

# 2022 Accelerate State of DevOps



**The information shared in these slides is confidential and under embargo.**

**Please do not share outside of this group. The final report *should be published by* **September 28th.****

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04 Demographics & firmographics

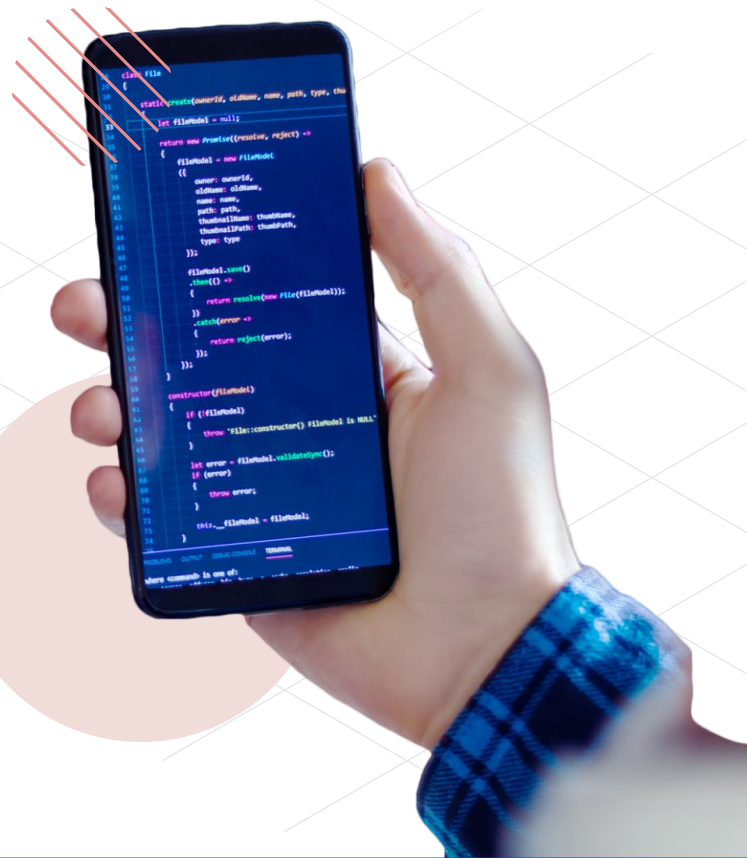
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# 01

## Executive summary & key findings



# 01

## Securing the software supply chain

In 2021, we found that a secure software supply chain is essential to reaching many important outcomes.

**In 2022, we found that the biggest predictor of an organization's application-development security practices was cultural, not technical:** high trust, low-blame cultures focused on performance were significantly more likely to adopt emerging security practices.

We noticed that teams who focus on establishing these security practices demonstrate reduced developer burnout; teams with low levels of security practices have **1.4x greater odds of having high levels of burnout than teams with high levels of security practices.**

Further, **teams with high levels of security practices are 1.6x more likely to have high levels of organizational performance** than teams with low levels of security practices.



# 02

## Drivers of organizational performance

The key variables that impact organizational performance tend to fall in the following categories:

### Organizational and team culture

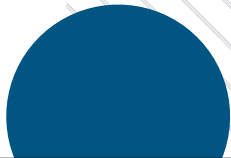
High-trust and low-blame cultures tend to have higher organizational performance. Similarly, organizations with teams that feel supported through funding and leadership sponsorships tend to have higher organizational performance. Team stability and positive perceptions about one's team also tend to lead to higher levels of organizational performance. Lastly, the companies that offer flexible work arrangements are the companies that tend to see high levels of organizational performance.

### Reliability

Both the practices we associate with reliability engineering and the extent to which people report meeting their reliability expectations are powerful predictors of high levels of organizational performance.

### Cloud

Teams continue to move workloads to the cloud and those that leverage all five capabilities of cloud see increases in software delivery and operational (SDO) performance and organizational performance. Multi-cloud adoption is also on the rise so that teams can leverage the unique capabilities of each provider.



# 03

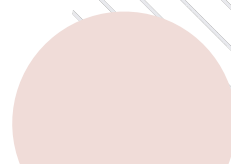
## Delivery depends

DORA has long postulated that many of these effects depend on a team's broader context. For example, a technical capability in one context could empower a team, but in another context, could have deleterious effects

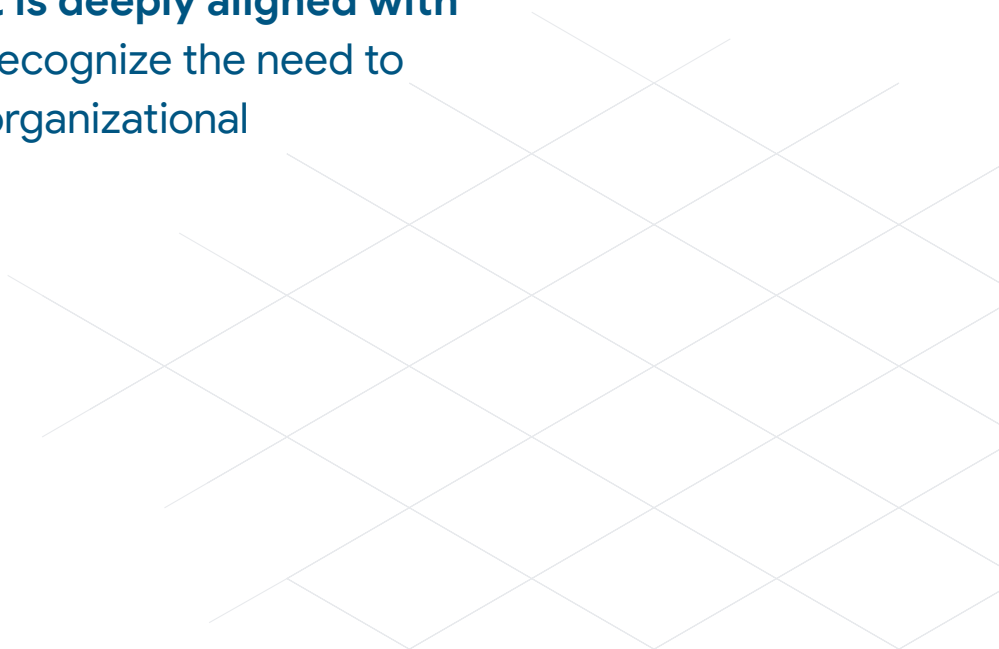
Software delivery performance's effect on organizational performance depends on operational performance (reliability), such that **high software delivery performance is only beneficial to organizational performance when operational performance is also high.**

Implementing software supply chain security controls like those recommended by the SLSA framework has a positive effect on software delivery performance, **but only when continuous integration is firmly established as a capability.**

Technical capabilities build upon one another. Continuous delivery and version control **amplify each other's ability to promote high levels** of software delivery performance. **Combining continuous delivery, loosely coupled architecture, version control, and continuous integration fosters software delivery performance that is greater than the sum of its parts.**



**Indeed, we found an effect this year that is deeply aligned with this overarching philosophy:** teams that recognize the need to continuously improve tend to have higher organizational performance than those that don't.





# 02

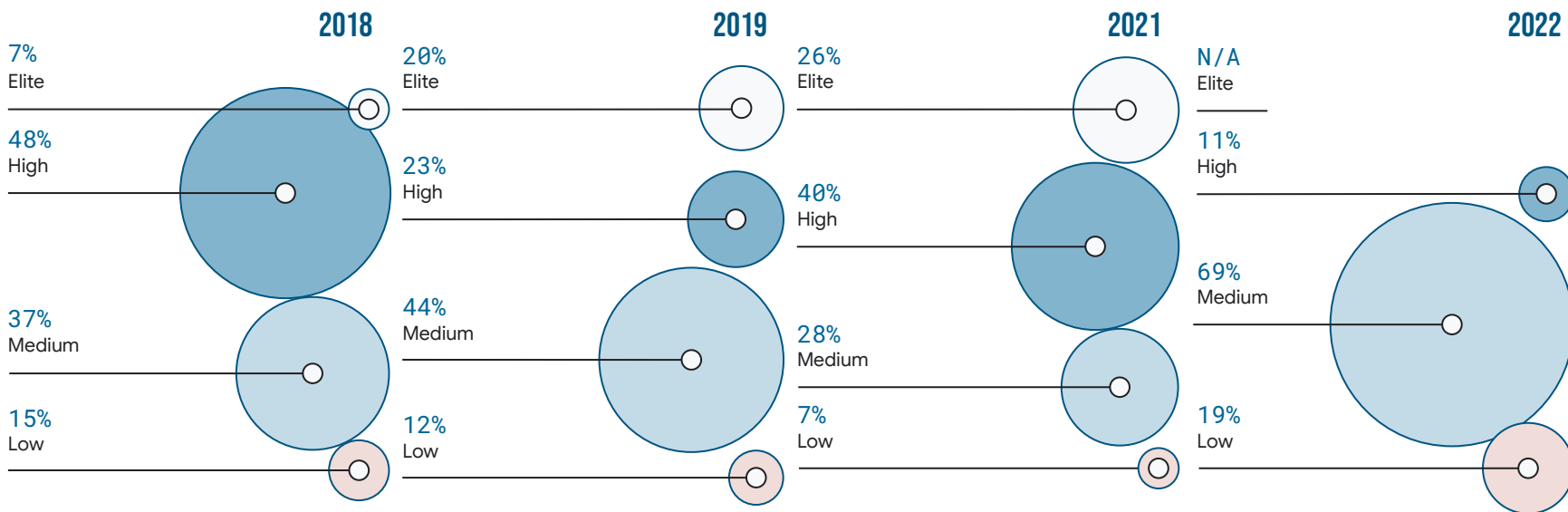
## How do we compare?



# Software delivery performance at a glance

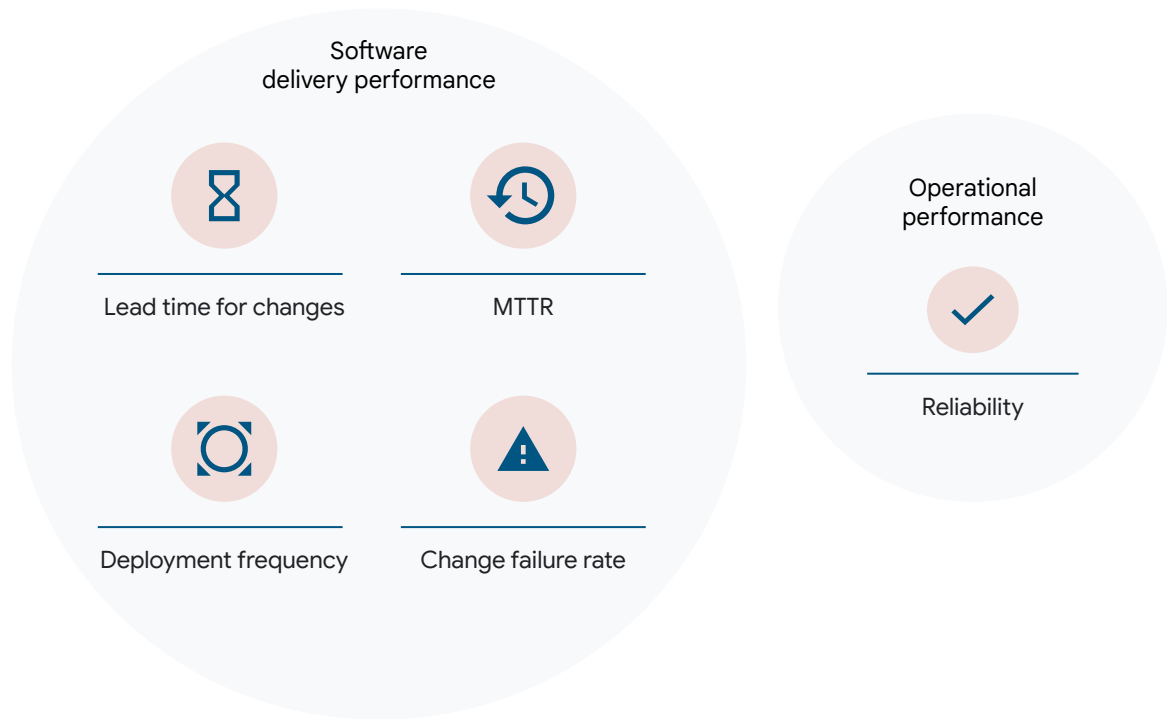
Software delivery performance metric	Low	Medium	High
<b>Deployment frequency</b> For the primary application or service you work on, how often does your organization deploy code to production or release it to end users?	Between once per month and once every 6 months	Between once per week and once per month	On-demand (multiple deploys per day)
<b>Lead time for changes</b> For the primary application or service you work on, what is your lead time for changes (i.e., how long does it take to go from code committed to code successfully running in production)?	Between one month and six months	Between one week and one month	Between one day and one week
<b>Time to restore service</b> For the primary application or service you work on, how long does it generally take to restore service when a service incident or a defect that impacts users occurs (e.g., unplanned outage or service impairment)?	Between one week and one month	Between one day and one week	Less than one day
<b>Change failure rate</b> For the primary application or service you work on, what percentage of changes to production or released to users result in degraded service (e.g., lead to service impairment or service outage) and subsequently require remediation (e.g., require a hotfix, rollback, fix forward, patch)?	46%-60%	16%-30%	0%-15%

# The industry continues to evolve\*



\*note that elite is no longer a cluster in 2022

# The four keys & the fifth key of **Reliability**



**Reliability** is a multi-faceted measure of how well a team upholds these commitments, and this year we continued our explorations into reliability as a factor in software delivery and operations.

## \*new finding\* We Incorporated fifth metric to create 4 new cluster

Cluster	Stability		Operational Performance	Throughput		% respondents
	Time to restore service	Change failure rate	Reliability	Lead time	Deployment frequency	
Starting	Between one day and one week	31%-45%	Sometimes meet expectations	Between one week and one month	Between once per week and once per month	28%
Flowing	Less than one hour	0%-15%	Usually meet expectations	Less than one day	On demand (multiple deploys per day)	17%
Slowing	Less than one day	0%-15%	Usually meet expectations	Between one week and one month	Between once per week and once per month	34%
Retiring	Between one month and six months	46%-60%	Usually meet expectations	Between one month and six months	Between once per month and once every 6 months	21%

# Each cluster has unique characteristics and accounts for a substantial proportion of the responses

The **Starting** cluster performs neither well nor poorly across any of our dimensions. This cluster may be in the early stages of their product, feature, or service's development. They may be less focused on reliability because they're focusing on getting feedback, understanding their product-market fit and more generally, exploring.

The **Flowing** cluster performs well across all characteristics: high reliability, high stability, high throughput. Only 17% of respondents achieve this flow state.

Respondents in the **Slowing** cluster do not deploy too often, but when they do, they are likely to succeed. Over a third of responses fall into this cluster, making it the most representative of our sample. This pattern is likely typical — though far from exclusive — to a team that is building, but mostly happy with their current state, and their customers are too.

And finally, the **Retiring** cluster looks like a team that is working on a service or application that is still valuable to them and their customers, but no longer under active development.

**Each cluster has unique characteristics and accounts for a substantial proportion of the responses.**

# 03

## How do we improve?



# Cloud usage continues to accelerate YoY

	2022	% change over 2022
Hybrid cloud	42.47%	25%
Public and/or Multiple public	76.08%	36%
Private Cloud	32.55%	12%
No Cloud	10.55%	-50%

The number of respondents reporting no cloud usage is **down 50%**



# Hybrid and multi-cloud drive organizational performance

## Benefits realized by adopting multiple cloud providers

Availability	62.61%
Leverage unique benefits of each provider	51.59%
Trust is spread across multiple providers	47.54%
Disaster recovery	43.48%
Legal compliance	37.97%
Negotiation tactic or procurement requirement	19.13%
Other	4.06%

Use of hybrid and multi-cloud (and private) seems to have a **negative impact** on software delivery performance indicators **unless respondents had high levels of reliability**.

# Cloud benchmark changes

The following data shows how many of our respondents have implemented the **five essential characteristics of cloud computing**—as defined by the National Institute of Standards and Technology (NIST).

NIST	2021	2021	2022	Percent change
Broad network access	74%	0.74	80%	8
Rapid elasticity	77%	0.77	81%	5
On-demand self-service	73%	0.73	78%	7
Measured service	78%	0.78	83%	7
Resource pooling	73%	0.73	83%	14

The use of the [five characteristics of cloud computing](#) is a crucial beginning to a long journey that leads to organizational performance

# Reliability

Without reliability, software delivery performance doesn't predict organizational success


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Investment in SRE yields improvements to reliability, but only once a threshold of adoption has been reached

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Dependable teams make dependable services: generative team culture predicts better reliability

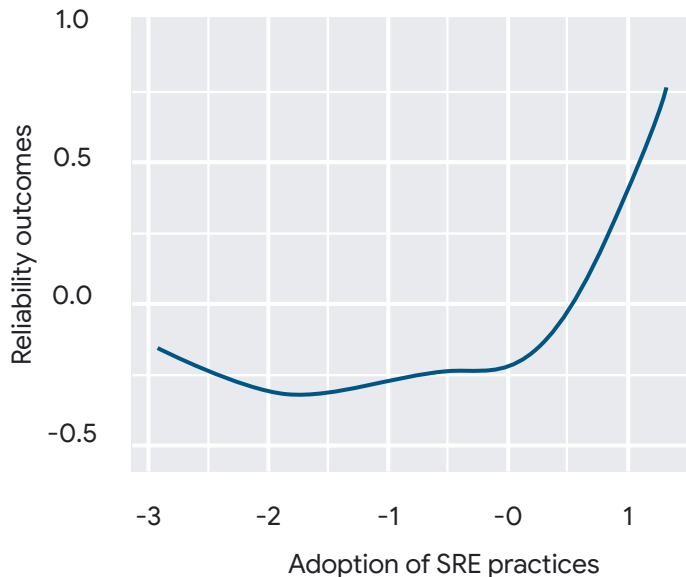
High performers who meet reliability targets are 1.4x more likely to use continuous integration



# Site reliability engineering (SRE) & DevOps

Site Reliability Engineering (SRE) is an influential approach to operations which originated at Google and is now practiced in many organizations. SRE prioritizes empirical learning, cross-functional collaboration, extensive reliance on automation, and the use of measurement techniques including Service Level Objectives (SLOs).

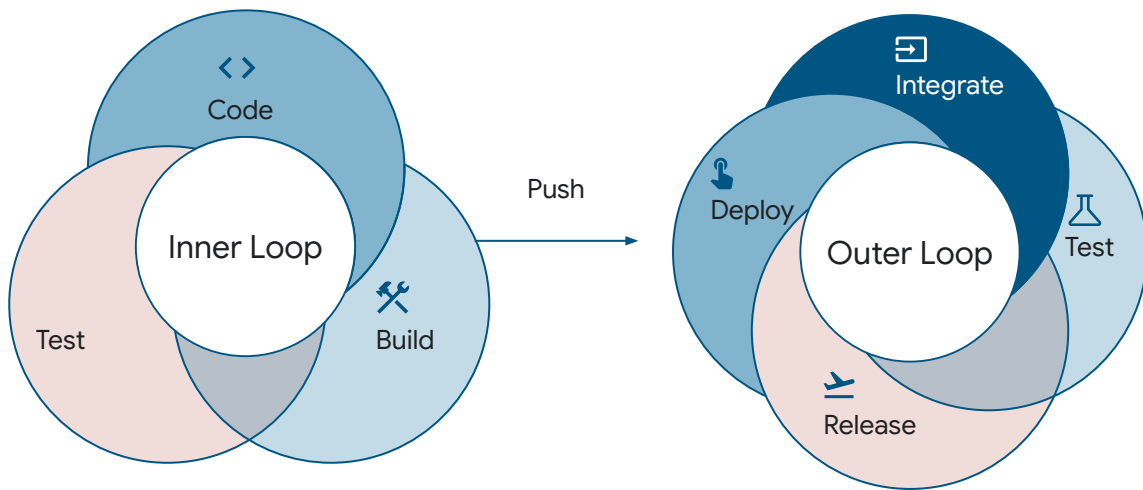
- Without reliability, software delivery performance doesn't predict organizational success
- Investment in SRE yields improvements to reliability, but only once a threshold of adoption has been reached
- Dependable teams make dependable services: generative team culture predicts better reliability



Teams that persist beyond initial steps of SRE adoption see increasing improvement in reliability outcomes.

# Technical DevOps capabilities

This year, we looked at a variety of technical capabilities to understand the outcomes that are driven by different technical practices. We considered two broad phases of software development: the “inner loop,” and the “outer loop”



Our research shows that companies that excel in inner and outer loop development are able to **ship code faster and with higher levels of reliability**

# Technical Capabilities

## Drivers of organizational performance

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33% more likely to  
use version control

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46% more likely to practice  
continuous delivery

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39% more likely to practice  
continuous integration

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40% more likely to have systems based  
on a loosely coupled architecture

Respondents who make higher-than-average use of all of the above capabilities have **3.8x higher organizational performance**

# Culture/flexibility

Data from this year's research support previous findings that **organizational performance** is impacted by the type of culture that exists within an organization. Specifically, a **generative culture** is associated with higher levels of organizational performance.

- Cloud users reported a **16% increase in positive cultural elements** such as less burnout, job satisfaction, team stability, and feeling more supported in their roles
- Flexible work models are associated with **decreases in employee burnout and increases in employees likelihood of recommending their team** as a good place to work and organizational performance

High performing organizations are more likely to have **flexible work arrangements**

# 04

## Security





There were over [22 billion records exposed](#) in 2021 because of data breaches. With these publicly reported data breaches and numerous other malicious attacks, security continues to be top of mind for every organization as we all work to secure the software supply chain and keep customer data safe.

We took a **deep dive into security** this year to learn more about what companies are doing to keep their customer safe. Here are the some of the initial findings.

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## 01 Adoption has already begun

Software supply chain security practices embodied in SLSA and SSDF already see modest adoption, but there is ample room for more.

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## 02 Healthier cultures have a head start

Organizational culture is a primary driver of software development security practices, with higher trust, “blameless” cultures more likely to establish SLSA and SSDF practices than lower-trust organizational cultures.

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## 03 There’s a key integration point

Adoption of the technical aspects of software supply chain security appears to hinge on the use of CI/CD, which often provides the integration platform for many supply chain security practices.

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## 04 It provides unexpected benefits

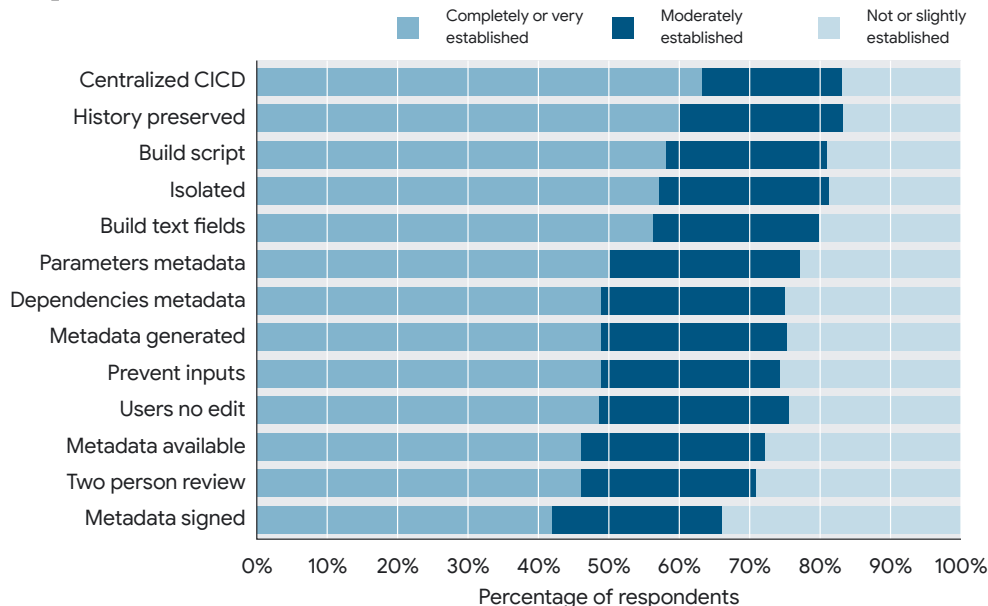
Besides a reduction in security risks, better security practices carry additional advantages, such as reduced burnout.

# We looked at two security posture frameworks to evaluate organization security initiatives

Supply-chain Levels for Software Artifacts ([SLSA](#), pronounced “salsa”), and NIST’s Secure Software Development Framework ([SSDF](#)).

Using continuous integration/continuous delivery (CI/CD) systems for production releases was the most commonly established practice, with 63% of respondents saying this was “very” or “completely” established.

On the lower end, the two **least** commonly established practices were requiring two or more reviewers to approve each code change (45%) and signing build metadata to prevent/detect tampering (41%).



Security Practices like SLSA drove both Delivery performance and Organizational Performance and reduced a teams error proneness

Our survey data confirms that a lower chance of security breaches, service outages, and performance degradation all accompany increased establishment of supply chain security practices.

- The biggest predictor of an organization's application development security practices was cultural, not technical
  - organizations closest to the “generative” Westrum culture group were significantly more likely to say they had broadly established security practices
- Teams that focus on establishing these security practices demonstrate reduced developer burnout and an increased likelihood to recommend their team to someone else

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**Incorporating security processes into existing workflows help reduce security risks and increase developer joy**

# 05

## Demographics & firmographics



# Who took the survey?

With **eight years of research** and more than **33,000 survey responses** from industry professionals, the State of DevOps Report showcases the software development and DevOps practices that make teams and organizations most successful.

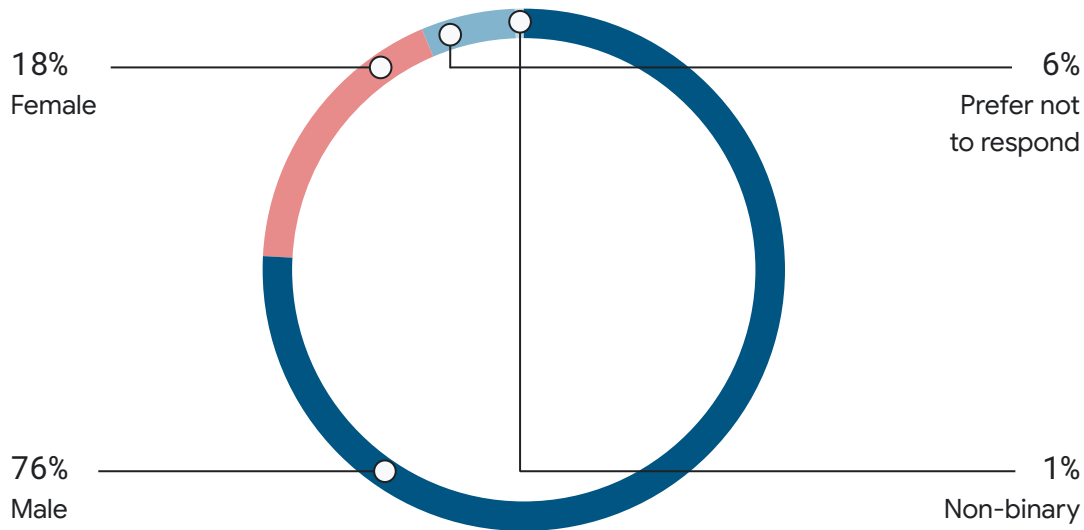
For this year's report, **1357 (+12.5% increase from 2021) working professionals from a variety of industries around the globe** shared their experiences to help grow our understanding of the factors that drive higher performance.

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Thank you sponsors for sharing the survey with your networks, this wouldn't have been possible without you!

# Gender

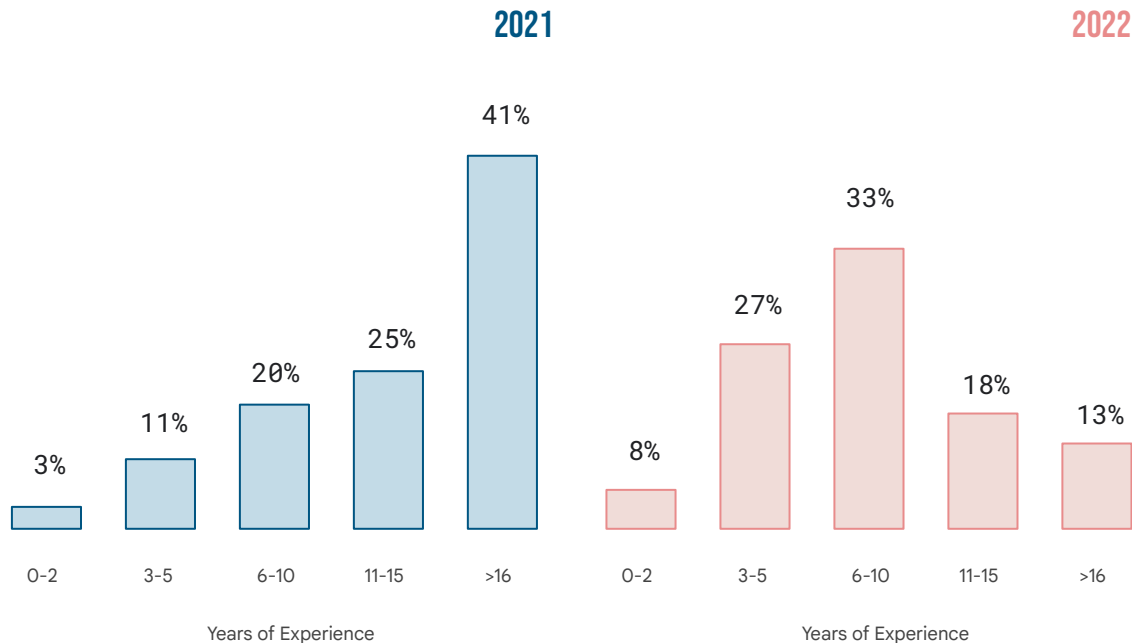
Relative to 2021, this year's sample had a higher proportion of female respondents (18% vs. 12%). The proportion of male respondents (76%) was lower than 2021 (83%). Respondents stated that women make up 25% of their teams, which is identical to 2021 (25%).



Percent women: **25% Median**

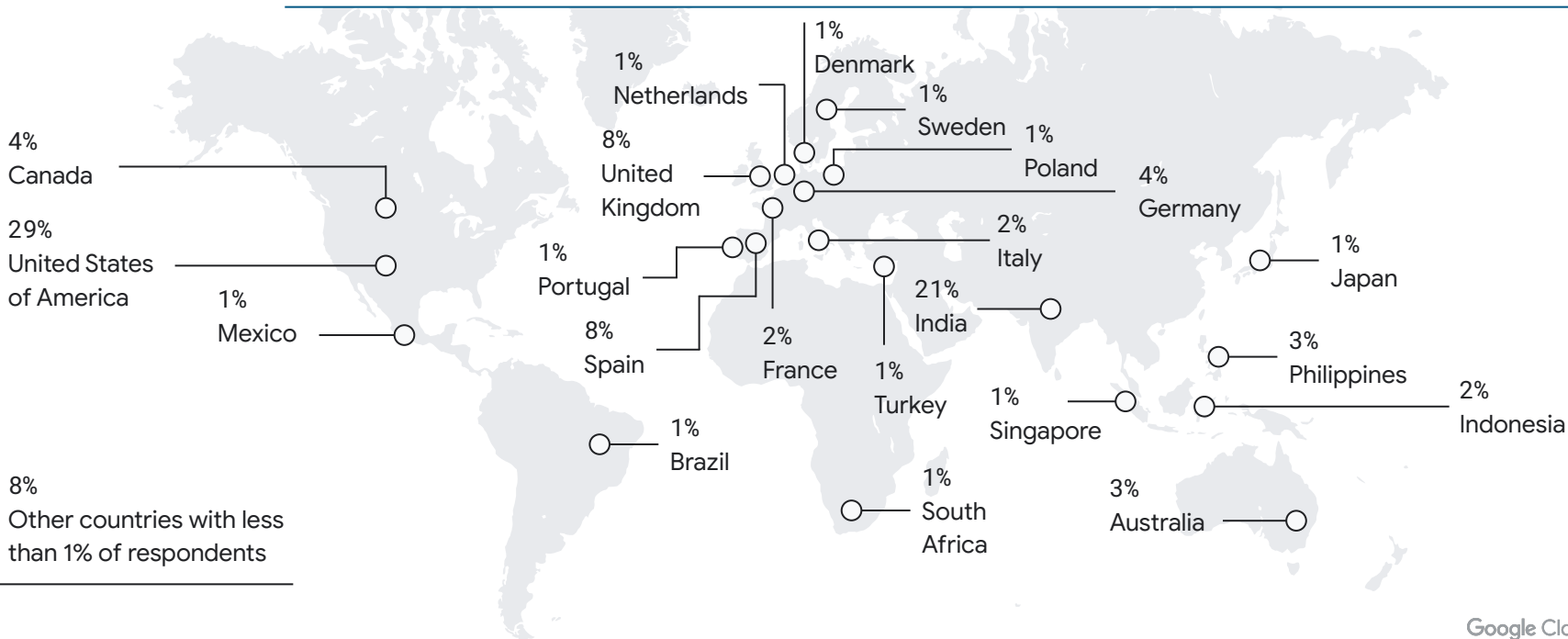
# Experience

Notably more respondents this year had five years or less of experience (35%) than in 2021 (14%). Perhaps unsurprisingly then, the proportion of respondents with more than 16 years of experience (13%) was a fraction of 2021 (41%).



## Region

This year we asked respondents to select the country they were from instead of the region. Region, which was frequently represented by a continent, seemed a bit too coarse to understand the makeup of our respondents. Roughly 89% of the respondents come from 22 countries and represent 70 countries in total.

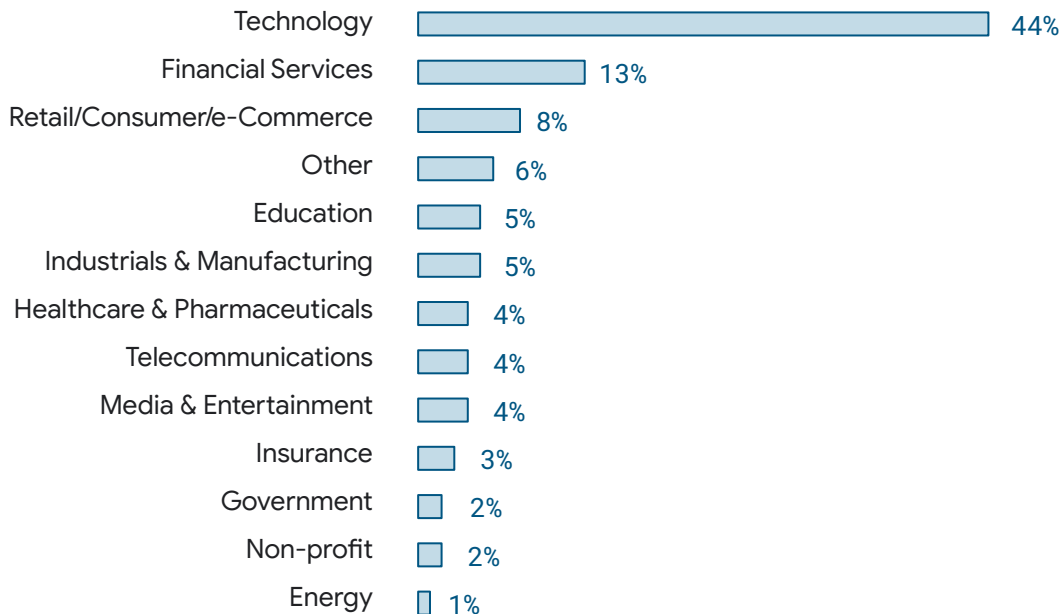




# Industry

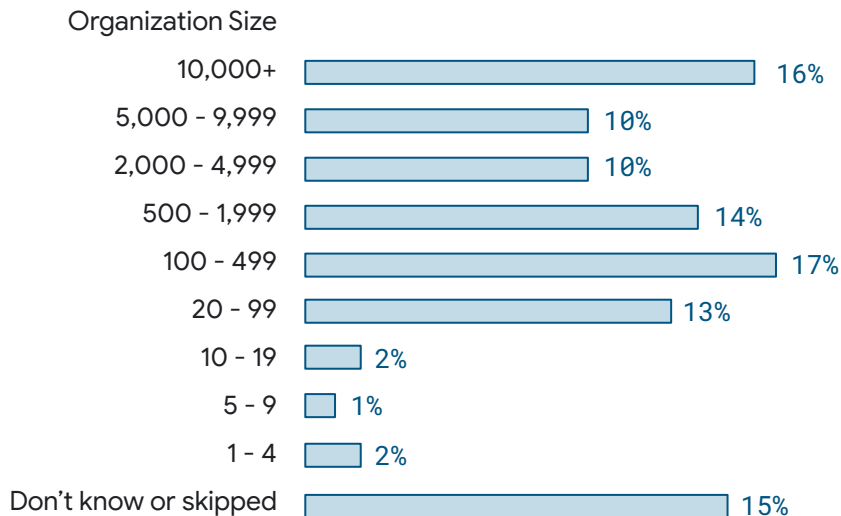
As in previous State of DevOps reports, we see that most respondents work in the technology industry, followed by financial services, other, and retail.

2022



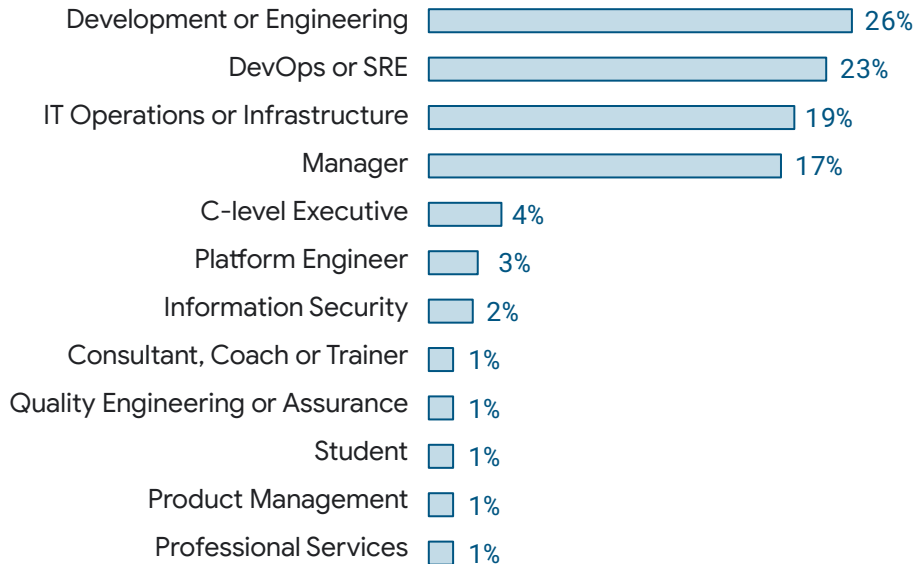
# Company size

Consistent with previous State of DevOps surveys, respondents come from organizations of a variety of sizes. 22% of respondents are at companies with more than 10,000 employees and 7% are at companies with 5,000–9,999 employees. Another 15% of respondents are at organizations with 2,000–4,999 employees. We also saw a fair representation of respondents (13%) from organizations with 500–1,999 employees, 15% with 100–499 employees, and finally 15% with 20–99 employees. This year, we also allowed respondents to select “I don’t know” about their organization’s size; 15% of respondents either reported not knowing or skipped the question



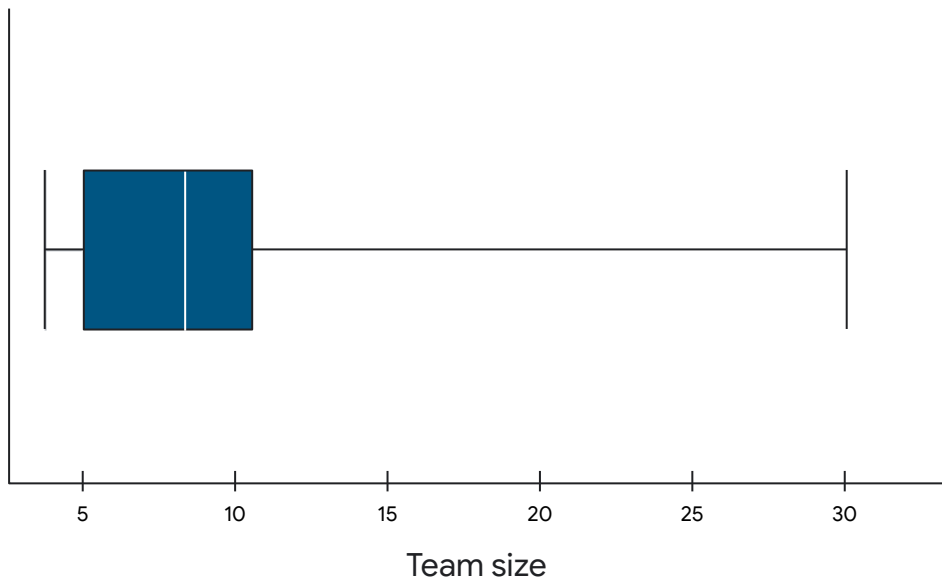
# Roles

85% of respondents consist of individuals who either work on development or engineering teams (26%), work on DevOps or SRE teams (23%), work on IT ops or infrastructure teams (19%), or are managers (17%). The proportion of respondents who work on IT ops or infrastructure teams (19%) more than doubled last year's proportion (9%). C-level executives (9% in 2019 to 4%), and Professional Services (4% in 2021 to 1%) are two of the more pronounced decreases relative to last year.



# Team size

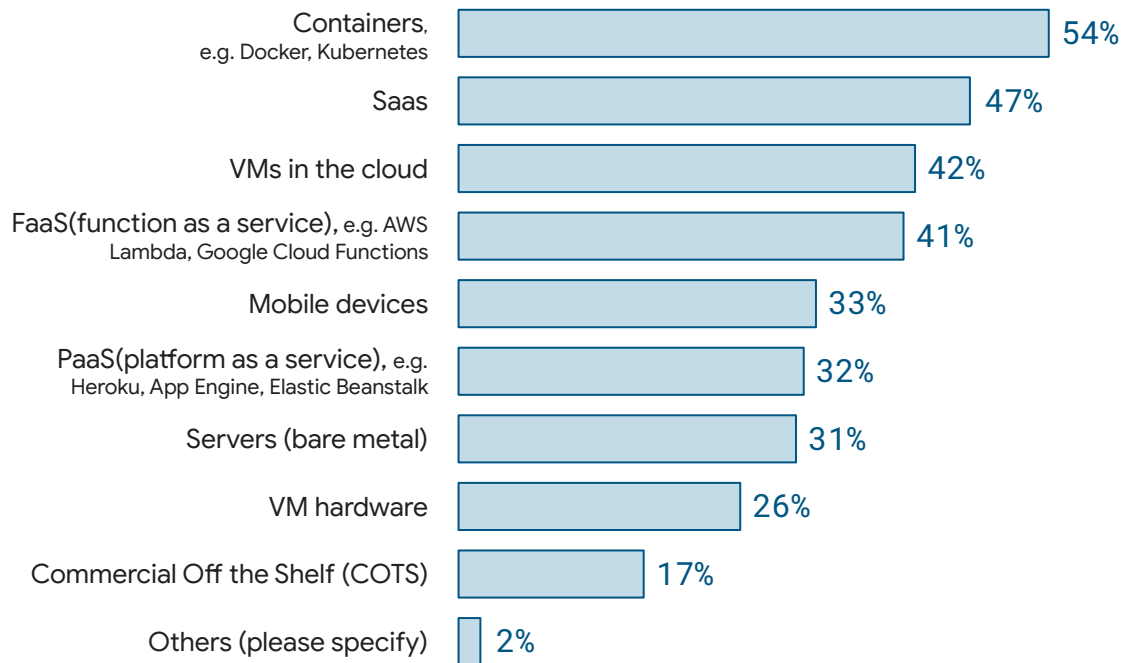
This year we had participants indicate the approximate number of people on their team. 25% of respondents worked on teams with 5 people or fewer. 50% of respondents worked on teams with 8 people or fewer. 75% of respondents worked on teams with 12 people or fewer.



Whiskers represent 10th and 90th percentile. Box represents interquartile range. Line in center of box represents median.

# Deployment targets

2021 was the first year we decided to look at where respondents deployed the primary service or application they work on. To our surprise, the number one deployment target was containers. This year was no different, although at a lower proportion (54%) than last year (64%).



# 06

## Final thoughts



## In closing

After eight years of research, we continue to see that **technical capabilities build on each other to create better performance**. As in years past, we saw the benefits inherent in the use of **cloud**, and in a **positive workplace culture**.

This year we investigated **the technical and cultural practices that enable a more secure software supply chain**, as well as **the drivers of organizational performance (reliability, use of cloud, and company culture)**. We also, for the first time, studied how technical capabilities affect teams differently when those capabilities are combined.

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We thank everyone who contributed to this year's survey, and hope our research helps organizations build better teams and better software—while also maintaining work-life balance.

Let's continue the  
conversation.

Join  
<http://dora.community>





**What questions do you have?**

**What surprised you most?**

**Thank you.**