
CD.FOUNDATION
STATE OF CONTINUOUS DELIVERY REPORT
June 2021

WHAT IS CONTINUOUS DELIVERY?

Software increasingly plays a key role in various organizations and industries. Delivering new software features faster, while making sure that services are solid and secure is a key differentiator for every business.

Continuous delivery is a software development practice in which teams release software changes to users safely, quickly and sustainably. Continuous delivery is critical to how teams deliver value. Being able to release small software changes reliably at any time is a crucial competency for companies in the modern world.

Continuous delivery is related to DevOps in that DevOps is an organizational and cultural movement that aims to improve continuous delivery, and build shared ownership among software stakeholders.

"Continuous Delivery powers innovation at Netflix and we're thrilled to be a founding member of the Continuous Delivery Foundation. Working with other leading practitioners to promote Continuous Delivery is an exciting opportunity to join forces and bring the benefits of rapid, reliable, and safe delivery to an even larger community."

– Andy Glover, Director of Delivery Engineering, Netflix

WHY DOES CONTINUOUS DELIVERY MATTER?

All businesses and organizations have to adapt to operate in a continuously changing environment. In a traditional approach, businesses begin with an idea for a new product or service that they think people want. They then spend a while building the product and delivering it to prospective customers. When they fail to reach broad uptake from customers, it is often because they never received early feedback from prospective customers to determine whether or not the product or service was relevant.

Modern lean approaches help organizations innovate in a more streamlined way. Ideas are worked on iteratively with customers to build a series of experiments that test the usefulness of an idea at minimum-viable scale. The ideas showing strong evidence of good product-market fit can then be invested in heavily. The key to operating in this lean model is to reduce the time it takes to deliver software safely and securely to customers. Continuous delivery is about optimizing the software delivery loop so that businesses can afford as many iterations as possible to maximize chances of discovering a feature or service that will succeed in the ever-changing market.

In addition to being key to innovation and adapting in changing markets, research shows continuous delivery has proven benefits for organizations, their processes and their teams.

Benefits of Continuous Delivery

ORGANIZATION	PROCESS	TEAM
 Accelerates delivery of new features	 Fast feedback and insights	 Creates a high trust culture
 Increases responsiveness to external events	 Decreases deployment pain	 Improves employee job satisfaction
 Builds deeper user relationships	 Improves quality	 Reduces burnout

HOW TO MEASURE SUCCESS IN SOFTWARE DELIVERY

In order to adopt continuous delivery, organizations must adopt a set of practices and continuously improve at them. These practices include continuous integration, test automation, continuous deployments, automated security and others. In order to know if efforts are being effective it is important to track progress against key metrics. Research outlined in the *Accelerate* book by Nicole Forsgren et al,[1] identifies four key metrics that are used to measure software delivery performance and are also predictive of organizational performance. The peer-reviewed research found that teams that performed well on these metrics were twice as likely to exceed objectives in quality of products or services, customer satisfaction and achieving mission goals.

SPEED

Deployment Frequency

How frequently a team successfully releases into production eg. daily, weekly, monthly, yearly

Lead Time for Changes

The median amount of time for a commit to be deployed into production

STABILITY

Change Fail Rate

The number of failures per the number of deployments

Time to Restore Services

For a failure, the median amount of time between the deployment which caused the failure and restoration

"The four key metrics are a guiding light for any organization going through a tech transformation. They are IT related metrics that also tie directly to business outcomes. There is a simplicity to the metrics that helps create a shared language and common focus for teams. The metrics also work well for any team, regardless of the team's speed or context."

– Nicholas Penston, Vice President and Head of Cloud Engineering for Enterprise Cloud Computing, Fidelity Investments

2021 SOFTWARE DELIVERY PERFORMANCE

For these four key metrics we want to have a better shared view of what the reality of software delivery performance is for developers across every industry. We recently commissioned SlashData, a research firm that surveys more than 40,000 developers annually, to develop an exclusive dashboard for use by our community. The dashboard is based on SlashData's Developer Nation survey, which reached 19,000+ respondents from 155 countries and was carried out between December 2020 and February 2021.

The dashboard provides insights into **lead time for changes, deployment frequency** and **time to restore services.** At this stage, data on change fail rate was not available. The interactive dashboard can be filtered on programming language and industry. This data acts as a baseline from which we can observe how software delivery performance changes over time, especially as the Continuous Delivery Foundation seeks to improve the world's capacity to deliver software with speed, security and stability.

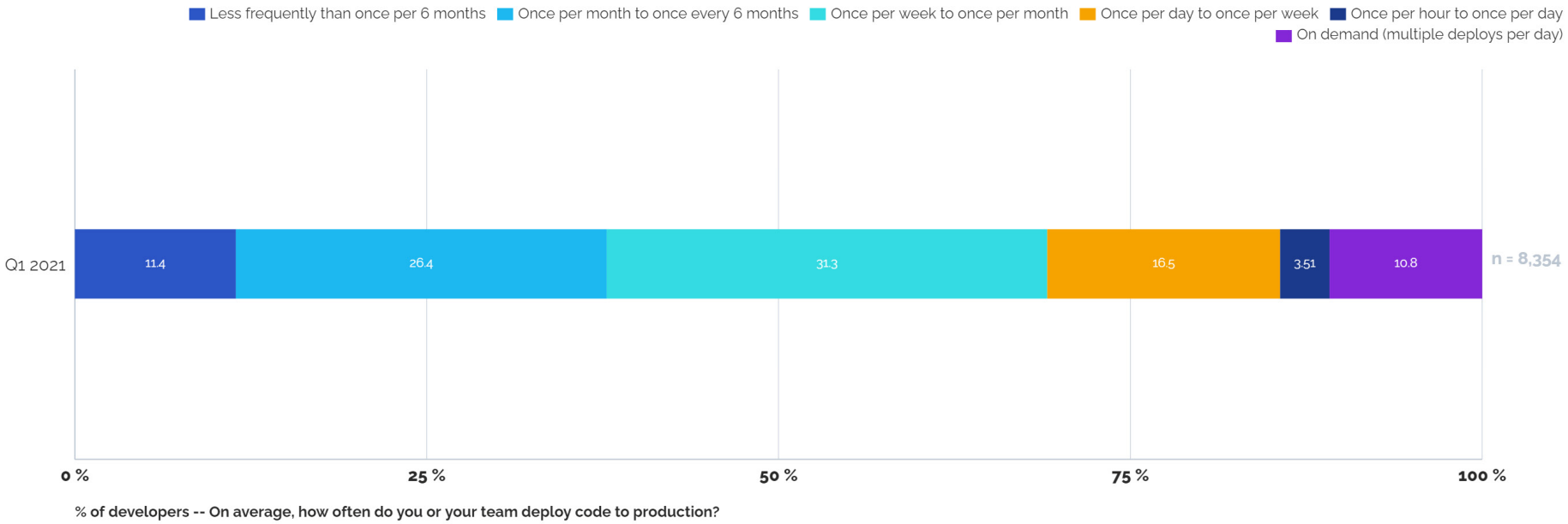
Here are the key insights from the dashboard:

"Software-first companies know the only thing constant is change. They use continuous delivery to ship better software faster. CDF is central to driving innovation in this area, and data like this is critical to understanding how we can help developers more reliably get code to production."

– Isaac Mosquera, CTO, Armory

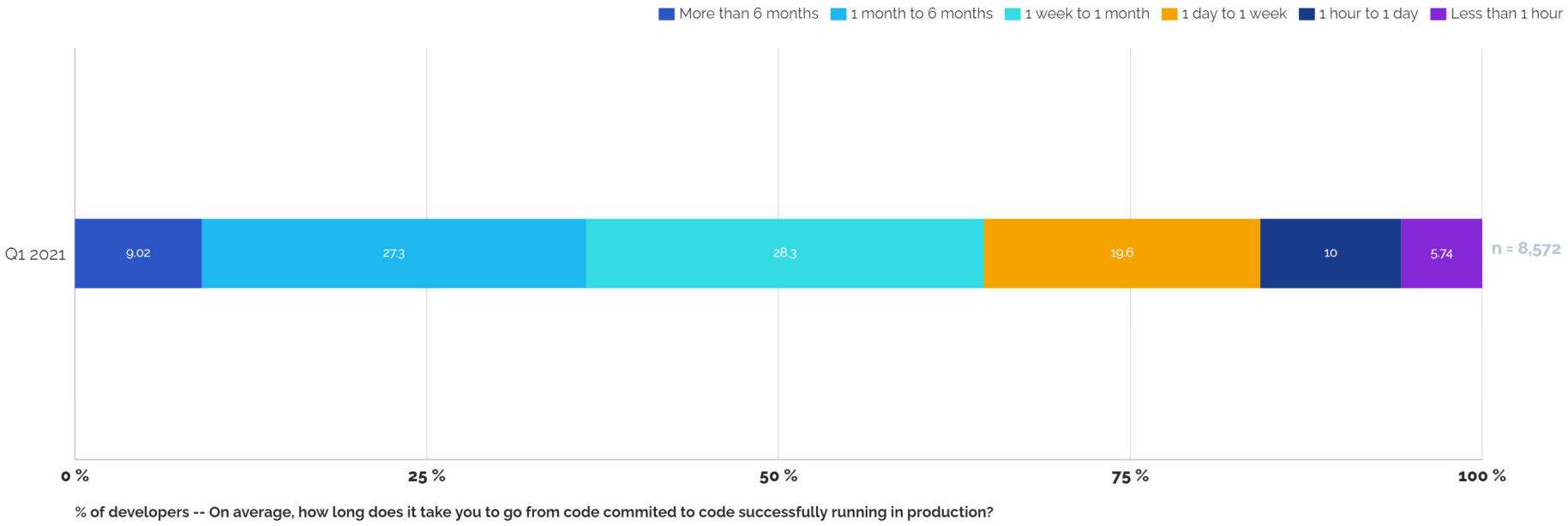
DEPLOYMENT FREQUENCY

Only 1 in 10 developers are elite performers in terms of deployment frequency, i.e. they release multiple deploys per day.



LEAD TIME FOR CHANGES

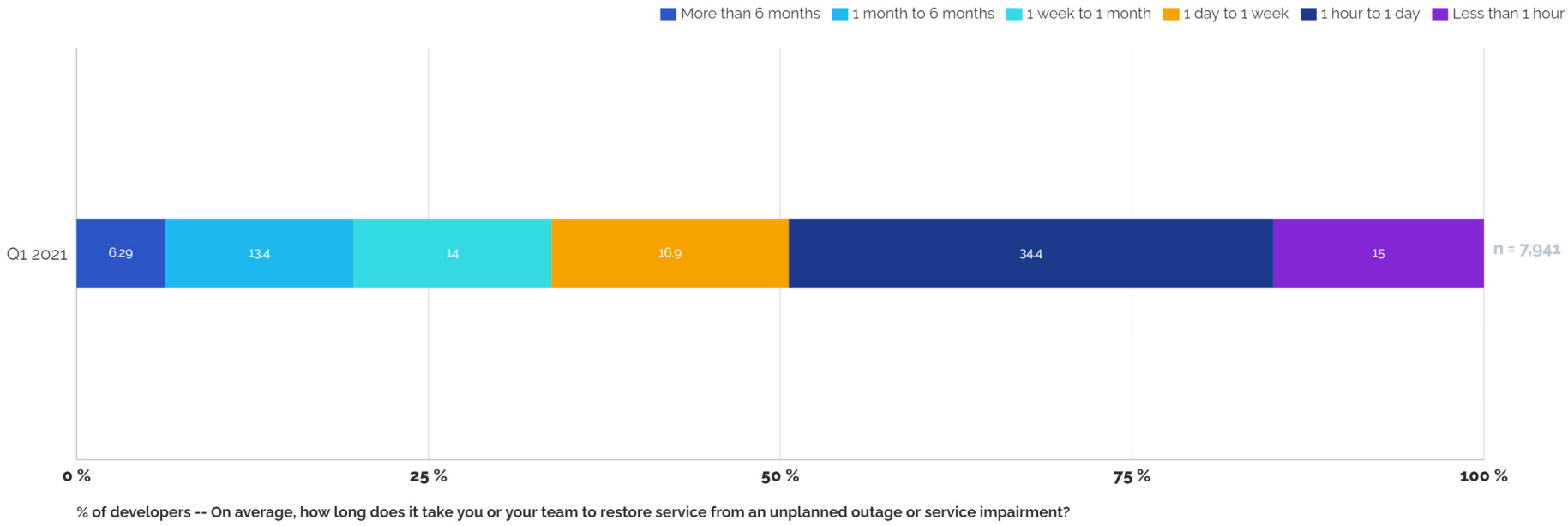
For nearly two thirds of developers it takes at least one week to go from code committed to code successfully running in production.



% of developers -- On average, how long does it take you to go from code commited to code successfully running in production?

TIME TO RESTORE SERVICE

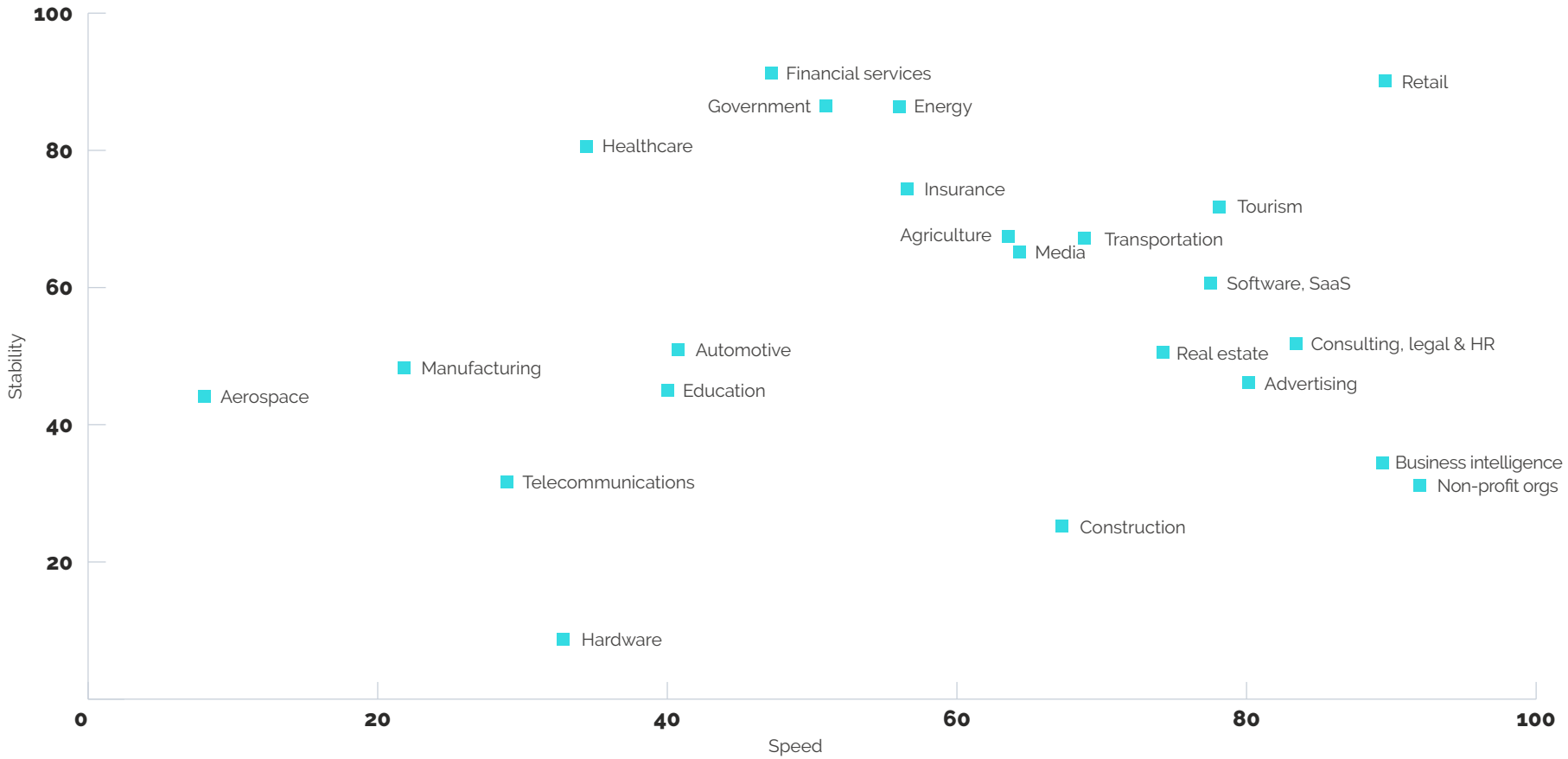
Half of developers report that they restore service from an unplanned outage in less than a day.



% of developers -- On average, how long does it take you or your team to restore service from an unplanned outage or service impairment?

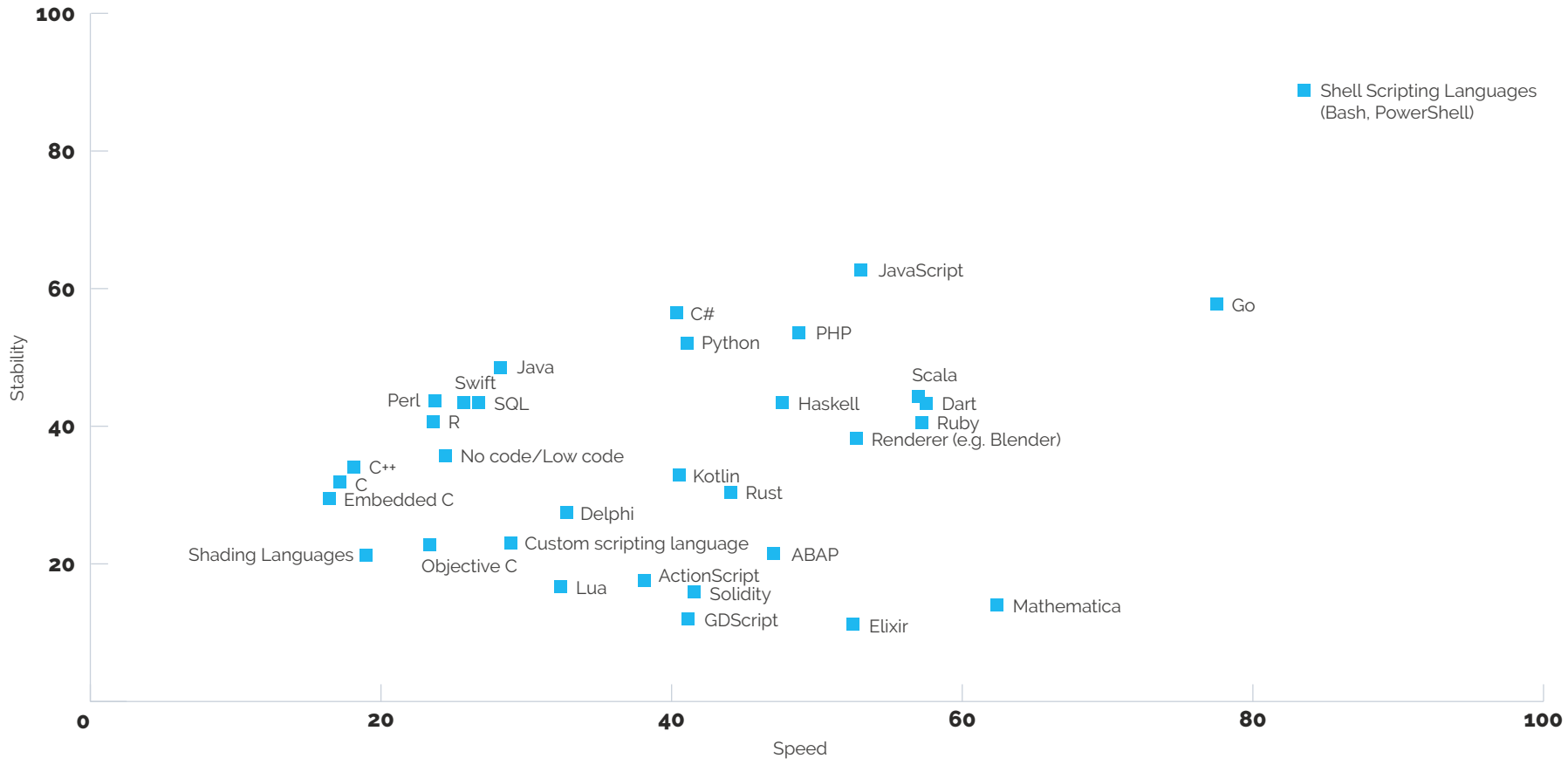
SOFTWARE DELIVERY PERFORMANCE BY INDUSTRY

The dashboard allows us to view the software delivery performance data by industry, which enables us to try to answer questions such as: "How do different industries perform at software delivery relative to each other?" We can get an overall picture by plotting 'speed' metrics (lead time for changes and deployment frequency) on the x axis versus 'stability' metrics (time to restore services) on the y axis. Industries toward the top-right of the chart are delivering software at speed with stability. Viewing the data in this way allows us to observe that the Retail industry ranks the best while industries like Telecommunications lag behind relative to other industries.



SOFTWARE DELIVERY PERFORMANCE BY PROGRAMMING LANGUAGE

The dashboard allows us to view the software delivery performance data by programming language. Culture is of huge importance when it comes to DevOps and continuous delivery and when it comes to developer communities, developer culture typically centres around programming language ecosystems. We can get an overall picture of how programming languages rank on software delivery performance by plotting 'speed' metrics (lead time for changes and deployment frequency) on the X axis versus 'stability' metrics (time to restore services) on the Y axis. This gives us a baseline from which we can compare year-on-year how communities and their ecosystems are evolving and getting better (or not) at software delivery performance, relative to each other.



TOP 10 PROGRAMMING LANGUAGES

Additionally we offer a top 10 ranking of the programming languages* based on the software delivery performance data:

1. Shell Scripting Languages
2. Go/Golang
3. Javascript
4. PHP
5. Scala
6. Dart
7. C#
8. Ruby
9. Python
10. Java

* For programming languages with n>100

CONCLUSION

Continuous delivery is key to innovating and staying relevant in a continuously changing world. The mission of the Continuous Delivery Foundation is to improve the world's capacity to deliver software with security and speed. To do so it is important to have a shared view of where the industry stands in 2021 on key metrics particularly lead time for changes, deployment frequency and time to restore services. We provide further analysis by providing insights into relative performance by industry and programming languages.

In the words of Nicole Forsgren et al from *Accelerate:*[1]

"Software delivery is an exercise in continuous improvement, and our research shows that year over year the best keep getting better, and those who fail to improve fall further and further behind".

This report offers a baseline from which we can track how industries and developer communities evolve, as well as support those industries and communities in their efforts to continuously evolve.

ABOUT THE CONTINUOUS DELIVERY FOUNDATION

The Continuous Delivery Foundation is an open source foundation that seeks to improve the world's capacity to deliver software with security and speed.

Accelerating Software Delivery with Open Source

Our mission is to improve the world's capacity to deliver software with security and speed. We help our members become high performing software delivery organizations while leveraging open source. The open source projects we nurture are used by millions of developers worldwide.

The Continuous Delivery Foundation is an open source foundation that seeks to improve the world's capacity to deliver software with security and speed. We help you figure out your best path to being a high performing team and how to use open source to get there. The open source projects we nurture are used by millions of developers worldwide. For more information on the Continuous Delivery Foundation or our projects please visit: cd.foundation

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SAP
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snyk
sumo logic
Sysdig
Twistlock
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END USER MEMBERS

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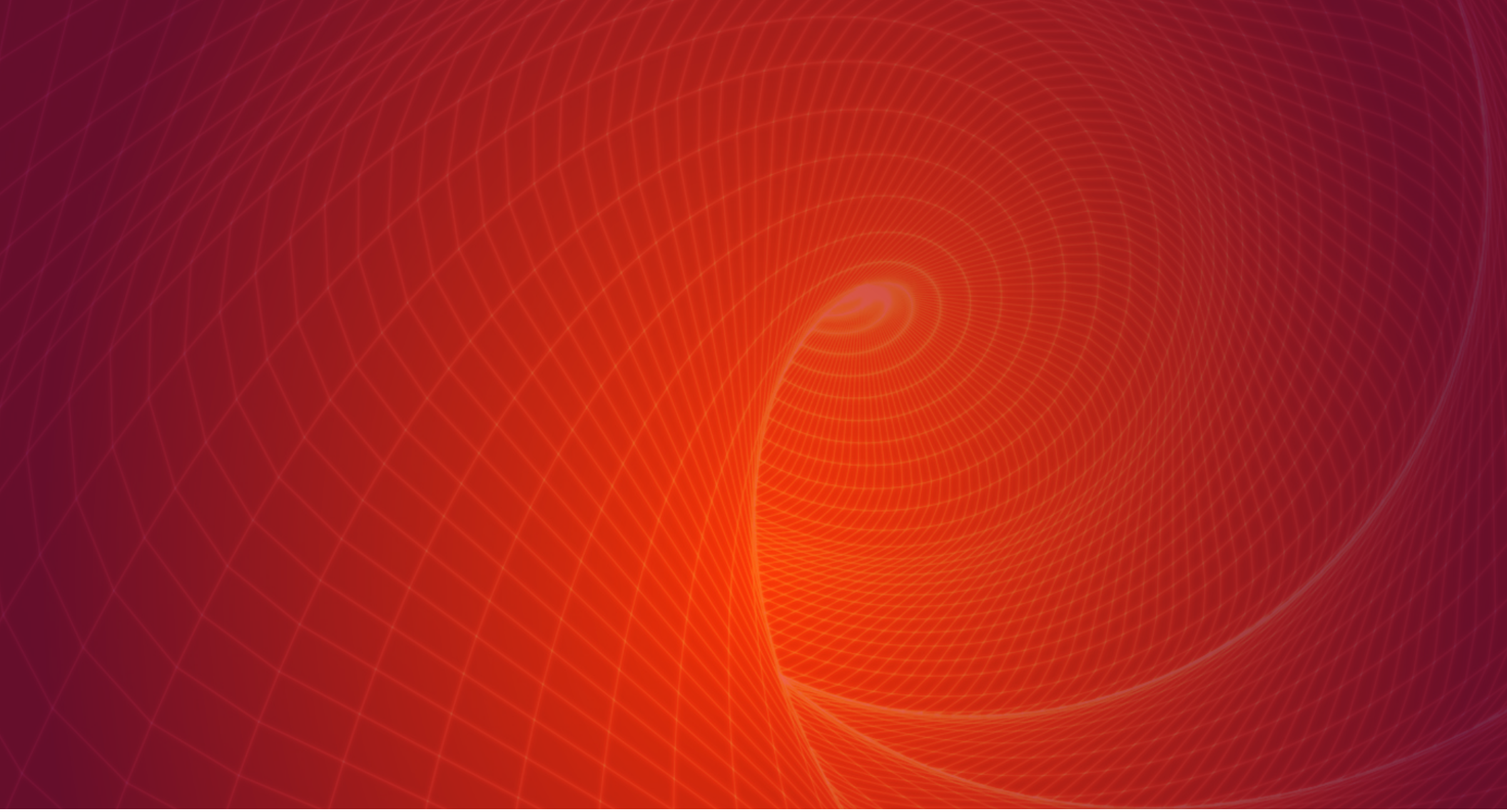
ASSOCIATE

EAST CHINA NORMAL UNIVERSITY



This report is made possible by the support of our member organizations. Our member organizations are end users, enterprises, universities, start-ups and other organizations who are committed to collaborating in open source and recognize that Continuous Delivery is a key differentiator. We are grateful for their support in advancing our mission. To join or for more information on Continuous Delivery Foundation please visit cd.foundation/members/join

REFERENCES

1. Forsgren, N., Humble, J., Kim, G. 2018. Accelerate: The Science of Lean Software and DevOps: Building and Scaling High Performing Technology Organizations. IT Revolution Press.