

The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

by Christopher Condo

September 19, 2019

Why Read This Report

In our 27-criterion evaluation of cloud-native continuous integration (CI) tool providers, we identified the 10 most significant ones — Amazon Web Services (AWS), Atlassian, Buildkite, CircleCI, CloudBees, Codefresh, GitLab, Google, Microsoft, and Travis CI — and researched, analyzed, and scored them. This report shows how each provider measures up and helps application development and delivery (AD&D) professionals select the right one for their needs.

Key Takeaways

Google, GitLab, Microsoft, AWS, And CircleCI Lead The Pack

Forrester's research uncovered a market in which Google, GitLab, Microsoft, AWS, and CircleCI are Leaders; CloudBees and Atlassian are Strong Performers; Buildkite and Codefresh are Contenders; and Travis CI is a Challenger.

Speed, Scale, And Security Are The Important Differentiators

As organizations transition to continuous delivery (CD) and shift hosting of production workloads to cloud servers, traditional, on-premises continuous integration will no longer suffice. Cloud-native CI products with exceptional build speed, on-demand scale, and secure configurations will lead the market and enable customers to accelerate delivery speed and lower management costs, all while meeting corporate compliance needs.

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Table Of Contents

- 2 To Develop Faster, Do It In The Cloud
- 3 Evaluation Summary
- 6 Vendor Offerings
- 6 Vendor Profiles
 - Leaders
 - Strong Performers
 - Contenders
 - Challengers
- 10 Evaluation Overview
 - Vendor Inclusion Criteria
- 12 Supplemental Material

Related Research Documents

[Cloud CI Tools Mature To Meet Enterprise Challenges](#)

[The Forrester Wave™: Continuous Integration Tools, Q3 2017](#)

[Now Tech: Continuous Integration Tools, Q3 2019](#)



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The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

To Develop Faster, Do It In The Cloud

All organizations, even those in risk-averse industries like financial services, are feeling the need to deliver software faster. As the VP for development tools engineering at a large UK bank put it, “We simply need to go faster; shifting our development processes to the cloud is how we see this happening.”

Why now? The tech unicorns — Amazon, Facebook, and Netflix, among others — have demonstrated not only that using cloud development tools delivers software better and faster but also that leveraging this capability enables them to disrupt traditional industries and drive growth. Our recent report “[Now Tech: Continuous Integration Tools, Q3 2019](#)” contrasts the various ways of hosting, maintaining, and configuring CI services, from on-premises to cloud, including new hybrid models that combine cloud-native orchestrators with bring-your-own-build servers. For this Forrester Wave™, reference customers enthused about the benefits of a 100% complete cloud solution; one noted, “We’ve moved our CI processes to the cloud, and we’re never looking back.” Cloud-native CI is the secret development sauce that enterprises need to be fast, responsive, and ready to take on incumbents and would-be digital disruptors.

Development shops we interviewed cited several important benefits of shifting CI to the cloud:

- › **Eliminating CI server maintenance.** Reference customers universally called out the time and effort needed to maintain on-premises CI servers as a main driver to shift their CI processes to cloud-native CI tools. As one customer noted, it’s not just the cost of maintaining the infrastructure that matters — the server software itself becomes difficult to maintain once it’s configured with plug-ins and custom scripts, causing a proliferation of snowflake build-servers. One reference customer explained, “Hosting our own CI server in the cloud isn’t enough; it just shifts our problems to the cloud. [Instead], we need to eliminate maintenance altogether, which is why we see cloud-native CI as the best option.”
- › **Speeding up development.** Cloud-native CI tools speed the software development process, reducing the cost of delays on multiple fronts: They offer multiple build-server sizes to optimize build times, elastic scale to take on cyclical demand and reduce queue times, and configuration-as-code to enable teams to create new pipelines as needed rather than waiting for the fulfillment of IT tickets. One reference customer explained that the organization went from waiting weeks for new build pipelines to instantiating them in minutes. Another noted that since switching to cloud-native, the firm gets the scale it needs when it needs it — and pays only for what it uses.
- › **Assuring compliance and security.** Not many dev shops can claim that their CI server meets FedRAMP or SOC 2 compliance standards.¹ In contrast, most of the vendors in this evaluation have multiple compliance certifications, plus role-based access control (RBAC) rules to match enterprise authentication and authorization systems, plus full audit capability to track who made changes and when. CircleCI, Google, and Microsoft offer multiple certifications. AWS goes even further, offering hosted networks that have zero open-internet traffic to ensure that the only traffic within the build environment is the customer’s traffic.

The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

Evaluation Summary

The Forrester Wave evaluation highlights Leaders, Strong Performers, Contenders, and Challengers. It's an assessment of the top vendors in the market and doesn't represent the entire vendor landscape. You'll find more information about this market in our reports on continuous integration tools.²

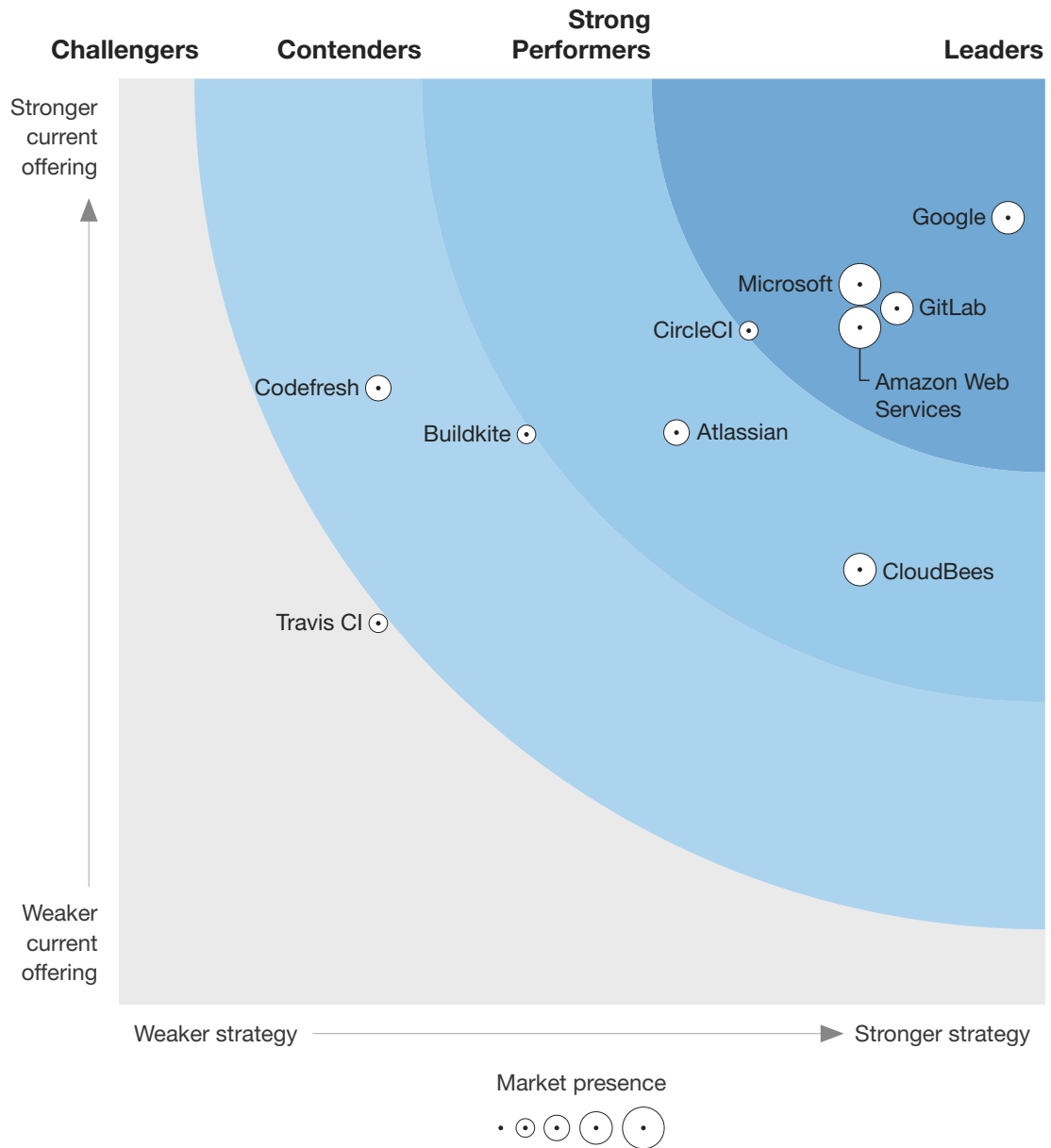
We intend this evaluation to be a starting point only and encourage clients to view product evaluations and adapt criteria weightings using the Excel-based vendor comparison tool (see Figure 1 and see Figure 2). Click the link at the beginning of this report on [Forrester.com](https://www.forrester.com) to download the tool.

The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

FIGURE 1 Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019**THE FORRESTER WAVE™****Cloud-Native Continuous Integration Tools**

Q3 2019



The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

FIGURE 2 Forrester Wave™: Cloud-Native Continuous Integration Tools Scorecard, Q3 2019

| | Forrester's weighting | Amazon Web Services | Atlassian | Buildkite | CircleCI | CloudBees | Codefresh | GitLab | Google | Microsoft | Travis CI |
|---|-----------------------|---------------------|-----------|-----------|----------|-----------|-----------|--------|--------|-----------|-----------|
| Current offering | 50% | 3.66 | 3.09 | 3.08 | 3.64 | 2.35 | 3.33 | 3.76 | 4.25 | 3.89 | 2.06 |
| Developer experience | 15% | 3.00 | 3.00 | 2.90 | 2.30 | 3.90 | 3.30 | 3.80 | 3.90 | 4.40 | 2.70 |
| Platform | 20% | 3.00 | 2.20 | 4.20 | 4.00 | 3.80 | 4.40 | 3.20 | 3.40 | 4.00 | 2.40 |
| Build speed and scale | 25% | 5.00 | 5.00 | 1.80 | 5.00 | 1.80 | 3.00 | 4.20 | 5.00 | 3.80 | 1.80 |
| Configuration and analytics | 15% | 2.00 | 1.10 | 3.80 | 1.80 | 1.60 | 4.30 | 4.20 | 3.40 | 4.20 | 2.70 |
| Enterprise security and compliance | 20% | 4.60 | 3.00 | 2.80 | 3.60 | 1.00 | 2.00 | 3.40 | 5.00 | 3.00 | 1.00 |
| Enterprise support | 5% | 2.80 | 3.60 | 4.40 | 5.00 | 2.20 | 3.20 | 3.80 | 4.40 | 5.00 | 2.40 |
| Strategy | 50% | 4.00 | 3.00 | 2.20 | 3.40 | 4.00 | 1.40 | 4.20 | 4.80 | 4.00 | 1.40 |
| Commercial model | 20% | 5.00 | 3.00 | 3.00 | 5.00 | 1.00 | 1.00 | 3.00 | 5.00 | 3.00 | 1.00 |
| Partner ecosystem | 10% | 3.00 | 3.00 | 1.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 5.00 | 3.00 |
| Enterprise strategy and vision | 30% | 5.00 | 3.00 | 3.00 | 3.00 | 5.00 | 1.00 | 5.00 | 5.00 | 3.00 | 1.00 |
| Developer engagement/ecosystem/outreach | 10% | 3.00 | 3.00 | 3.00 | 3.00 | 5.00 | 3.00 | 3.00 | 5.00 | 5.00 | 3.00 |
| Product road map | 30% | 3.00 | 3.00 | 1.00 | 3.00 | 5.00 | 1.00 | 5.00 | 5.00 | 5.00 | 1.00 |
| Market presence | 0% | 5.00 | 3.00 | 1.70 | 1.70 | 3.60 | 2.40 | 3.10 | 3.70 | 5.00 | 1.70 |
| Number of enterprise customers | 30% | 5.00 | 3.00 | 1.00 | 1.00 | 5.00 | 1.00 | 1.00 | 3.00 | 5.00 | 1.00 |
| Product revenue | 35% | 5.00 | 3.00 | 1.00 | 3.00 | 5.00 | 1.00 | 3.00 | 3.00 | 5.00 | 3.00 |
| Product revenue growth | 35% | 5.00 | 3.00 | 3.00 | 1.00 | 1.00 | 5.00 | 5.00 | 5.00 | 5.00 | 1.00 |

All scores are based on a scale of 0 (weak) to 5 (strong).

The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

Vendor Offerings

Forrester included 10 vendors in this assessment: Amazon Web Services, Atlassian, Buildkite, CircleCI, CloudBees, Codefresh, GitLab, Google, Microsoft, and Travis CI (see Figure 3).

FIGURE 3 Evaluated Vendors And Product Information

| Vendor | Product evaluated |
|---------------------|---|
| Atlassian | BitBucket Cloud |
| Amazon Web Services | AWS CodeBuild |
| Buildkite | Buildkite |
| CircleCI | CircleCI |
| CloudBees | CloudBees Codeship |
| Codefresh | Codefresh |
| GitLab | GitLab (Version 12) |
| Google | Google Cloud Build |
| Microsoft | Azure DevOps Service and Azure DevOps Server 2019 |
| Travis CI | Travis CI |

Vendor Profiles

Our analysis uncovered the following strengths and weaknesses of individual vendors.

Leaders

- › **Google comes out swinging, matching up well with other cloud giants.** Google Cloud Build is relatively new in comparison with the other public cloud CI offerings; this vendor had a lot to prove — and it did. Google's CI system executes each build step in a separate container. It natively supports container builds that get placed into the Google container registry, which then natively integrates with Kubernetes. Google realizes it's coming to the cloud CI party a little late, so it offers an abundance of free minutes and a pay-as-you-go pricing model to win over developers. Google's underlying technology is based on its open source project, Tekton, which it has donated to the Continuous Delivery Foundation (CDF).³

The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

Customer references are happy to trade the cost of paying for the operation and management of build servers for moving their operations to Google's pay-per-compute system. One reference explained that it's in the middle of a cloud shift and is currently executing up to 650 builds per day. With that proved out, this customer plans to move an additional 250 repositories to the cloud. Customer references also tell us they'd like to see Google improve the granularity of build triggers and make it easier to pass artifacts from one step to the next to create more tightly integrated build pipelines.

- › **GitLab's simple and cohesive approach lands it squarely as a leader.** GitLab's approach of having a single application to manage each phase of software development comes through in its developer experience. The UI is easy to use, cohesive, and comes integrated with collaborative tools and development tasks at a glance; it was one of the most fluid UIs we evaluated. GitLab also shines with its preconfigured environments and its ability to support on-premises build agents that can execute on multiple operating systems, including Linux, Mac, and Windows.

GitLab's continuous delivery capability includes support for container registries and Kubernetes, making it easy to get started. GitLab's investment in value stream management also pays off with strong analytics, and customers liked the flexibility of being able to orchestrate builds in the cloud but run them on-premises if they want to. Reference customers would like improved customer support as well as support for greater rules complexity for managing code branches.

- › **Microsoft and GitHub create a dynamic duo.** Microsoft's 2019 acquisition of GitHub is paying off, both in the product itself and in how customers perceive the value of Microsoft's cloud-native CI solution. Like many born-in-the-cloud solutions, Microsoft's developer experience now integrates with GitHub, making it easy to get started. Once in the Microsoft experience, there are step-by-step guides and numerous preconfigured build environments to choose from. Its solution can scan a repository to recommend and expose the correct environment to match your project and can read existing YAML to recreate a build process in the cloud.

Microsoft is also strong with its approach to multicloud, providing ready-made Terraform templates for pushing applications to other public clouds; it makes those templates easy to find in its marketplace. Where Microsoft falls short is with its support for hybrid, and its identity and authorization capability doesn't offer as many single sign-on options as other vendors' solutions do. Overall, however, customer references were very satisfied, and one praised Microsoft's willingness to share notes from its own transition to the cloud, which the customer found very helpful.

- › **AWS adds beefy security features to complement its speed and scale.** AWS CodeBuild offers users the ability to create a walled-off network in the cloud; it added this feature, VPN Elastic Network, to meet the stringent security needs of businesses such as banking and fintech. This private network, the ability to scale vertically and horizontally, and CodeBuild's connectivity with CodePipeline continuous delivery services make AWS a Leader. Customer references loved the ability to instantly scale from 100 to 1,000 builds while paying only for what they use. One large enterprise stated, "AWS is ready and willing to work with us" as it makes the journey to the cloud, a quality that enterprises tell us they want and need to help them make the transition.

The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

AWS supports enterprise migration in multiple ways; notably, with its ability to link to existing Jenkins servers to help move builds from on-premises to the cloud. AWS customer support also receives top scores — it was a deciding factor in why one reference chose this provider over another public cloud vendor. AWS has proven that the pay-per-build-minute plan (which it pioneered) is preferred by customers and easier to manage than other plans that incur fixed monthly costs. Based on customer feedback, AWS should focus on improving its developer experience by providing a more comprehensive UI that's easier to use, with a more integrated UX that also incorporates analytics. But by and large, customers were extremely satisfied with its speed and scale and the lower cost of operating AWS's CI system.

- › **CircleCI's wide variety of build systems offsets its lack of migration tools.** Large enterprises often need to develop using multiple technology stacks that include Linux, macOS, and Windows. CircleCI's support for these build environments helps push its offering into the Leader category. Its support for enterprise compliance with multiple certifications, such as FedRAMP, is also a strong factor. CircleCI provides a large number of preconfigured environments, which enterprises told us they look for to help them jump-start their efforts to get into the cloud.

CircleCI's orbs technology allows customers to easily integrate and maintain third-party applications, creating more-resilient build pipelines. To further cater to large enterprises, CircleCI has a customer success team and enterprise support packages. Customer references told Forrester they'd like to see a more customizable dashboard with more-useful analytics. In addition, CircleCI lacks a hybrid orchestration model, an option that an increasing number of enterprise customers tell Forrester they're interested in.

Strong Performers

- › **Atlassian has fast onboarding and strong Jira integrations but limited build options.** Easy onboarding and a great user experience are hallmarks of Atlassian's Bitbucket offering. It includes an easy-to-use UI and integration with multiple integrated development environments (IDEs) as well as out-of-the-box Slack integration. Another strong point is Atlassian's support for unlimited concurrency, with no sliders or settings to manage, allowing builds to easily scale up and scale down as needed.

Enterprises that already use other Atlassian products, such as Jira and Opsgenie, will appreciate its product strategy, which includes strong binds to those products, making the entire tool chain more integrated. But Atlassian falls short with a narrow range of CI build options, as Bitbucket supports only Linux and .NET Core builds; to improve, the vendor needs to support more build options, like macOS and .NET Framework. It also lacks enterprise migration tools, something enterprises are increasingly asking for to make the jump to the cloud.

The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

- › **CloudBees' slick getting-started experience is hindered by lack of analytics.** The getting-started experience for Codeship is one of the best, featuring uncluttered and easy-to-understand instructions with pertinent information present at each step, including plenty of useful examples. Customer references told us they like the simplicity of Codeship's operation. "Very cohesive and consistent for how to orchestrate containers. Simple and opinionated," noted one enterprise user.

However, customer references also pointed out weaknesses. For example, they noted, "Not a lot of analytics" and "Error reporting was unintuitive." They also expressed a desire for repository templates. In addition, Codeship suffers from its concurrency slider, which requires users to manually configure a concurrency limit and pay more for capacity, whereas our Leaders simply charge by the minute and don't require manual settings. Looking forward, however, Cloudbees has an exciting strategy and a road map that will leverage other products and infuse more data and analytics.

Contenders

- › **Buildkite's hybrid architecture shows great promise but lacks fully managed builds.** Buildkite's hybrid architecture orchestrates CI in the cloud but executes builds via build agents on systems the customer manages. This means customers get the benefit of a cloud orchestrator but can leave their source code on-premises if they choose, a model that some enterprises find desirable as they grow more security-conscious. Another benefit of this model is that agents can be hosted on any public cloud, so customers can hunt for the best prices. The downside is that customers still need to manage their fleet of build agents. To improve its offering, Buildkite should provide the option of managing an end user's build fleet.

Looking forward, Buildkite should move more aggressively to gain multiple compliance measures; it's currently undergoing International Organization for Standardization (ISO) certification, but government and financial enterprises will want to see FedRAMP and SOC 2 compliance as well. Buildkite also needs a more comprehensive product strategy that includes a clear vision for its product, with features to help more enterprises adopt this approach. There appears to be a real market opportunity for this type of hybrid system; Buildkite would benefit from a product road map that clearly indicates coming improvements.

- › **Codefresh offers an innovative CI engine, but its payment model disappoints users.** The Codefresh CI system uses container-based pipelines, allowing for a modular process that potentially creates reusable steps as building blocks. Codefresh integrates with Helm, and its support for continuous delivery is stronger than that of many other CI tools in this evaluation. Support for Helm was the reason one customer signed up with Codefresh. Customer references positively called out its Kubernetes support; its support for a hybrid CI model, which Forrester believes has great market potential, is also a plus.

To reach its full potential, Codefresh simply needs more time and effort to grow and mature its offering and business strategy. Customer references explained that while they appreciate the innovative offering and its use of emerging technologies, they recognize that Codefresh is a startup

The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

and have set their expectations accordingly when it comes to enterprise support and security. The pricing model (by concurrency) was also a sticking point for several customers we spoke with; they felt that this model results in paying for unused capacity and would prefer a simple price-per-minute plan (this also applies to other vendors that use this model). Lastly, the Codefresh product strategy is lacking when it comes to both future vision and road map, something that enterprises look for before making a strategic purchase such as CI/CD.

Challengers

- › **Travis CI, a long-standing cloud CI vendor, is falling behind in multiple areas.** Travis CI is one of the original cloud-native CI tools; nearly all of the customer references we spoke with during the evaluation were familiar with it. Customers praised the vendor's integration with GitHub and liked the open source nature of the product. Travis CI also has an excellent onboarding experience and received high marks for its support of continuous delivery.

Travis CI falls short, however, when it comes to the overall breadth of its CI system. At this time, it supports only GitHub for source code management and lacks the ability to add custom tools. It also trails its competitors due to a fixed-concurrency pricing model. Another major shortcoming is its sole reliance on GitHub to manage identity and authorization; this works very well for small companies, but enterprises want more options. Lastly, the Travis road map focuses on very tactical updates, such as supporting PowerPC. This is great for some customers but seems narrow in comparison with the other providers in this evaluation.

Evaluation Overview

We evaluated vendors against 27 criteria, which we grouped into three high-level categories:

- › **Current offering.** Each vendor's position on the vertical axis of the Forrester Wave graphic indicates the strength of its current offering. Key criteria for these solutions include comprehensive user experience, source code management (SCM) integrations, supported build targets, scaling options, support for hybrid CI, comprehensive data protection, and support for multicloud.
- › **Strategy.** Placement on the horizontal axis indicates the strength of the vendors' strategies. We evaluated commercial model, partner ecosystem, enterprise strategy and vision, developer engagement/ecosystem/outreach, and product road map.
- › **Market presence.** Represented by the size of the markers on the graphic, our market presence scores reflect each vendor's number of enterprise customers, product revenue, and product revenue growth.

The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

Vendor Inclusion Criteria

Forrester included 10 vendors in the assessment: Amazon Web Services, Atlassian, Buildkite, CircleCI, CloudBees, Codefresh, GitLab, Google, Microsoft, and Travis CI. Each of these vendors has:

- › **A cloud-native continuous integration product.** The product must be available to users using a software-as-a-service (SaaS) deployment model and must operate in a public cloud.
- › **A CI product that the SaaS vendor maintains.** The product includes updates and management.
- › **At least 10 enterprise-scale customers.** Forrester defines an enterprise as 1,000 employees or \$1 billion in total revenue.
- › **Significant CI tool revenue.** The provider must have continuous integration tool revenue of \$2 million or more per year.
- › **A cloud-native SaaS CI product that satisfies these requirements on its own.** The product must meet these requirements without combining revenue, enterprise customer numbers, or capabilities from other offerings. The vendor offering the SaaS CI product must be the creator and owner of the product (i.e., we did not evaluate vendors that are reselling another vendor's CI product).

The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019

The 10 Providers That Matter Most And How They Stack Up

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Supplemental Material

Online Resource

We publish all our Forrester Wave scores and weightings in an Excel file that provides detailed product evaluations and customizable rankings; download this tool by clicking the link at the beginning of this report on Forrester.com. We intend these scores and default weightings to serve only as a starting point and encourage readers to adapt the weightings to fit their individual needs.

The Forrester Wave Methodology

A Forrester Wave is a guide for buyers considering their purchasing options in a technology marketplace. To offer an equitable process for all participants, Forrester follows [The Forrester Wave™ Methodology Guide](#) to evaluate participating vendors.

The Forrester Wave™: Cloud-Native Continuous Integration Tools, Q3 2019**The 10 Providers That Matter Most And How They Stack Up**

In our review, we conduct primary research to develop a list of vendors to consider for the evaluation. From that initial pool of vendors, we narrow our final list based on the inclusion criteria. We then gather details of product and strategy through a detailed questionnaire, demos/briefings, and customer reference surveys/interviews. We use those inputs, along with the analyst's experience and expertise in the marketplace, to score vendors, using a relative rating system that compares each vendor against the others in the evaluation.

We include the Forrester Wave publishing date (quarter and year) clearly in the title of each Forrester Wave report. We evaluated the vendors participating in this Forrester Wave using materials they provided to us by July 15, 2019, and did not allow additional information after that point. We encourage readers to evaluate how the market and vendor offerings change over time.

In accordance with [The Forrester Wave™ Vendor Review Policy](#), Forrester asks vendors to review our findings prior to publishing to check for accuracy. Vendors marked as nonparticipating vendors in the Forrester Wave graphic met our defined inclusion criteria but declined to participate in or contributed only partially to the evaluation. We score these vendors in accordance with [The Forrester Wave™ And The Forrester New Wave™ Nonparticipating And Incomplete Participation Vendor Policy](#) and publish their positioning along with those of the participating vendors.

Integrity Policy

We conduct all our research, including Forrester Wave evaluations, in accordance with the [Integrity Policy](#) posted on our website.

Endnotes

¹ SOC 2 is Service Organization Control 2.

² See the Forrester report "[Now Tech: Continuous Integration Tools, Q3 2019](#)," see the Forrester report "[Cloud CI Tools Mature To Meet Enterprise Challenges](#)," and see the Forrester report "[The Forrester Tech Tide™: Continuous Software Delivery, Q3 2018](#)."

³ Source: Dan Lorenc and Kim Lewandowski, "Introducing the Continuous Delivery Foundation, the new home for Tekton, Jenkins, Jenkins X and Spinnaker," Google Open Source Blog, March 12, 2019 (<https://opensource.googleblog.com/2019/03/introducing-continuous-delivery-foundation.html>).

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