GraalVM, resulting in near instant startup time and smaller application footprint. For those who are aware of Spring Native (72% of respondents), 98% are interested in native compilation. They see the most compelling potential benefits as *reduced startup time* (chosen by 79%), *reduced memory footprint* (74%), *works well with containers and Kubernetes* (54%), and *reduces financial costs of hosting* (42%).

The larger the company, the more important *reducing financial costs of hosting* becomes. Almost half (47%) of companies with *more than 10,000 employees* see this as a benefit of native compilation, and it is recognized as a benefit across all industries—with the exception of Government (9%) (possibly because hosting is less important in government IT).

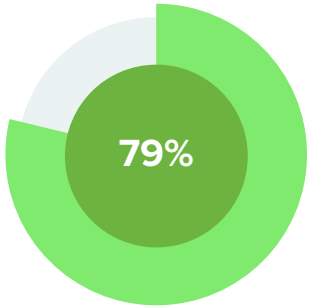
Among those who are aware of GraalVM (1276 respondents), 43% have tried Spring Native, and more than three-quarters (79%) of those who think Spring support for native compilation is a benefit (972 respondents) intend to deploy at least one Spring Boot application as a native executable within 2 years.



of respondents that are aware of Spring Native and are interested in native compilation of Spring apps



of those aware of GraalVM have tried Spring Native



intend to deploy a native Spring application within 2 years

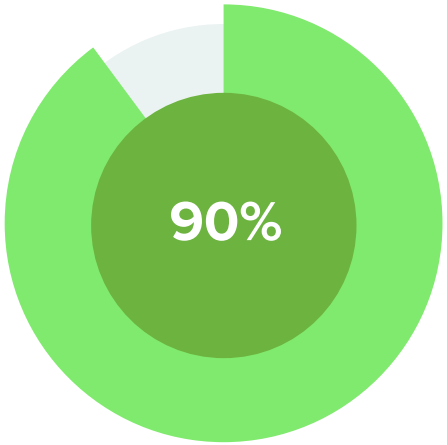
Excitement building for Project Loom

With a goal to dramatically reduce the effort of writing, maintaining, and observing high-throughput concurrent applications via lightweight virtual threads, this year's number one hot technology is Project Loom. While almost a third (30%) say they plan to use the technology, almost as many (27%) haven't heard about it yet. Of those who have heard of Project Loom, almost all (90%) have a positive view of the technology. With just 2% using it extensively, and another 4% using it minimally, it's safe to say that Loom is nearing the peak of the hype cycle.

If your team is excited about Loom, you can explore virtual threads with custom Executor configuration in Spring Framework 6, which includes the Project Loom preview found in JDK 19. This preview is expected to become a first-class feature in a future 6.x feature release.

Spring doesn't play favorites

Although Spring is committed to follow new technologies closely and make them available to Spring users on a timely basis, Spring is all about providing our users with the greatest range of choices—not playing favorites or picking winners and losers. This applies to the technologies we currently support and ones we will support in the future. While we look forward to enabling Spring developers to utilize Project Loom functionality as it becomes available as part of the JVM, we'll continue to provide the support and continued development you expect for Reactive programming models and conventional threading.



of respondents have a positive view of Project Loom, even though just 6% have used it

Project Loom reduces memory footprint, increases concurrency

Many applications make use of data stores, message brokers and remote services. If these apps use blocking I/O, they may benefit from the lightweight virtual thread model provided by Project Loom. Running such workloads with virtual threads can reduce the memory footprint compared to platform threads. Virtual threads can also increase concurrency, allowing an application to perform more different tasks in parallel.

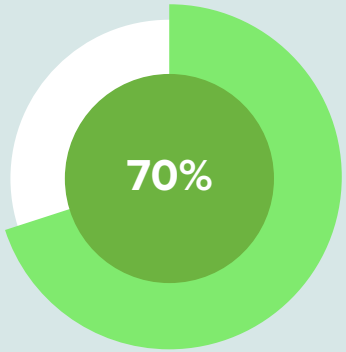
To learn more about virtual threads and Project Loom, read the blog Embracing Virtual Threads.

Upgrade and flourish

Upgrades have become a pain point across the entire IT landscape, stretching developers and operations staff even thinner. This includes the Java community, with new JDK releases coming at an accelerated rate. This has a knock-on effect on frameworks and libraries—which necessarily must release more frequently as well. One of our goals for this year's survey was to get a better understanding of upgrade behavior in the Spring Community. Spring users are doing a great job keeping up with new releases. The major reason for not upgrading is simply *"our current environment is working well."*

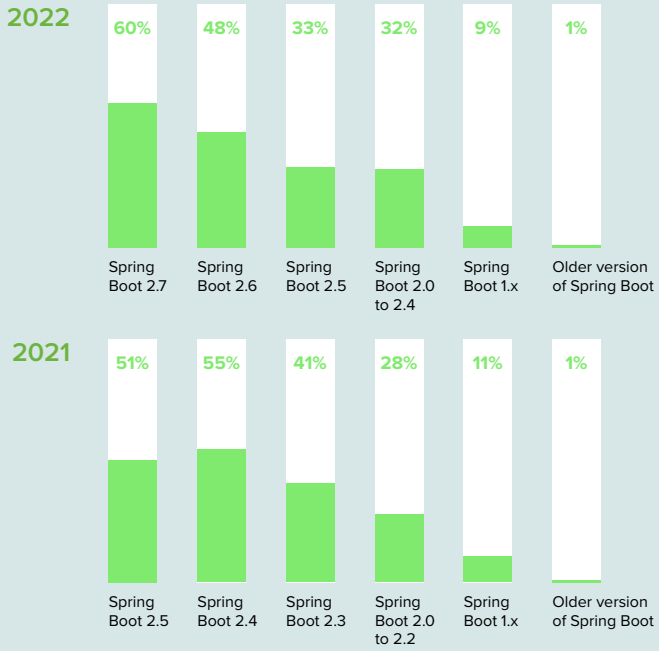
Spring Boot users are keeping up with the pace of releases

We were pleasantly surprised to see that Spring stakeholders are keeping up with the latest releases of Spring Boot. Most users this year are on current versions and keeping up better than they did in 2021. More than two-thirds (70%) plan on upgrading to the next major generation of Spring based on the Java 17 baseline within 12 months, and 88% will do so within 2 years.



plan on upgrading to the next generation of Spring within 12 months

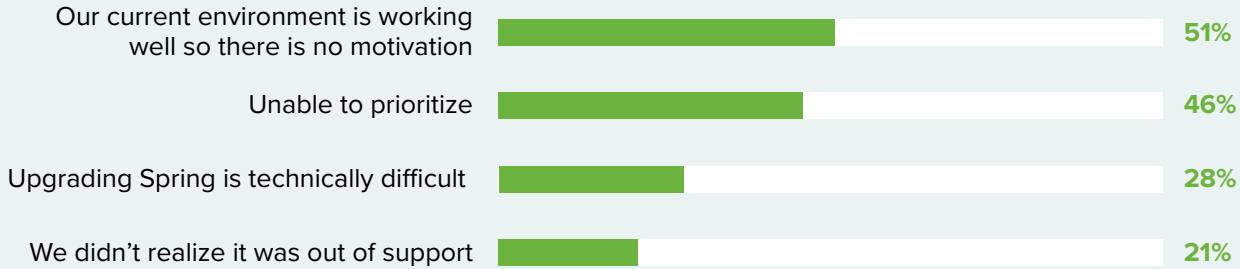
What versions of Spring Boot are you currently using in production?



If it ain't broke...

Naturally, we wanted to understand any impediments that keep Spring users from upgrading. The number one reason for running a version of Spring Boot that is out of open source support in production was: *our current environment is working well so there is no motivation* (selected by 51%), followed by *unable to prioritize* (46%). Just 28% chose *upgrading Spring is technically difficult.*

Why are you running a version of Spring Boot that is out of open source support in production?



Spring provides flexibility when it comes to upgrades and support

Some alternative Java environments ONLY support the current release. While the Spring team strongly believes that being proactive on upgrades rather than reactive is the best option for most customers, Spring provides more flexible upgrade options to accommodate a wide range of customer needs.

- For those that upgrade proactively and keep pace with the Spring ecosystem, you're covered by a OSS support with up to 3 years of support for major releases and a minimum of 12 months of support for minor releases
- Those that need longer support for a particular release can get it by contracting for commercial support available through VMware Tanzu

“Spring”ing up (to speed)

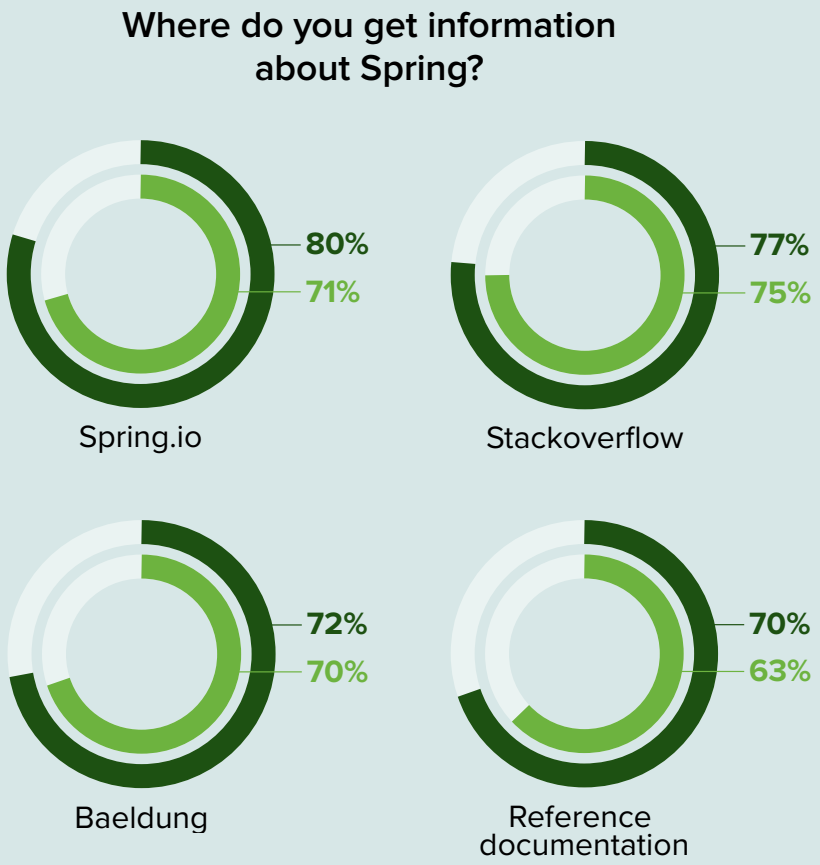
As tech moves faster, keeping up becomes harder and education and training become that much more important. For 2022, we wanted to learn more about the go-to sources the Spring community relies on.

The learning curve is getting steeper

Every year, we include questions to learn about the challenges organizations face with Spring. As noted earlier, challenges like *slow startup time* and *poor memory usage* showed significant improvements this year. A notable exception was *steep learning curve* which saw a substantial rise. More than a quarter (26%) now see learning as a challenge.

Preferred sources of information

So where do people learn about Spring? When we asked this question, *Spring.io* jumped to the top of the list for the first time (up 9% to 80%). In second and third positions were *Stack Overflow* (77%) and *Baeldung* (72%). Each of the top 5 sources saw an uptick, suggesting that people really are working harder to find the information they need.



Learning new Spring features

When we asked about preferred methods for *learning how to use a new Spring feature or capability, documentation* was the clear winner (82%), followed by *concise guide or tutorial explaining concepts with snippets* (61%), *books or articles* (60%), and *video-based courses* (44%). *Baeldung* (68%) and *Stack Overflow* (56%) are the online sources that were recognized as *particularly good for learning a new Spring feature or capability* followed by the *SpringDeveloper Channel on YouTube* (34%).

And finally, when it comes to information sources, *Josh Long* may be as close as you can get to being a Spring superstar. Although his name doesn't appear anywhere in the formal survey, he received 12 mentions in survey comments (versus just 4 mentions last time).

Getting unstuck

It seems clear that in many cases, developers just want to identify the source(s) that can get them unstuck quickly so they can keep a project moving forward. Among this year's growing challenges were *hard to understand what all the components do and when to use them* (up 3% to 37%) and *lack of information about how to use modules together* (up 5% to 29%).

We'll be working harder in the coming year to help Spring users tackle challenges like these.

Summary and recommendations

In 2022, 55% of Spring stakeholders surveyed reported using *mostly modern* architectures, with 93% using microservices, 35% using Reactive, and almost a quarter (24%) now using Serverless—up 5% since last year. Exposing internal and external APIs remains the dominant Spring use case. While plain JSON over HTTP (81%) remains the dominant type of API, OpenAPI (61%) and GraphQL (24%) showed the biggest increases in popularity versus 2021.

Native compilation remained a hot technology in 2022. Almost all respondents (98%) who are aware of Spring Native are interested in compiling Spring apps. More than three-quarters (79%) intend to deploy compiled Spring applications within two years or less. However, when it comes to expectations, Project Loom has eclipsed native. With its focus on using lightweight virtual threads to reduce the effort needed for high-throughput concurrent applications, 30% already *plan to use* Loom. Of those in the know (63% of stakeholders), 90% have a favorable view. You can explore virtual threads in Spring Framework 6, which includes a Project Loom preview.

Upgrades have become a pain point in the Java community as new major and minor releases come faster and faster, increasing demands on operations staff and developers. We were surprised and gratified to learn that most Spring users are running current versions—and keeping up better than they did in 2021. 70% say they will plan on upgrading to the next major Spring release within twelve months.

More than a quarter (26%) of Spring stakeholders now see a steep learning curve as a challenge. *Spring.io* was the main source of Spring information in 2022 (chosen by 80%), followed closely by *Stack Overflow* (77%) and *Baeldung* (72%). *Baeldung* (68%) and *Stack Overflow* (56%) were recognized as *particularly good for learning a new Spring feature or capability*. The *Spring Developer Channel on YouTube* (34%) was a distant third for that purpose.

In response to community interest and feedback, the Spring team has launched Spring Academy, a new and engaging learning environment that we hope will simplify and accelerate learning — for both newcomers to Spring and veterans.

This annual survey is an invaluable resource as we work with the Spring Community to prioritize new areas for innovation and identify and resolve issues. Thanks for taking time to read this report. If you also participated in the survey, thank you for your feedback!

Visit Spring.io for all the resources, training, documentation, and much more as you continue your journey into the world of Spring.

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