OpenLogic by Perforce

ECLIPSE FOUNDATION

# 2024 State of Open Source Report

## Open Source Usage, Market Trends, & Analysis

# Foreword

Dear colleagues,

It is my pleasure to share with you the 2024 State of Open Source Report. This year OpenLogic collaborated again with the Open Source Initiative (OSI) and brought on a new partner: The Eclipse Foundation. In October of 2023, we invited open source users to respond to a survey with more than two dozen questions about the use and support of open source software (OSS) by their organizations. We received a record number of responses: More than 2,000 people, from large enterprises to early-stage startups, working across numerous industries all over the world, completed the survey. One of the things I'm most proud of is that we can share a more global perspective in this year's report — we increased the amount of respondents from every continent and kept under 30% responses from North America.

**Javier Perez**

Chief OSS Evangelist and Senior Director of Product Management, Perforce Software

This year, we narrowed the scope of the survey slightly in order to focus on the business-critical software where there is the most fluctuation and investment. We added a question about open source security tools since cybersecurity awareness, specifically related to open source software, has grown and become a big enough concern to warrant government oversight both in the U.S. and the EU. We also gave respondents opportunities to write in comments and clarifications for some questions.

One of the objectives of publishing this report is to illuminate which open source technologies are becoming more popular compared to previous years, and highlight trends by geography, industry, and organization size. These insights should be meaningful to open source practitioners: the developers, engineers, system administrators, and architects who represent 50% of this year's survey respondents, many of whom may also contribute to open source projects. The findings should also be of interest to IT leadership (managers, directors, VPs, CTOs) in organizations deploying open source — which is, of course, all of them.

In the following pages, I trust you will find much to digest in terms of where OSS is today, particularly what software organizations are using and what challenges they frequently encounter. There is much to be excited about, such as greater OSS adoption in Latin America, Africa, and Asia, as well as some milestones yet to be achieved.

I want to thank Stefano Maffulli, OSI's Executive Director, and Clark Roundy from the Eclipse Foundation for helping promote the survey to a broader audience. And thanks to all those who responded — without your thoughtful participation, there would be no report. Finally, I hope that all of you reading will continue to support open source projects and organizations so they can keep doing their important work!

Enjoy the report,

Javier Perez | Chief OSS Evangelist and Senior Director of Product Management, Perforce Software

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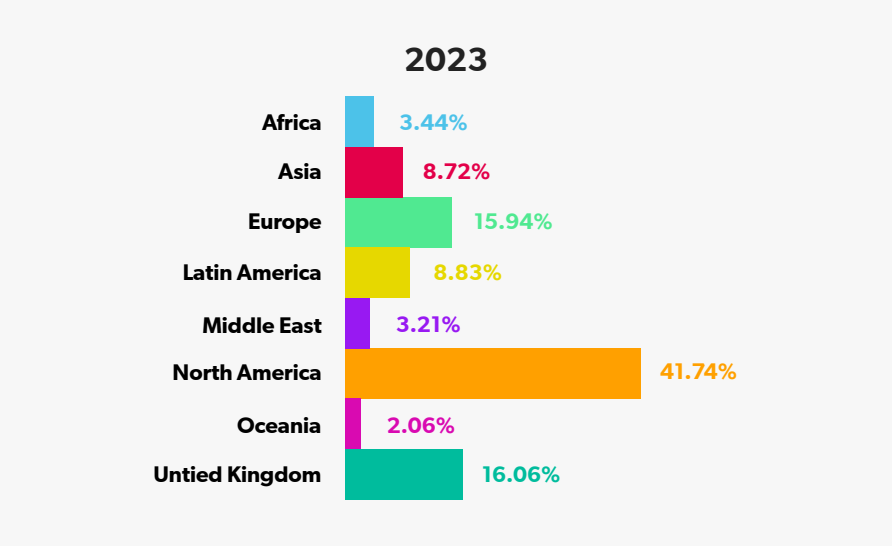
# About the Survey

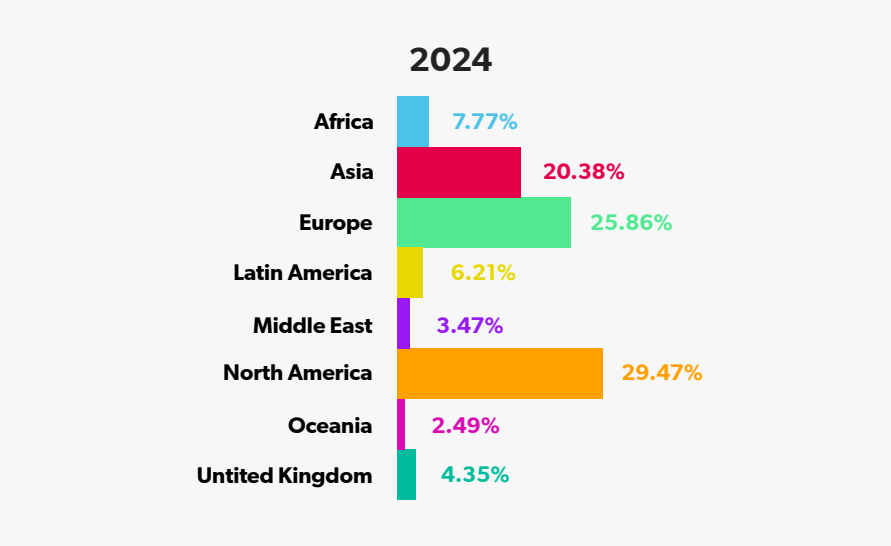
The 2024 State of Open Source Report is based on an anonymous survey conducted between October 10 and November 8, 2023. The survey received a total of 2,046 responses from individuals all over the world working with open source software in their organizations.

The survey began with some initial questions about location, industry, organization size, and title.

## REGION

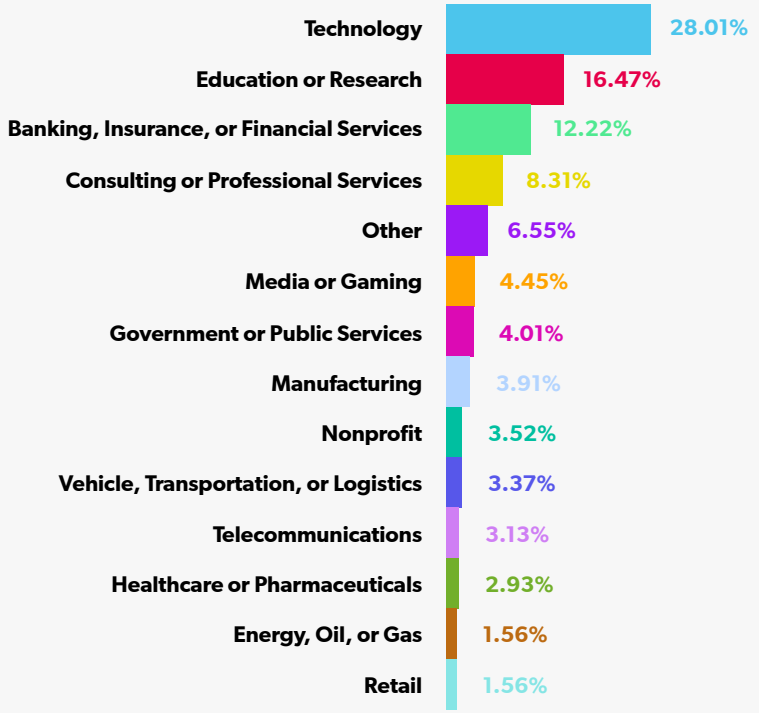
It was exciting to see that, compared to 2023 where 42% of our respondents were in North America, we have a much more balanced distribution across all regions. Specifically, many more people in Asia and Europe responded to this year's survey.



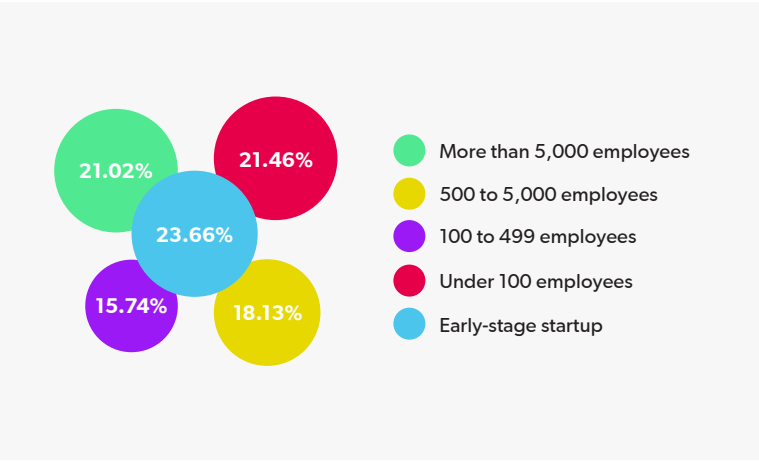
## INDUSTRY

Just like last year, the largest percentage of this year's survey respondents — more than a quarter — work in technology. Education or research and banking, insurance, or financial services were the next most common sectors in the 2024 survey population.



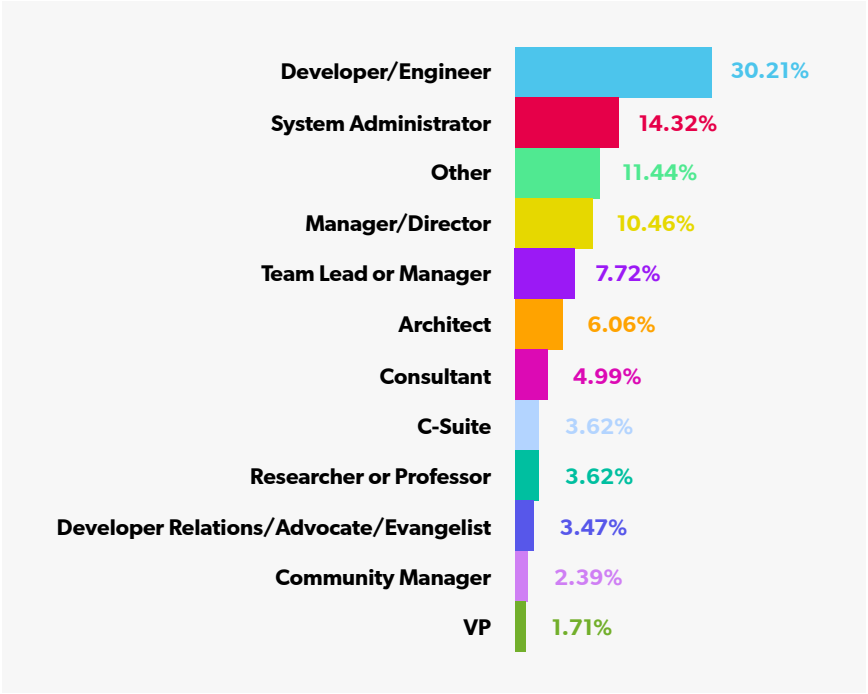

## ORGANIZATION SIZE

We know organizations of all sizes work with OSS, and the following graph shows the breakdown by size. Early-stage startup was a new option this year, and the most popular. This will be important to remember as we get into the technology sections, as we consider how the inclusion of this group is reflected in the data. Overall, it is a well-balanced distribution with 16–23% of respondents from each organization size.



## JOB TITLE

50% of our respondents hold titles like systems administrator, developer, engineer, and architect, with 17% in manager, team lead, and director roles, and a little under 5% in VP or C-Suite positions. The remainder identify as consultants, community managers, professors, researchers, or evangelists/advocates.



# Open Source Usage, Investment, and Support Challenges

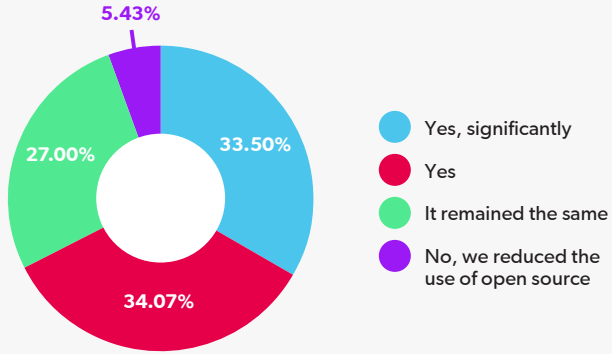
In this section, find out how survey participants answered questions about open source usage in their organizations over the past year, including why they chose OSS, what technologies were invested in, and which support challenges caused the most headaches.

## OPEN SOURCE SOFTWARE USAGE: DID IT GROW, STAY THE SAME, OR DECLINE?

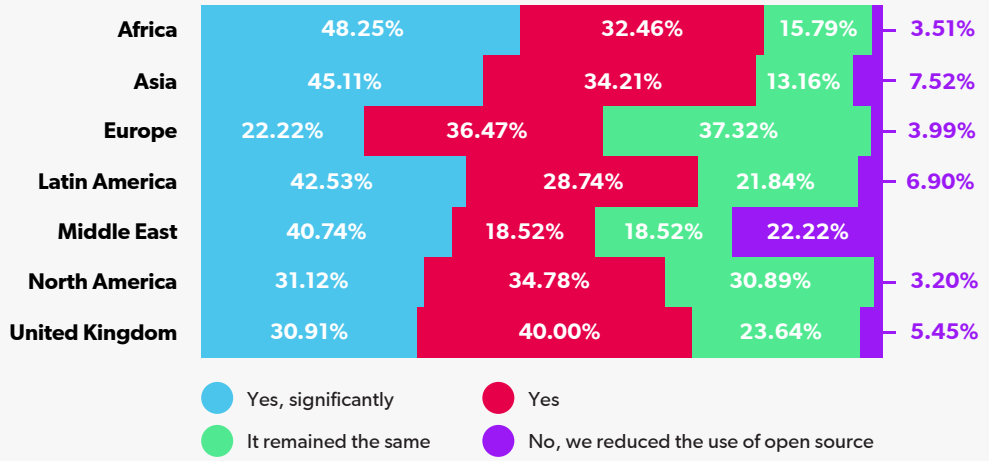
95% of respondents said their organizations either increased or maintained their use of open source software in the past year — and 33% said their usage increased significantly. As for the 5% who reduced their OSS, they were predominantly from early-stage startups, whereas 39% of those representing large enterprises (<5,000 employees) reported a significant increase.

> 95% of organizations increased or maintained their use of open source software in the past year.

### Has Your Organization Increased the Use of Open Source Software Over the Last Year?

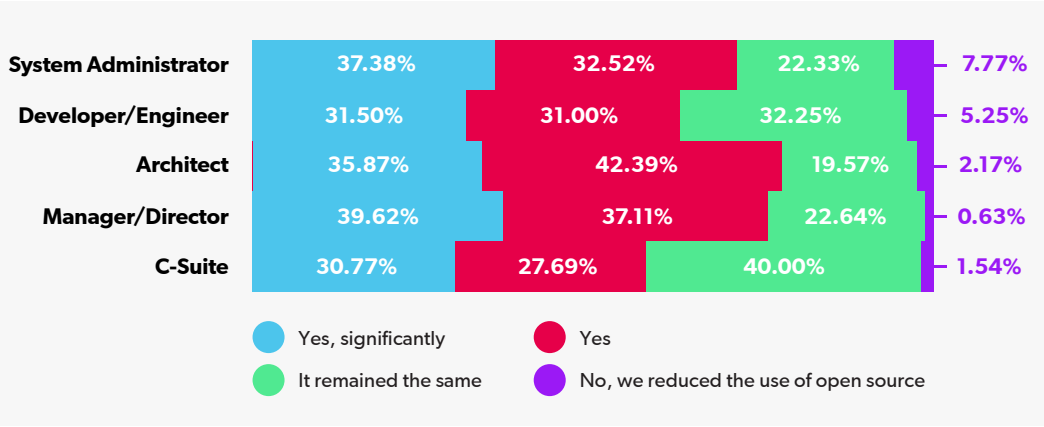



Geographically, Africa, Asia, and Latin America had the largest percentages of respondents who noted significant increase.



There was some interesting variation on this question based on job titles as well — for example, C-Suite respondents were more likely to say their organization's usage stayed the same compared to those in more hands-on roles. This suggests a possible disconnect for those in leadership positions who many not know how much open source software is being adopted.

40% of C-Suite respondents indicated that the use of OSS remained the same while over 60% of those in more technical roles increased the use of OSS.



# Why Organizations Chose Open Source Software

What drove open source adoption in 2023? We allowed people to select more than one answer and overall, no license cost/cost reduction was the top choice, selected by 37% of survey respondents (and notably 51% of those working in government). In 2022, cost reduction was the 9th most popular reason, but challenging economic circumstances worldwide may have played a bigger role this year and many organizations likely had tighter budgets. A more geographically distributed population of respondents also influenced the change in the responses from previous years.

> No license cost and overall cost reduction proved the most compelling reason to use open source software in 2023.

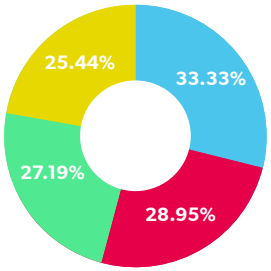
Regionally, there is some notable variation when comparing the top four reasons. In North America, Europe, and the UK, cost reduction appears to be a bigger motivator than in other parts of the world.

In terms of industries and verticals, slightly more than half (51.5%) of respondents working in government or public services said no license cost and overall cost reduction was their reason for using OSS. This was the highest percentage for any industry, and it's encouraging to see more OSS usage in governments around the world.

| Reason for Using OSS | Percentage |
|---|---|
| No License Cost, Overall Cost Reduction | 36.64% |
| Functionality Available to Improve Development Velocity | 30.71% |
| Stable Technology with Community Long-Term Support | 27.64% |
| Access to Innovations and Latest Technologies | 26.86% |
| To Reduce Vendor Lock-In | 21.29% |
| Open Standards and Interoperability | 20.93% |
| To Modernize Technology Stack | 20.00% |
| Fast Moving / Constant Enhancements, Releases, and Patches | 14.21% |
| Community-Oriented and Transparent | 12.86% |
| Ability to Contribute to, and Influence Direction of, Open Source Projects | 10.43% |
| Large Selection of Options for Similar Functionality | 8.14% |
| Makes It Easier to Hire or Retain Employees | 6.14% |

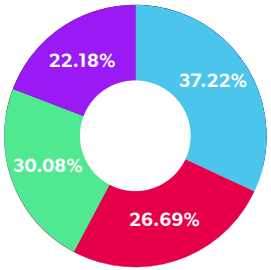
> 51.5% of respondents working in government or public services said no license cost and overall cost reduction was their reason for using OSS.

## Africa



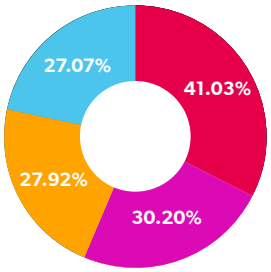

- Functionality Available to Improve Development Velocity
- No License Cost/Overall Cost Reduction
- Access to Innovations and Latest Technologies
- Stable Technology With Long-Term Community Support

## Asia



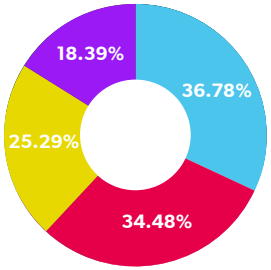

- Functionality Available to Improve Development Velocity
- No License Cost/Overall Cost Reduction
- Access to Innovations and Latest Technologies
- To Modernize Technology Stack

## Europe




- No License Cost/Overall Cost Reduction
- Open Standards and Interoperability
- Reduce Vendor Lock-In
- Functionality Available to Improve Development Velocity

## Latin America




- Functionality Available to Improve Development Velocity
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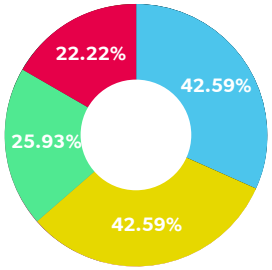
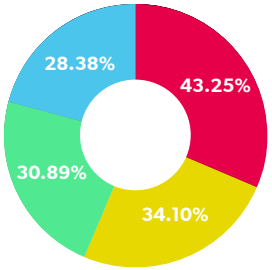
## Middle East



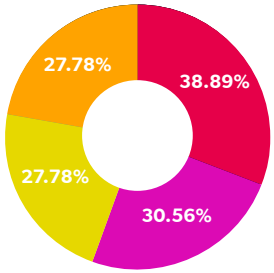

- Functionality Available to Improve Development Velocity
- Stable Technology With Long-Term Community Support
- Access to Innovations and Latest Technologies
- No License Cost/Overall Cost Reduction

## North America



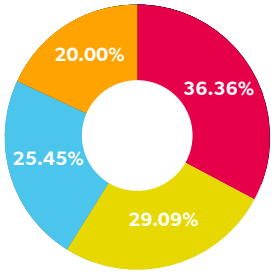

- No License Cost/Overall Cost Reduction
- Stable Technology With Long-Term Community Support
- Access to Innovations and Latest Technologies
- Functionality Available to Improve Development Velocity

## Oceania




- No License Cost/Overall Cost Reduction
- Open Standards and Interoperability
- Stable Technology With Long-Term Community Support
- Reduce Vendor Lock-In

## United Kingdom




- No License Cost/Overall Cost Reduction
- Stable Technology With Long-Term Community Support
- Functionality Available to Improve Development Velocity
- Reduce Vendor Lock-In

# Investment in Open Source

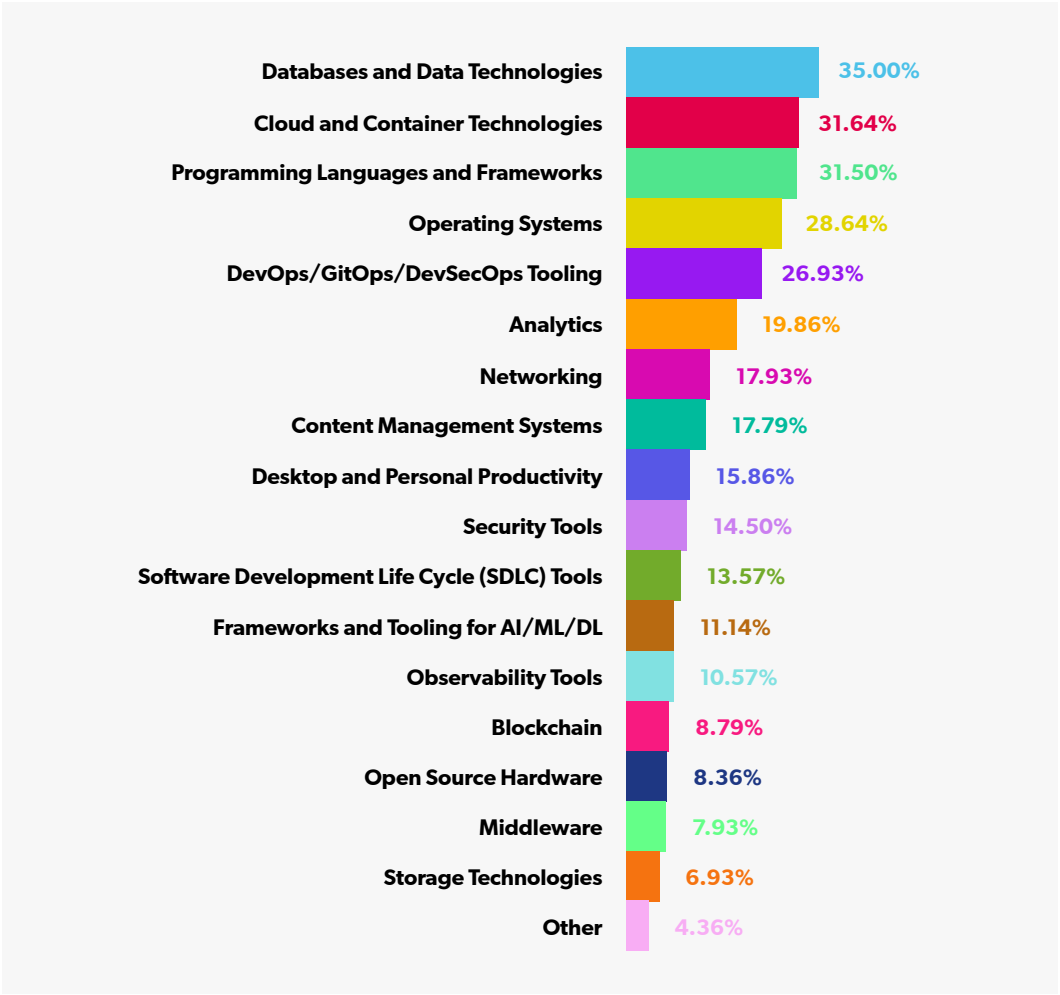
Asking about what types of technologies are getting the most investment, in terms of dollars and other resources, gives us a good idea of priorities when it comes to deploying open source and the direction of organizations with regards to technology trends and innovation.

In last year's report, software development lifecycle (SDLC) tools and containers occupied the top two spots, but in 2024, both were surpassed by databases and data technologies. Data continues to be a dominant force in the digital economy, and with the rise of AI models that train on large amounts of data, it's not surprising to see data technologies getting the most attention.

> Organizations are investing the most in databases and data technologies.

We include the term "data technologies" because not all technologies fit under the category of databases. Presently, we have technologies dedicated to streaming and log file management. Additionally, we're seeing diverse architectures that bear little resemblance to traditional relational databases.

## Which Categories of Open Source Software Has Your Organization Invested in the Most in Terms of Projects, Budget, and Resources?




As you can see from the chart, cloud and container (and container orchestration) technologies are still being heavily invested in by many organizations. Further analysis reveals that it is particularly large enterprises that are investing in the use of containers as the preferred architectural model while small to mid-size entities are allocating more to data technologies.

| Organization Size | Data Technologies | Container Technologies |
|---|---|---|
| More than 5,000 employees | 27.66% | 38.30% |
| 500 to 5,000 employees | 38.15% | 37.04% |
| 100 to 499 employees | 41.46% | 34.15% |
| Under 100 employees | 38.24% | 31.70% |
| Early-stage startups | 30.41% | 18.24% |

We also asked respondents, "Which is the most business-critical open source software in your organization?" and there was considerable overlap between the top 5 investment areas and the technologies that got the most votes:


**Additional Insights:**

- Operating systems and DevOps/GitOps investment remained roughly at the same levels compared to last year and are both still among the top five.
- Interestingly, investment in SDLC software dramatically declined, dropping from 1st to 11th place. Why? There may have been not enough new tools or advancements in 2023 to fuel growth in that space.

# Support Challenges While Using Open Source Software

For a variety of reasons just illustrated, more and more organizations are relying on open source software, but of course there are still challenges. We always include a question in the survey about this to identify the barriers to adoption so we, as an industry, can find solutions.

Allowing respondents to choose multiple answers, we asked them to rank support issues as not challenging, somewhat challenging, challenging, or very challenging.

**We learned that:**

**79%** find maintaining security policies or compliance at least somewhat challenging (and 44% describe it as challenging or very challenging)

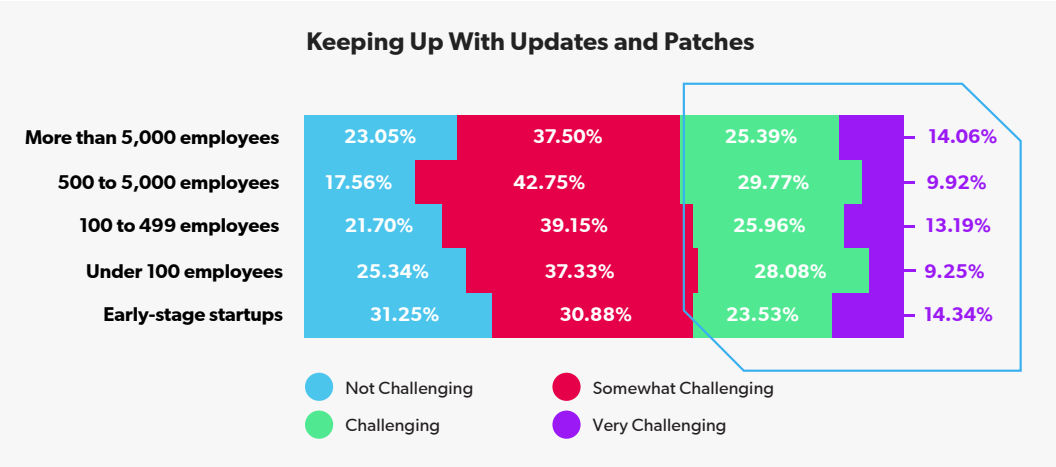
**42%** say maintaining end-of-life versions of open source software is challenging or very challenging

**40%** identified the lack of high-level technical support as a pain point

**38%** are having challenges related to their team's OSS skills, experience, and proficiency

**34%** have run into issues with installations, upgrades and configurations

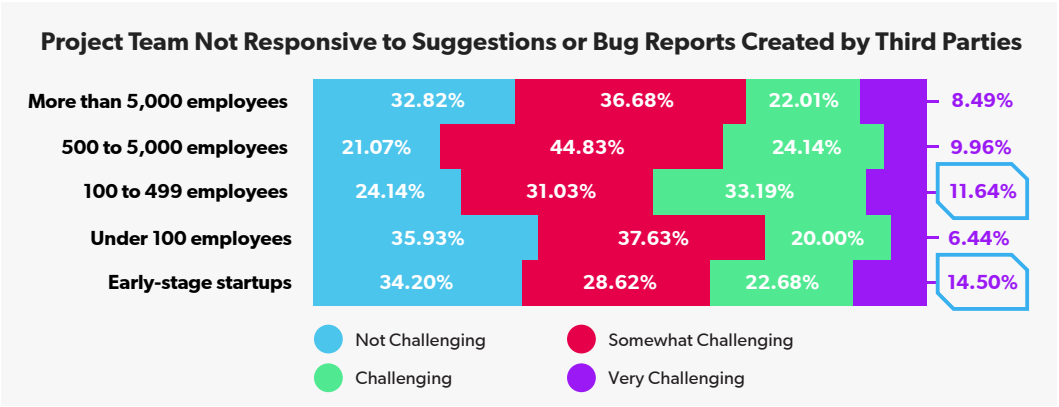
Keeping up with updates and patches is always a top challenge for organizations using open source software. This year, over 40% of the respondents from companies of all sizes considered this challenging or very challenging.

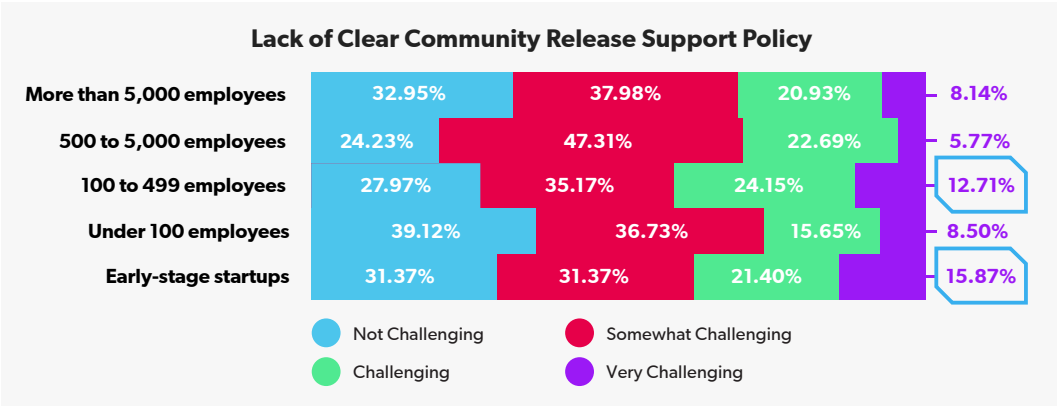



More than 40% of respondents from organizations of all sizes said keeping up with updates and patches is a challenge.

**Additional Insights:**

- Medium-sized companies in particular face challenges with infrastructure scalability.
- "Project team not responsive to suggestions or bug reports created by third parties " and "Lack of clear community release support policy" have more of an impact on early-stage startups and companies with between 100 and 499 employees.




This year we also asked,

## How Are You Addressing the Shortage of Open Source Software Skills?


Nearly half of those surveyed (45.45%) are dealing with shortfalls by providing training to their existing staff. Direct hiring of experienced professionals is also a viable option, with over a third of organizations (38.32%) going that route.

Organization size (and budget) probably plays a role here, as we see 50% of the largest enterprises are outsourcing talent, whereas, medium to large organizations prefer to provide internal or external training to address skill gaps.

Only 16.24% of respondents indicated that they don't have a skills shortage. This response was predominant among small organizations with under 100 employees (23%) and early-stage startups (22%).

# Open Source Linux Distributions

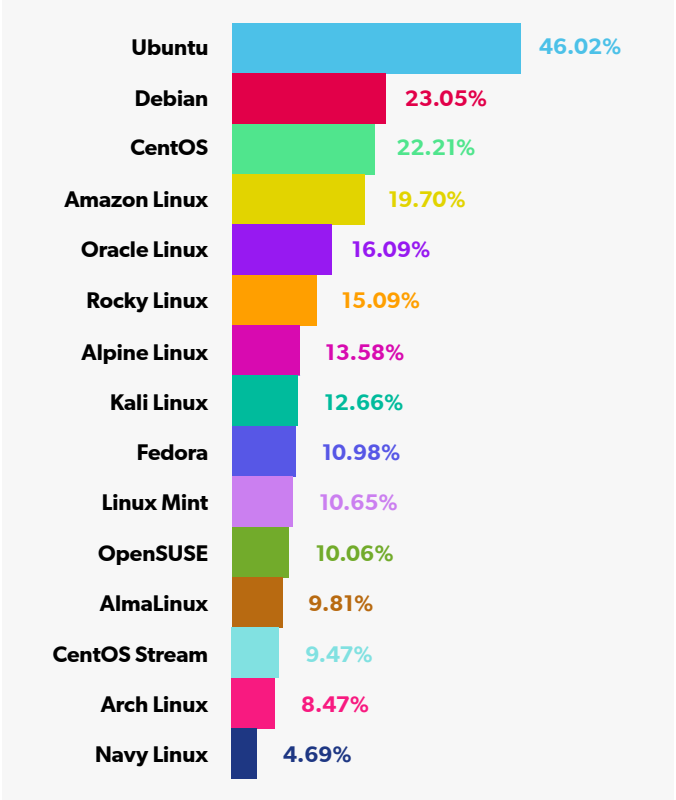
Once again, Ubuntu is the most common Linux distribution, with 46% of our respondents using it (up from 26% last year). It seems 2023's shakeups in the Linux space — such as Red Hat's decision to restrict access to RHEL code and the fast-approaching end-of-life for CentOS 7 this coming June — have benefitted Ubuntu.

Speaking of CentOS, 22% of those surveyed are still on it, making it the third most popular distribution, just 1% below Debian. Within the technology vertical, however, 28% remain on CentOS; these are most likely companies with large numbers of CentOS deployments that have not had time to migrate yet. Time is running out for organizations on CentOS, as community support for CentOS 7 will end on June 30, 2024, making all CentOS versions EOL.

Other than Ubuntu and Debian, which distros are poised to fill the considerable gap left by CentOS? Rocky Linux and AlmaLinux both made small gains this year, and Amazon Linux usage increased by 6%; CentOS Stream, however, dropped below 10%. It's still too early to declare a winner in the so-called "Linux Wars" but the graph on the right shows how the various contenders are doing. AlmaLinux is a favorite among vehicle or transportation logistics organizations, whereas Rocky Linux has the edge in the healthcare or pharmaceuticals sector.

22% of organizations are still on CentOS despite version 8 being end of life and the upcoming last release of version 7.

## Which Open Source Linux Distributions Does Your Organization Use Today?




We also asked survey takers to comment on how disruptive Red Hat's June announcement regarding access to RHEL code was for other open source projects. Some expressed concerns about the future and uncertainty around the impact of the change; one person explained, "It required us to stop other work to determine what direction we needed to take for our underlying stack (the OS)."

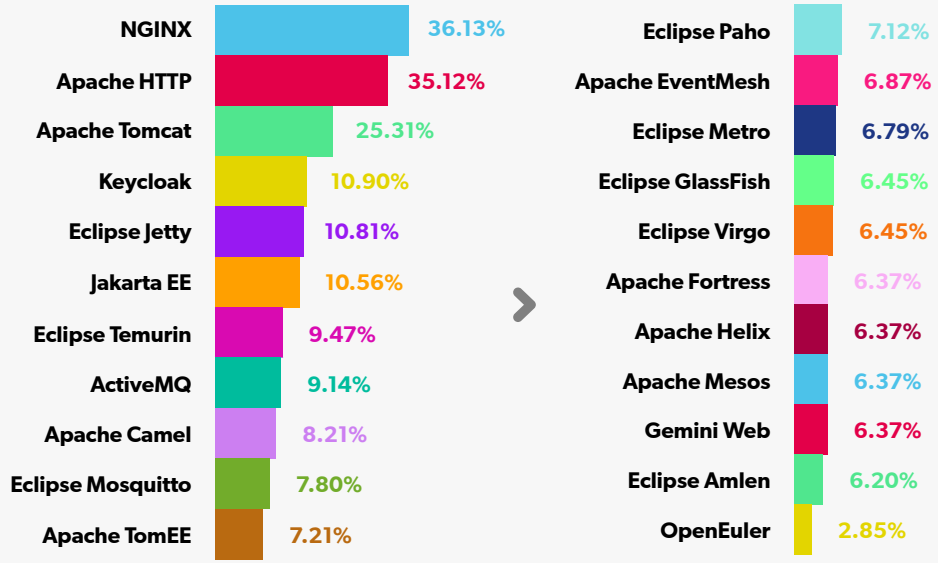
Overall, however, only a few described delays. Still, it's going to take time for organizations to decide on their directions post-CentOS. Among alternatives to CentOS, the respondents selected Oracle Linux, Rocky Linux, AlmaLinux, CentOS Stream and Navy Linux.

# Open Source Infrastructure Software

For open source web infrastructure, Apache HTTP and NGINX are always very close in terms of usage, and this year, NGINX was the more popular choice for our survey population. No surprise seeing Apache Tomcat in third place among all open source infrastructure software, and in fourth, Keycloak usage grew from 3% last year to nearly 11%.

If we look at the "best of the rest," a number of Eclipse Foundation technologies made the cut, with Eclipse Jetty, Jakarta EE, Eclipse Temurin, and Eclipse Mosquitto all making it into the top ten (along with ActiveMQ and Camel).

### Which Open Source Infrastructure Technologies Does Your Organization Use Today to Support Your Software Infrastructure?




A breakdown by industry is interesting for comparing NGINX vs. Apache HTTP usage. In the technology vertical, 50.48% of respondents use NGINX in their organizations vs. only 43% for Apache HTTP, perhaps reflecting performance requirements covered with NGINX. In the case of government or public services, 45.65% use Apache HTTP vs. 42.11% for NGINX, while in the telecommunications industry, usage is evenly split at 40.48% for each.

**Additional Insights:**

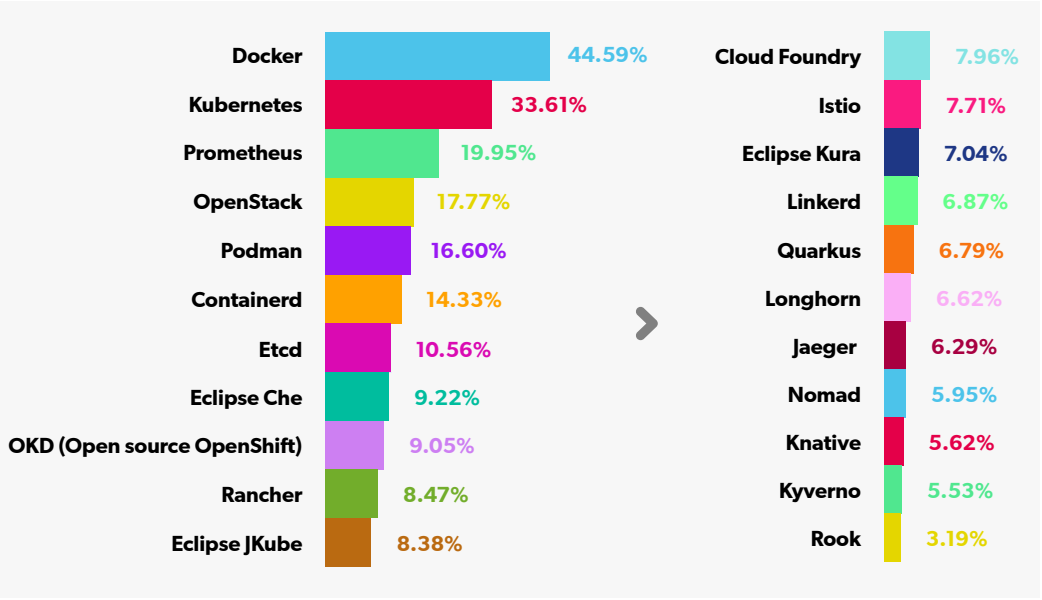
- OpenEuler, while a new open source project, is gaining traction in the vehicle, transportation and logistics industries (7.5%).
- Eclipse GlassFish is the most used in the Energy, Oil, and Gas industry (14.29%).
- We included Eclipse Jakarta EE in this category and the banking, insurance or financial services industry had 15% usage. More details in the runtimes section.
- Keycloak's biggest industry is government or public services with 14% usage, and it is good to see government agencies implementing identity and access management.

NGINX came out ahead of Apache HTTP this year as the most used open source infrastructure software.

# Cloud-Native Open Source Technologies

Cloud-native software is unquestioningly one of the biggest growth areas in open source. Container-based and Kubernetes-native deployments are trending, and open source tools designed to support cloud-native environments are on the rise.

## Which Cloud-Native Open Source Technologies Does Your Organization Use Today?




Nearly every technology in this category enjoyed growth this year and the top two (Docker and Kubernetes) made significant gains:

- Docker usage nearly doubled from 26% to 44.6%, with expansion in every region.
- Kubernetes adoption has been steadily increasing over the past 3 years — from 18% in 2021, to 22.5% in 2022, and in 2023, 33.6%, or one in three, of our survey participants deployed it in their organizations.
- Modernization to cloud-native technologies is happening predominantly in Europe (43.13%) and North America (36.90%).
- The top industries for Kubernetes are technology and government. There is also a positive correlation between Kubernetes usage and organization size, possibly due to associated costs and the level of expertise required (which smaller teams may lack).

| Organization Size | Kubernetes |
|---|---|
| More than 5,000 employees | 48.55% |
| 500 to 5,000 employees | 32.62% |
| 100 to 499 employees | 36.12% |
| Under 100 employees | 28.06% |
| Early-stage startup | 22.43% |

One in three organizations have Kubernetes deployments, which is more than a 10% increase from last year.

| Industry | Kubernetes |
|---|---|
| Banking, Insurance, or Financial Services | 26.25% |
| Consulting or Professional Services | 31.82% |
| Education or Research | 19.88% |
| Energy, Oil, or Gas | 33.33% |
| Government or Public Services | 42.11% |
| Healthcare or Pharmaceuticals | 30.00% |
| Manufacturing | 36.73% |
| Media or Gaming | 20.37% |
| Nonprofit | 18.00% |
| Retail | 33.33% |
| Technology | 48.57% |
| Telecommunications | 33.33% |
| Vehicle, Transportation, or Logistics | 35.00% |

**Other insights:**

- Prometheus, which collects metrics data and stores it in a time-series database, saw its usage go up by 8% in the last 12 months.
- While this question last year suggested OpenStack usage was possibly declining, it has rebounded this year to a healthy 17.7%, just behind Prometheus.
- Across all regions, competing Kubernetes open source platforms OKD and Rancher are virtually tied, separated by less than 1%, but in Europe and the UK, Rancher has more users.

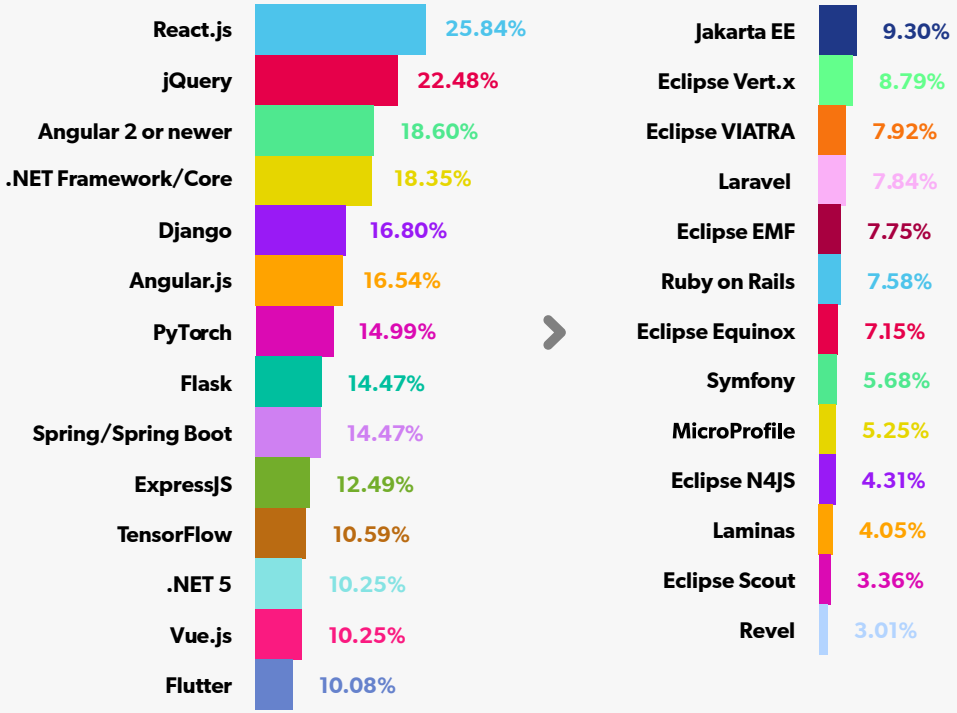
| Region | Kubernetes | OKD | Rancher |
|---|---|---|---|
| Africa | 18.82% | 10.59% | 7.06% |
| Asia | 27.85% | 7.31% | 4.57% |
| Europe | 43.13% | 7.03% | 11.50% |
| Latin America | 27.14% | 17.14% | 4.29% |
| Middle East | 19.51% | 7.32% | 7.32% |
| North America | 36.90% | 10.18% | 9.16% |
| Oceania | 27.59% | 6.90% | 3.45% |
| United Kingdom | 20.93% | 9.30% | 13.95% |

# Open Source Frameworks

Open source frameworks are heavily used among developers. This year, we included more open source frameworks in this question, and all are very active projects with large communities of contributors.

There was some deviation in this category from last year where React.js, Spring Boot, and jQuery were the top three, respectively. Take a look:

### Which Open Source Frameworks Does Your Organization Use to Build Applications Today?




React.js is still #1 with a quarter of respondents (25.84%) — almost the exact same percentage of usage as last year (25.69%) — but Spring Boot usage is down 9% from last year, causing it to fall to 9th and jQuery to claim the #2 spot. Angular 2 (or newer) is now the 3rd most used framework; its EOL predecessor, AngularJS, is surprisingly still being used by 16.54% (more on this in the next section).

**Additional Insights:**

- In the AI/ML/DL space, PyTorch usage grew for the third consecutive year.
- Of the six Eclipse frameworks, Eclipse Vert.x is the most popular (8.79% usage), followed by Eclipse VIATRA (7.92% usage).
- .NET Framework/Core usage is up 3% from last year.

# Angular.js Usage: A Closer Look

Angular.js has now been end of life for a full two years, and yet 16.54% of organizations are still using it.

- Among the largest organizations, Angular.js usage is at 21.89%, so there is practically no change from last year (20%) and the year before (21%). Many organizations are still running apps with end of life open source software.
- Almost half (49%) of organizations using Angular.js also have React.js, and close to a third (31%) have Angular 2 (or newer). This indicates that organizations have other apps, but migrating or decommissioning applications with end-of-life Angular.js takes time and resources.
- The top 3 industries running Angular.js are banking, insurance, or financial services (26.82%); technology (21.22%); and education or research (15.85%).

Nearly 27% of banking, insurance or financial services organizations are still on EOL Angular.js.

We also asked a follow-up question for respondents who selected AngularJS:

## What Is Your Organization's Plan if There Are Newly Disclosed Vulnerabilities (CVEs) in Angular.js?


This is quite telling — almost 29% of respondents with organizations using Angular.js said "I don't know" indicating that they have no information about the risk factors or have no knowledge of their organization's mitigation strategy. And if we look at the answers by job title, 45% of those who said "I don't know" are developers or engineers — presumably the individuals who would be responsible for the fix.

Only those who responded that they already have a vendor to provide patches (15.63%) or in-house support for CVEs (16.41%) are being proactive. The remaining 68% who are either not patching, not scanning, waiting until there is a critical CVE to start the vendor procurement process, or simply "don't know" are not in a good position from a security standpoint, especially the 12.5% who are not patching CVEs.

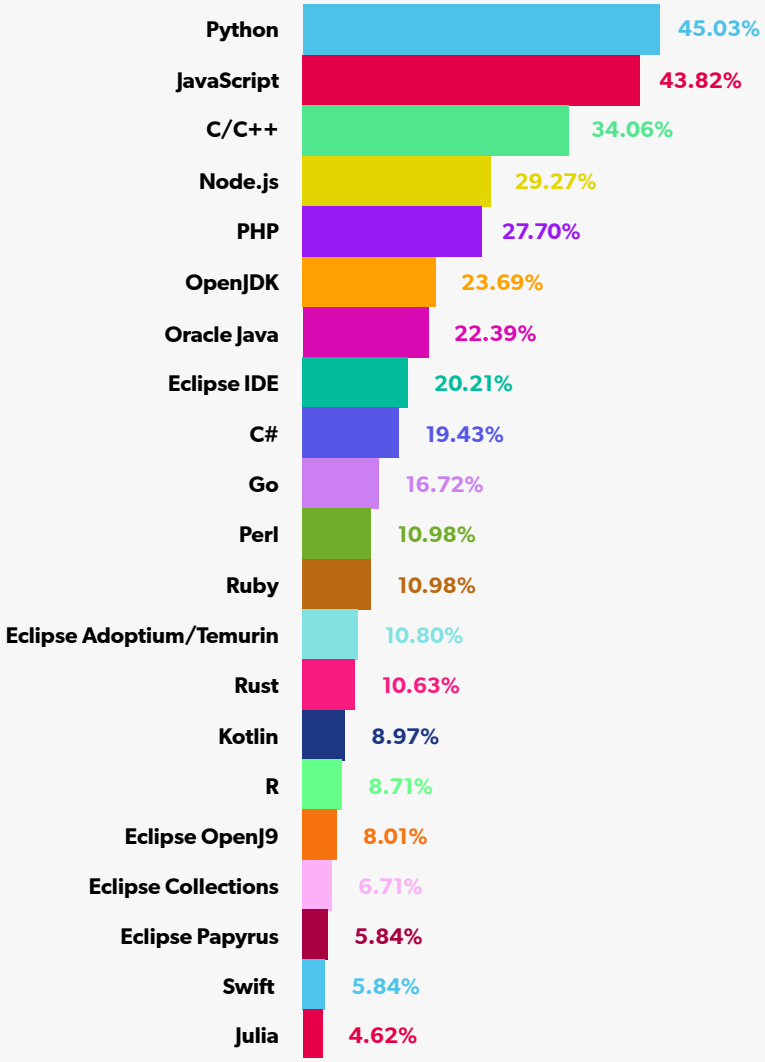
Almost 29% of organizations running Angular.js "don't know" what they will do if new vulnerabilities are disclosed.

# Open Source Programming Languages/Runtimes

A State of Open Source Report first: Python surpassed JavaScript as the most used programming language. Regardless of the type of application, everything starts with the choice of programming languages or runtimes, and while Python has been popular for a long time, it's significant to see it become the most popular programming language. Many organizations use more than one Java runtime for app development, and we gave respondents multiple options, such as Oracle Java, OpenJDK, Eclipse Adoptium/Temurin, and Eclipse OpenJ9.

Python surpassed JavaScript as the most used programming language.

## Which Technologies Does Your Organization Use to Build Applications Today?



Here, size seems to make a difference: Larger organizations (500 to 5,000+ employees) favor Python, but there is an even split among small to mid-size organizations (0-499 employees), and early-stage startups are using JavaScript more. PHP and C/C++ are second or third most popular among all organizations except startups, who favor Node.js after JavaScript and Python.

| Organization Size | Most Used | Second Most Used | Third Most Used |
|---|---|---|---|
| More than 5,000 employees | Python 55% | JavaScript 47% | C/C++ 42% |
| 500 to 5,000 employees | Python 43% | JavaScript 41% | C/C++ 33% |
| 100 to 499 employees | Python 41%<br>JavaScript 41% | PHP 32% | C/C++ 29% |
| Under 100 employees | Python 45%<br>JavaScript 45% | C/C++ 32% | PHP 31% |
| Early-stage startups | JavaScript 44% | Python 40% | Node.js 27% |

**Additional Insights:**

- In the Java development space, OpenJDK usage remained roughly the same (23.69% vs. 22% last year), but Oracle Java declined (22.39% vs. 30% last year). Eclipse Adoptium/Temurin usage is now at 10.8%, and Eclipse OpenJ9 at 8%.
- We included the popular integrated development environment, Eclipse IDE, in this category, and one in five respondents (20%) use it in their organization.

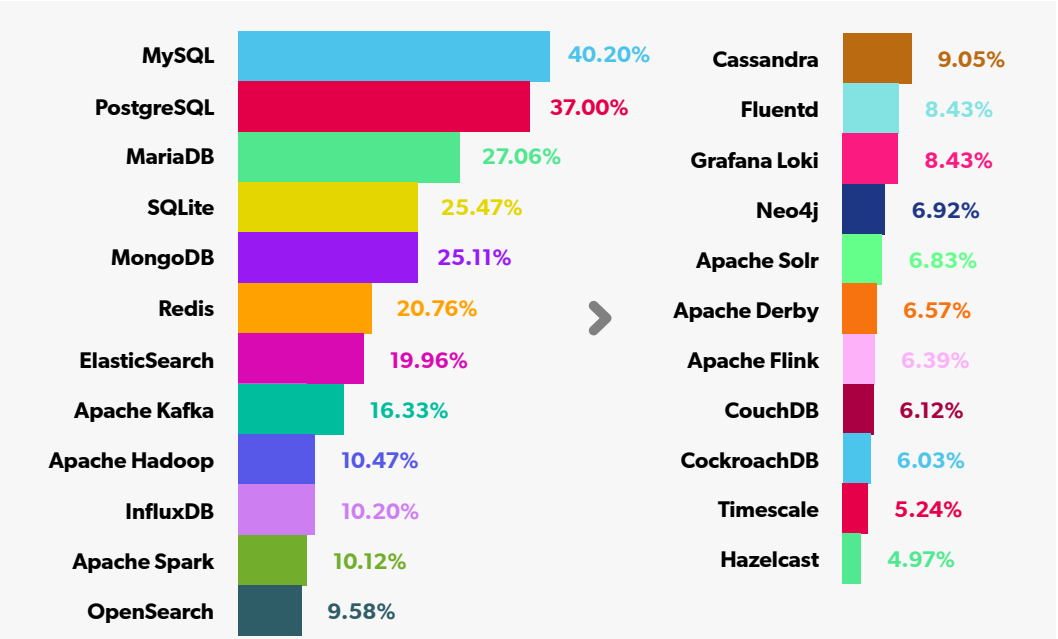
# Open Source Databases and Data Technologies

Consistent with the last few years, the top two most used open source data technologies are MySQL and PostgreSQL. Last year PostgreSQL was #1 and this year, it's MySQL by three percentage points. MongoDB* has historically rounded out the top 3 in this category, and while MongoDB usage stayed the same (25%), MariaDB is now the 3rd most used data technology. MongoDB fell to 5th place, less than 1% behind SQLite.

The top two most used open source data technologies are MySQL and PostgreSQL. MongoDB is out of the top 3.

**MongoDB, ElasticSearch, and CockroachDB have licenses that disqualify them from being considered open source, per OSI's Open Source Definition. We chose to include them, however, because they are popular and began as open source projects.*

## Which Open Source Data Technologies Does Your Organization Use Today?

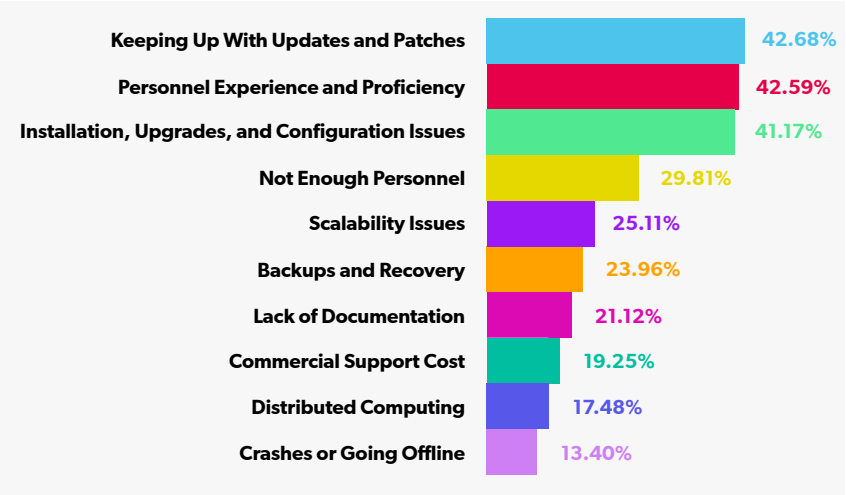



Some notable increases include Redis (almost 10% higher than last year), Apache Kafka, and Apache Spark. Redis now has more than a billion Docker Hub pulls and it has an engaged community of developers, architects, and open source contributors. Both Spark and Kafka are used in AI/ML/DL applications which may account for their growth in the past year.

**Additional Insights:**

- Percentage of usage was static for both ElasticSearch and its open source fork, OpenSearch.
- Regional results align with the overall usage, with one exception: Europe, where PostgreSQL is used more commonly than MySQL.
- Both the largest and the smallest organizations prefer MySQL over PostgreSQL.

## What Are the Main Support Challenges With the Open Source Data Technologies Your Organization Is Using?




Of the top four challenges, two are tied to personnel – not having enough people and/or not having people with the right experience and proficiency.

Databases and data technologies are among the most complex to work with and properly managing data is a huge responsibility, which is reflected in the top three challenges seen here. Many organizations struggle to find and retain personnel with enough experience and proficiency who can keep up with the application of releases and patches, as well as perform installations, upgrades, and configuration.

**Additional Insights:**

- Commercial support costs from well-known companies commercializing open source was a challenge for the largest enterprises (22.77%) and early-stage startups (20.62%).
- Small organizations with under 100 employees report personnel experience and proficiency as their top support challenge.
- Industries report different top challenges; see table on the right for details.

| Support Challenge | Industry |
|---|---|
| Not Enough Personnel | Manufacturing, Government, Transportation |
| Personnel Experience and Proficiency | Retail, Manufacturing, Energy, Oil, or Gas |
| Installation, Upgrades, and Configuration | Retail, Healthcare or Pharma, Transportation |
| Keeping Up With Updates and Patches | Telecommunications, Consulting or Professional Services, Healthcare or Pharma |
| Scalability Issues | Manufacturing, Retail, Technology |
| Distributed Computing | Manufacturing, Telecommunications, Energy, Oil, or Gas |
| Backups and Recovery | Telecommunications, Energy, Oil, or Gas, Technology |
| Crashes or Going Offline | Telecommunications, Energy, Oil, or Gas, Technology |
| Commercial Support Cost | Telecommunications, Technology, Media and Gaming |
| Lack of Documentation | Healthcare or Pharma, Technology, Nonprofit |

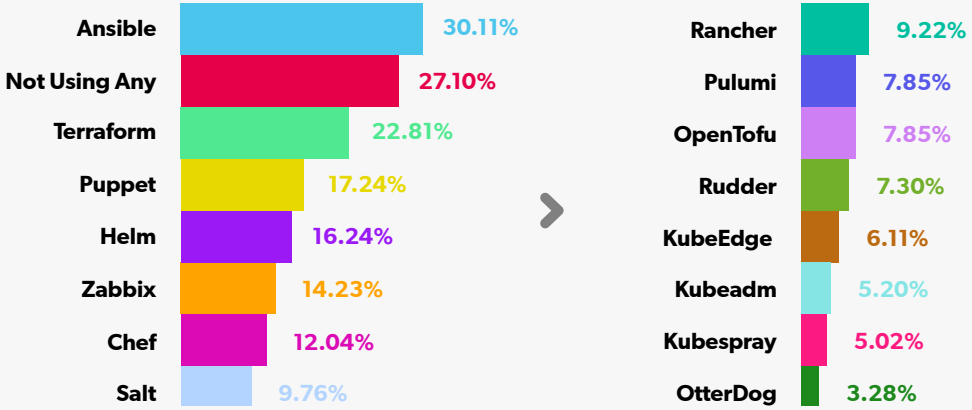
# Open Source Infrastructure Automation and Configuration Technologies

The responses from the open source tools for automation and configuration category, also known in some organizations as Infrastructure-as-a-Code or Platform Engineering, again show diversity across industries and regions.

Looking at the data here, it's important to keep in mind that smaller/newer organizations may not have environments that require automation and configuration tooling. And indeed, while "I'm not using any" more than doubled from last year and received the 2nd highest number of responses, 78% of respondents who selected that option work for early-stage startups or companies with under 100 employees.

Putting that aside, let's review the top infrastructure automation and configuration software:

### Which Open Source Infrastructure Automation and Configuration Tools Does Your Organization Use Today?




Ansible, Terraform, and Puppet are the most popular open source technologies in this space. While Ansible usage stayed the same compared to last year, Terraform and Puppet usage increased slightly over the past 12 months.

While Ansible usage stayed the same compared to last year, Terraform and Puppet usage increased slightly over the past 12 months.

In 2023, HashiCorp switched the Terraform license to a "source available" license so it is no longer open source software. This led to a fork, OpenTofu, which is being used by 7.85% of our survey population. It will be interesting to see how the numbers look next year — for now, the license change does not seem to have negatively impacted Terraform usage.

Puppet saw an overall 2% increase while adoption is growing at a higher rate across a few regions: in the UK, it is used by 30.77%, and in Latin America and Africa, usage is slightly above 23%.

**Additional Insights:**

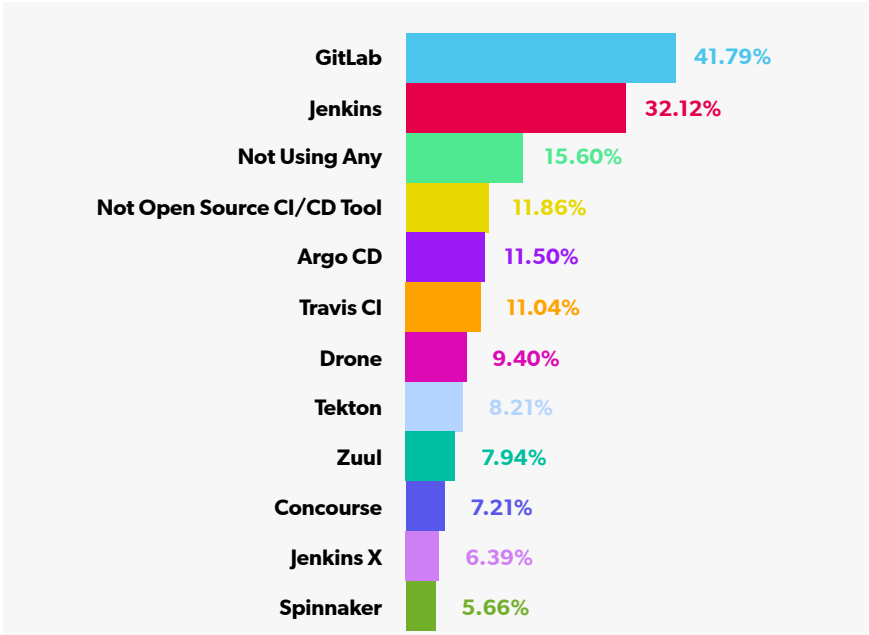
- Among systems administrators, the top two automation and configuration technologies are Ansible (40%) and Puppet (36%).
- Chef usage declined for the third consecutive year.
- Respondents for every major industry are testing or using already OpenTofu.

# Open Source CI/CD Technologies

While open source continuous integration (CI) and continuous delivery/deployment (CD) tools may have been perceived as the default choice for many organizations, there is still room for improvement in terms of adoption.

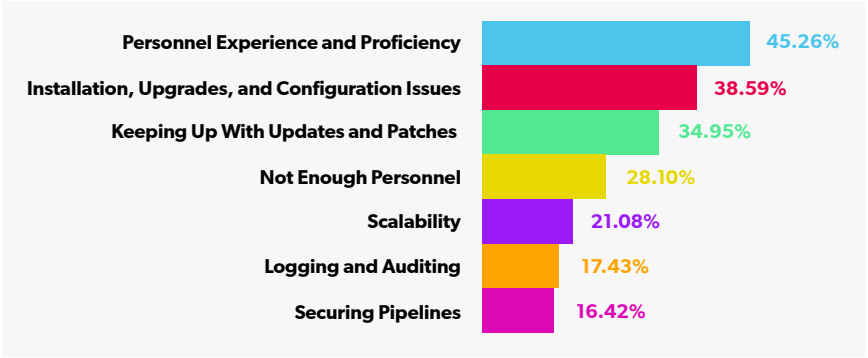
The results in this category are a little unexpected — CI/CD tools, especially those that run natively in containers like Jenkins X, Spinnaker, and Tekton, have been trending for the past few years. With this year's survey takers, however, those cloud-native technologies were less widely used than GitLab and Jenkins, the clear favorites by considerable margins.

## Which Open Source CI/CD Tools Does Your Organization Use Today?




"Not using any" was selected by 15.6%, again predominantly by those affiliated with small organizations and startups. We also added an option of "not using open source CI/CD tool" and 11.86% of our respondents chose this. This shows us that commercial and non-open source CI/CD tools like GitHub Actions are popular and, looking at the data by industry, especially among healthcare and pharmaceutical organizations.

## What Are the Main Support Challenges With the Open Source Software Your Organization Uses for CI/CD?




Again, the lack of qualified personnel is a major challenge for 45% of our respondents. If there are issues with the CI/CD pipelines, it means that the delivery and release of software is put on hold. For organizations with cloud environments, and especially Software-as-a-Service solutions that are constantly deploying updates, a delay or issue due to CI/CD tooling can have a significant monetary impact.

> When it comes to supporting CI/CD tooling, personnel experience and proficiency is the greatest challenge regardless of organization size.

If we zoom in on the top 3 CI/CD support challenges by organization size, here's what it looks like:

| Organization Size | Personnel Experience and Proficiency | Installation, Upgrades, and Configuration Issues | Keeping Up With Updates and Patches |
|---|---|---|---|
| More than 5,000 employees | 50.00% | 34.72% | 35.65% |
| 500 to 5,000 employees | 44.95% | 39.45% | 38.53% |
| 100 to 499 employees | 51.39% | 43.52% | 37.96% |
| Under 100 employees | 44.40% | 42.47% | 33.59% |
| Early-stage startups | 34.22% | 31.04% | 28.34% |

Interestingly, organization size makes no difference when it comes to the primary challenges of supporting CI/CD technologies: personnel experience and proficiency is the biggest pain point, followed by installation, upgrades, and configuration issues, and keeping up with updates and patches.

**Additional Insights:**

- For some issues, however, size does play a role — for example, about 21% of large enterprises said securing pipelines is a challenge, compared to 16.42% of the total survey population.
- Scalability ranked 5th overall, but is the 2nd biggest concern for retail and telecommunications organizations.
- 50% of respondents from the largest enterprises (more than 5,000 employees) and 51% of respondents from mid-size organizations (between 100 and 499 employees) identified personnel experience and proficiency as their top challenge.
- For installation, upgrades, and configuration issues, a couple of industries struggle more than others: retail (68.18%) and energy, oil, or gas (57.14%).

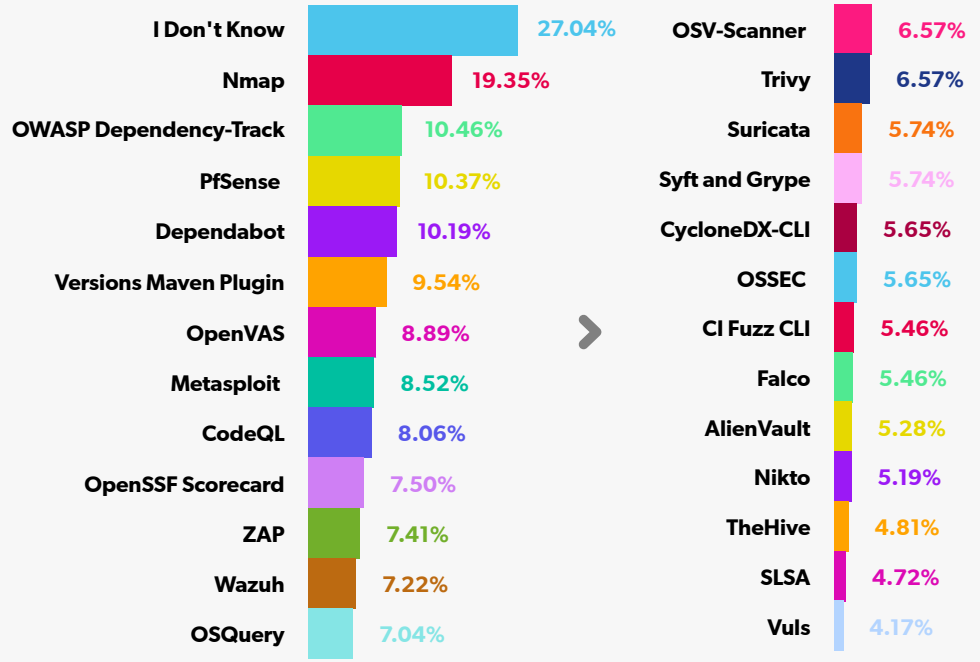
# Open Source Security Tools

Open source security tools — which do a range of things like scan for vulnerabilities, secure firewalls, and generate SBOMs — are a growing area due to the prioritization of security tooling at the software development stage as well as in networking and operations.

This is the first time we have asked about these technologies on the survey and it's striking that 27% of respondents selected "I don't know" when asked which open source security tools they were using in their organization. Are some organizations paying for commercial software due to a lack of awareness of the open source alternatives? Is there hesitation to use open source security tooling inside organizations? If that's the case for both questions, we hope this question piqued curiosity and will encourage more exploration of these tools.

27% of respondents selected "I don't know" when asked which open source security tools they were using in their organization.

## Which Open Source Security Tools Does Your Organization Use Today?



The most used open source security tool is Nmap, which is used by security and sometimes operations teams for network discovery, security auditing, and inventory. The second most used tool overall (and top choice for developers) is OWASP Dependency-Track, which is a Software Composition Analysis (SCA) tool for identifying vulnerabilities contained within applications and their dependencies (libraries, drivers, etc). A well-established open source project, OWASP Dependency-Track is popular in organizations of all sizes. PfSense is the most popular open source firewall, and for developers working within GitHub, Dependabot is the tool of choice for identifying vulnerabilities in dependencies.

**Additional Insights:**

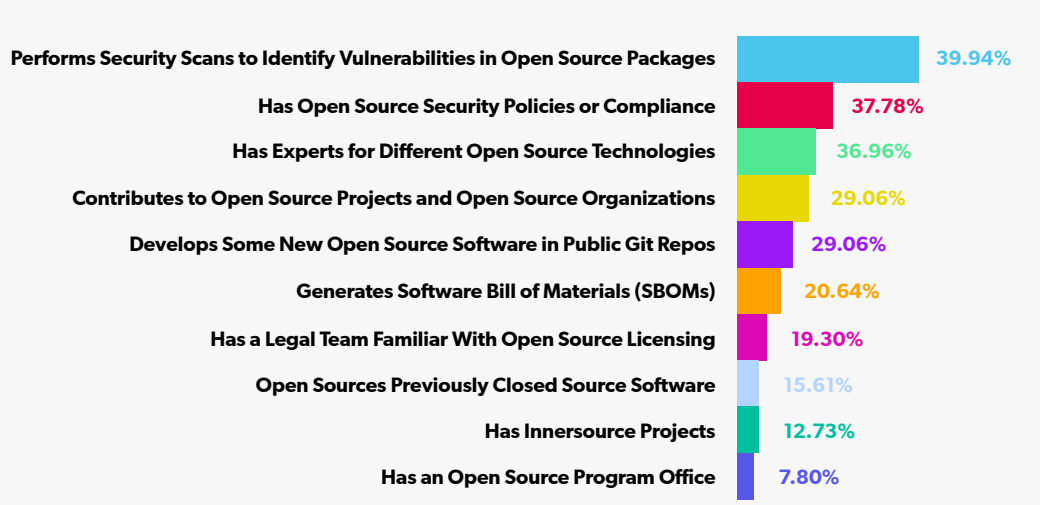
- While we provided an extensive list of open source security tools in the survey, there are many more — and when we asked respondents across all regions to write in the tools they are using, the most mentioned included Crowdsec, OPNsense, OpenSCAP,and SonarQube.
- While Nmap was the most popular open source security tool across the board, some industries had different preferred tools. In banking, insurance, or financial services, Versions Maven Plugin and OWASP Dependency-Track complemented Nmap as the top three tools of choice. In the consultancy or professional services space, it was good to see OpenSSF Scorecard and CODEQL among the top selections. And in the retail industry, Allenvault, CI FUZZ CLI, and Metasploit were the most used open source security tools.

# Open Source Maturity and Stewardship

Although everyone engages as a consumer and user of open source software, organizations vary in their efforts to participate and invest in open source. This final section is about assessing maturity in open source involvement including policies and governance, as well as participation in the greater open source community though sponsoring open source non-profit organizations.

As in previous years, open source maturity is measured by whether or not certain activities are taking place, and we asked respondents to select as many as were applicable to their organization:

## How Would You Describe the Level of Open Source Maturity in Your Organization?




The top two responses here — performs security scans to identify vulnerabilities in open source packages and has open source security policies or compliance — again point to increased concern for keeping open source software secure. It shows that organizations of all sizes are invested in implementing best practices for open source security and driving security initiatives during the software development life cycle — which, of course, helps prevent potential cyberattacks exploiting vulnerabilities.

Are the largest organizations the most advanced in terms of their open source strategy? Looking at the data by org size, 55% of large enterprises are doing security scans, 50% have security and compliance policies, and 28% have a legal team familiar with open source licensing. However, they are not leading when it comes to contributing to open source projects or having experts for different open source technologies. And more early stage startups have more Innersource projects and OSPOs than medium or large organizations. So it would be fair to say open source maturity is not directly tied to size, but more related to organizational strategy and priorities around OSS usage and investment.

> Early stage startups have more Innersource projects and OSPOs than medium or large organizations.

As you might expect, some maturity markers are more common in industries that are highly regulated. The survey data shows high percentages of security scans, security/compliance policies, and SBOM generation for organizations in the banking, insurance, or financial services sector as well as healthcare and pharma. This year, only 30% of government or public service entities report doing security scans or having security/compliance policies in place, which is a little worrisome.

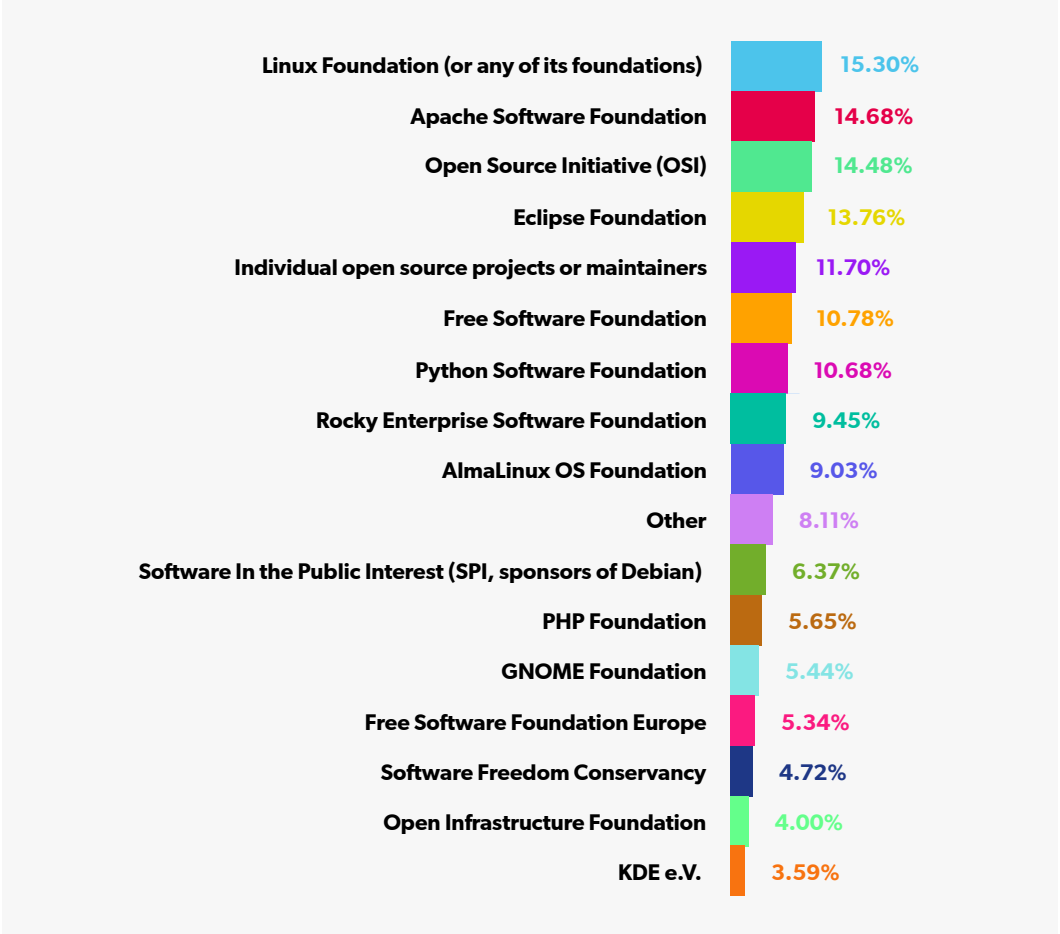
Only 30% of government or public service entities report doing security scans or having security/compliance policies.

**Additional Insights:**

- No changes in the past year to the proportion of organizations with Innersource projects and Open Source Program Offices (OSPOs).
- The percentage of organizations with a legal team familiar with OSS licenses declined by 9% and North America has the highest rate of legal teams familiar with OSS licenses.
- Only 20% of organizations are generating SBOMs, and the leading industry is manufacturing (which includes chip manufacturing).

Moving on to stewardship:

## Do You or Your Organization Sponsor Any of the Following Open Source Non-Profit Organizations?




The Linux Foundation, the parent organization which includes foundations such as OpenSSF, OpenJS, and the Cloud Native Computing Foundation (CNCF), is getting the most support, from 15% of respondents. However, the top four organizations (Linux Foundation, Apache Software Foundation, Open Source Initiative, and Eclipse Foundation) are all within a percentage point or two of each other, so sponsorship appears to be evenly spread across these major open source organizations.

These numbers are all lower than last year, but the data shows that North America and Europe are the regions with the most sponsorship participation, so having more respondents this year from other parts of the world made a difference. We hope to see open source stewardship grow in Asia, Latin America, Africa, and the Middle East in the coming years.

**Additional Insights:**

- As in past years, the technology industry is leading in terms of open source sponsorships and project contributions. Banking, insurance, or financial services; education or research; consulting or professional services; and media or gaming industries are also actively contributing.
- Contributions to individual projects or maintainers is in fifth place after the major foundations and OSI.
- For the "other" category, WordPress Foundation and The OpenBSD Project received write-in responses.

## Survey Data Set

Thanks for reading the 2024 State of Open Source Report! The complete data set from the State of Open Source survey can be accessed via the button below. We have shared it under the Creative Commons Attribution 4.0 International License, which means you are free to use, share, and adapt the data for any purpose as long as you credit OpenLogic as the original source.

VIEW DATA SET

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The Open Source Initiative (OSI) is the steward of the Open Source Definition, setting the foundation for the global open source ecosystem. Founded in 1998, OSI protects and promotes open source software, development and communities, championing software freedom in society through education, collaboration and infrastructure. The OSI is a 501(c)3 non-profit, and anyone interested in supporting the defense of Open Source Definitions can join today at join.opensource.org.


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