The Forrester Wave™: Continuous Delivery And Release Automation, Q4 2018

The 15 Providers That Matter Most And How They Stack Up

by Charles Betz
November 26, 2018

Why Read This Report

In our 26-criterion evaluation of continuous delivery and release automation (CDRA) offerings, we identified the 15 most significant ones — Atlassian, CA Technologies, Chef, CircleCI, CloudBees, Electric Cloud, Flexagon, GitLab, IBM, Inedo, Micro Focus, Microsoft, Octopus Deploy, Puppet, and XebiaLabs — and researched, analyzed, and scored them. This report shows how each provider measures up and helps infrastructure and operations (I&O) professionals make the right choice.

Key Takeaways

Electric Cloud, IBM, XebiaLabs, CA Technologies, And Microsoft Lead The Pack

Forrester's research uncovered a market in which Electric Cloud, IBM, XebiaLabs, CA Technologies, and Microsoft are Leaders; CloudBees, Puppet, Micro Focus, and Flexagon are Strong Performers; Chef, Atlassian, GitLab, Inedo, and Octopus Deploy are Contenders; and CircleCI is a Challenger.

I&O Pros Are Looking For An Expanding Mix Of CDRA Capabilities, From Source To Deploy

The CDRA market is growing in breadth and functionality. CDRA tools model, deploy, and visualize application pipelines, orchestrating existing tools and assets. They also automate the delivery and release pipeline between development and production, supporting emerging use cases like containers, cloud-native architectures, and release readiness analytics.

Robust Modeling, Platform Support, And Cognitive Capabilities Are Key Differentiators

CDRA capabilities used to be the domain of separate tools — but no longer. Vendors are providing more robust integrated tooling and automation, including more sophisticated release modeling and choreography, as-code capabilities, application drift management, support for a broader spectrum of platforms, and increasing use of cognitive and machine learning.

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CDRA Further Expands To Address Today's Digital Delivery Demands

I&O teams must support the rapid delivery of applications to provide differentiated customer experiences that meet accelerating business expectations.[1] Automating the deployment of infrastructure and the movement of applications is thus a key concern. However, faster delivery alone merely leads to customer disappointment when the software delivery process defers to velocity without also addressing quality. CDRA offerings address both these concerns.

Forrester defines continuous delivery and release automation as:

> *Enabling faster, higher-quality, more automated software delivery through modeling applications, infrastructure, middleware, and their supporting installation processes and dependencies. The resulting release packages then transition across defined digital pipelines, spanning the value stream from source code through build, test, package, and deployment into production.*

It's important that I&O and development teams:

- **Know the key functional aspects of CDRA.** Releases flow across pipelines. At the most basic level, a release package model includes a bill of materials for the different prebuilt software components and the order to install them. The more granular the model, the greater the value. For instance, pairing an application model with configuration, middleware, network, and infrastructure models represents a more complete release package. The model will determine the supporting software required, where to obtain the components, and further dependencies. CDRA tools track changes to the components in the model, enabling drift tracking and, upon failure, allowing environments to fall back to a previous working version or fail forward, correcting the failure.
- **Distinguish between release automation and release management.** All vendors in this Forrester Wave™ evaluation have some degree of release automation (RA). Only a subset of them also handle release management, which includes capabilities similar to project management: calendaring, milestones, coordinating conflicting releases, managing multiproduct release trains, and so forth. Some teams may want a CDRA tool that provides both release automation and management. Others may select a vendor that offers a separate product on the same architectural platform or a pure-play release management tool such as CollabNet VersionOne or Plutora.
- **Adapt to a world of expanding CDRA functionality and vendor coverage.** Through both organic development and acquisitions, the CDRA market is expanding from a diverse set of best-of-breed vendors to integrated suites. For example, Puppet expanded from a focus on configuration management to address RA by acquiring Distelli, rebranding it as Puppet Pipelines. CloudBees is pivoting the popular Jenkins continuous integration (CI) platform to include production deployment, starting with cloud-native architectures.

Vendors Converge To Provide More Complete Continuous Delivery

The CDRA market includes best-of-breed offerings and integrated suites from vendors of varied origins. As the CDRA market matures, competition and convergence are apparent across multiple entry points. The result is a tools market that fulfills the original "source to production" vision of continuous delivery. There are four primary paths by which vendors appear in this research:

- **Continuous integration vendors.** CI vendors expanding into the broader CDRA market bring strong capabilities to tasks, such as running automated tests and packaging tested software into deployable units. These vendors typically support fewer target platforms and rely more on scripting (i.e., imperative) versus the modeling approaches that more mature CDRA tools offer. Examples include Atlassian Bamboo, CircleCI, and CloudBees.
- **Infrastructure configuration-centric vendors.** Infrastructure management vendors expanding into CDRA bring strengths such as declarative configuration management and the ability to manage provisioning and infrastructure-as-code. These vendors, however, are generally weaker in CI unless they've made specific investments there (e.g., Chef developing Habitat and Puppet acquiring Distelli). This category of vendors is capable of simple application deployments and can be a fit if your release choreography needs are less demanding. Examples include Chef and Puppet.
- **Release and deployment automation-centric vendors.** Tools originating from the RA space are built to handle the most complex needs, such as canary and blue/green deployment models. These solutions offer strong deployment modeling and release choreography and also may support declarative approaches where sequencing and dependencies are automatically planned by the tool based on a desired state. Currently, some stop short of full CI (e.g., kicking off a Maven build). In general, pure-play RA tools have the best security, as they were designed from the start to interact with production infrastructure. Examples include CA Automic, Electric Cloud, IBM UrbanCode, Octopus Deploy, and XebiaLabs.
- **IT operations management and automation-centric vendors.** Amid the marketing noise in the CDRA market, some accuse vendors of DevOps-washing existing tools. Forrester doesn't believe this is a valid critique. Continuous delivery leverages a number of capabilities that may exist in various tool sets with long histories: runbook and workload automation, configuration management, choreography, and even cloud management. Challenges for vendors pursuing this strategy include proving use case applicability, integrating between their capabilities, ease of use, and clarity of messaging. Examples include CA Technologies and Micro Focus.

Cloud, Cognitive, And Configuration Technologies Are Impacting The CDRA Landscape

The CDRA market will continue to evolve at a rapid pace. Customers need to bear this in mind, as vendor agility is going to be important and long-term survival isn't yet certain for a number of players. Forrester observes that:

- **Cloud-native capabilities quickly became table stakes in 2018.** Most tools in this report have some capability for deploying to cloud environments, including Kubernetes and other modern container architectures, with certain vendors, such as CloudBees and GitLab, focusing their strategies foremost on cloud-native. These vendors assume, for better or worse, that capacity is always available on demand to spin up new environments. This means they also sidestep legacy and on-premises environment considerations such as static environment discovery and reserving limited capacity resources. Other vendors with deeper release management capabilities can support environment reservations, which are important to both on-premises and cloud-first environments, especially when large data sets are involved.
- **The battle for the legacy and on-premises market is heating up.** While cloud is top of mind for many, it still represents a minority of workloads worldwide. Global infrastructure technology decision makers report a mere 21% of infrastructure as being in the public cloud.[2] There's a lot of money to be made in both servicing existing legacy workloads and helping guide enterprises to next-generation platforms. CA Automic, Electric Cloud, IBM UrbanCode, and XebiaLabs are among the stronger vendors in legacy support.
- **Cloud providers loom large.** Public cloud providers are also getting into the CDRA game. Microsoft qualified for this Forrester Wave fueled by Azure DevOps (originally Visual Studio Team Services) and its GitHub acquisition. Not included in this report, Amazon continues to invest in its CodePipeline CI service, and Google (technically Alphabet's GV fund) is backing GitLab. Cloud providers may have different strategies than pure-play CDRA vendors, approaching CD automation as value-add services to their lucrative infrastructure services. They also have deep pockets to invest in R&D and put further pressure on pure-play vendors.
- **Documentation is getting better, but reporting capabilities need a lot of improvement.** Customers interviewed in years past complained of poor documentation, but this has improved. The biggest weakness that users expressed for this general market area is reporting. Some vendors are opting to address this through value stream management tools (e.g., CloudBees DevOptics and XebiaLabs XL Impact), yet these often require additional licensing.
- **CDRA vendors are advancing toward a continuous cognitive delivery paradigm.** Artificial intelligence (AI), cognitive, advanced analytics — call it what you will, more intelligence is coming to your CD pipeline. Specifically, vendors are applying cognitive technologies to release readiness and risk assessment, building models and rule sets that help determine whether a given release can and should go forward. The most advanced tools can incorporate data from version control systems, monitoring tools, service management systems, and other sources alongside performance histories of particular systems, technologies, and people (e.g., developers). For example, Electric Cloud's release readiness capability brings together a wide variety of data from sources such as application performance management, cognitive operations, and service management tools.

› **Terraform is becoming a de facto standard.** HashiCorp Terraform bears mentioning, as it's becoming a universally accepted syntax for and interface to cloud infrastructure resources. Rather than interacting directly with cloud management APIs, most tools we evaluated defer this to Terraform or cloud-specific offerings such as Amazon CloudFormation.

Prepare For A Dynamically Changing Continuous Delivery Environment

I&O teams need to adopt strategies that can adapt to rapid market shifts and expanding use cases, technical complexity, and integration requirements (e.g., portfolio management, service management, and monitoring). Understand the scope, architectural implications, and vendor trajectories. While continuous delivery is still relatively nascent, we're seeing consensus around these practices:

› **Manage your pipelines, preferably as-code.** Knowing the exact combination of infrastructure, configurations, and artifacts in operation at any point in time is best done through an as-code approach, in which human-readable text artifacts fully describe all aspects. These artifacts can be stored in source control tools and evaluated for differences between versions. This can also help future-proof you against shifts in the vendor landscape.

› **Drive release automation as an application of business process management (BPM).** The most capable vendors in this Forrester Wave offer BPM-class deployment definitions. BPM vendors provide robust, general-purpose technologies for tracking task workflows, decision points, concurrent execution, approvals, escalations, and similar concerns. BPM-influenced CDRA tools adopt these practices and use a graphical canvas and commonly recognized flowchart symbols to describe complex release automation workflows.

Know The Decision Points And Make The Calls

There are a number of decisions and tradeoffs to evaluate in designing and implementing your continuous delivery toolchain:

› **Know your business objectives.** Do you fundamentally understand why you need a CDRA solution? Are you seeking faster time-to-market? More reliable releases? Better stability or security? If you have any questions on that front, see Forrester's continuous deployment playbook.[3]

› **Plan how you'll support and secure your digital pipelines and toolchain.** What are your current and future platform and language requirements (cloud, Microsoft, Linux, Oracle, legacy, etc.)? What skills do you have in your organization to support the CDRA pipeline itself? Are you prepared for the power, and inherent risks, that CDRA toolchains can pose? If an attacker gains privileged access to a CI server or a deployment automation tool, large sections of the enterprise could be compromised.[4]

- **Decide whether you'll pursue best-of-breed or an integrated toolchain.** On one hand, your technologists may be very passionate about the latest shiny object; on the other, building and managing integrations can add cost and potential friction. Some CDRA vendors offer CI as an integrated part of their toolchain; others don't. But are these tools as strong as pure-play vendors? You'll have to carefully investigate this with your key stakeholders.
- **Evaluate the pros and cons of agent versus agentless approaches.** IT managers have long debated whether agents — small programs running on infrastructure to provide needed services — are worth their trouble and expense. Some CDRA tools use agents to deploy and update release packages, while others rely on remote system integrations, which are more convenient but may have security and other limitations.
- **Understand native versus third-party integrations.** The products listed in this report integrate extensively with other products via their respective APIs. The terms "plug-in" or "adapter" frequently describe such capabilities. Plugins may be developed and supported by the vendor itself, by a commercial third party, or as a community open source project. We scored vendors based on both the overall number of integrations available from any source and how many the vendor directly developed and supported.
- **Prepare for market consolidation to accelerate in 2019.** CDRA is an interesting and active market, although not a particularly large one. Complementary deeper-pocketed vendors such as ServiceNow that see opportunities to expand vertically are watching it. As today's hot vendor could be tomorrow's neglected acquisition, keep your options open by adopting strong architecture and as-code practices that enable you to readily adapt.

CDRA Evaluation Overview

To assess the state of the CDRA market and see how the vendors stack up against each other, Forrester evaluated the relative strengths and weaknesses of top CDRA vendors. After examining past research, user need assessments, and vendor and expert interviews, we developed a comprehensive set of evaluation criteria. We evaluated vendors against 26 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 functionality for modeling and sequencing resources and releases, automating the release from build through readiness assessment and deployment, and overall platform capabilities from analytics and reporting to security and operations.
- **Product strategy.** Placement on the horizontal axis indicates the strength of the vendors' product strategies. We evaluated each provider's vision and value proposition for the product and the product innovation road map, market approach, commercial model, supporting services, and third-party ecosystem.

› **Market presence.** Represented by the size of the markers on the graphic, our market presence scores reflect each vendor's customer numbers and solution revenue.

Evaluated Vendors And Inclusion Criteria

Forrester included 15 vendors in the assessment: Atlassian, CA Technologies, Chef, CircleCI, CloudBees, Electric Cloud, Flexagon, GitLab, IBM, Inedo, Micro Focus, Microsoft, Octopus Deploy, Puppet, and XebiaLabs (see Figure 1). We screened the CDRA products included in the Forrester Wave to ensure that they:

› **Provided a breadth of CDRA functionality.** This included full stack element and sequence modeling for application and infrastructure resources, execution and control of deployment automation, API and out-of-the-box integrations to support the digital life cycle, and a healthy mix of production implementations on a spectrum of platforms.

› **Were generally available on or before July 31, 2018.** Vendors also had at least $3 million in estimated CDRA product revenue and drew client interest from Forrester's client base over the past 12 months.

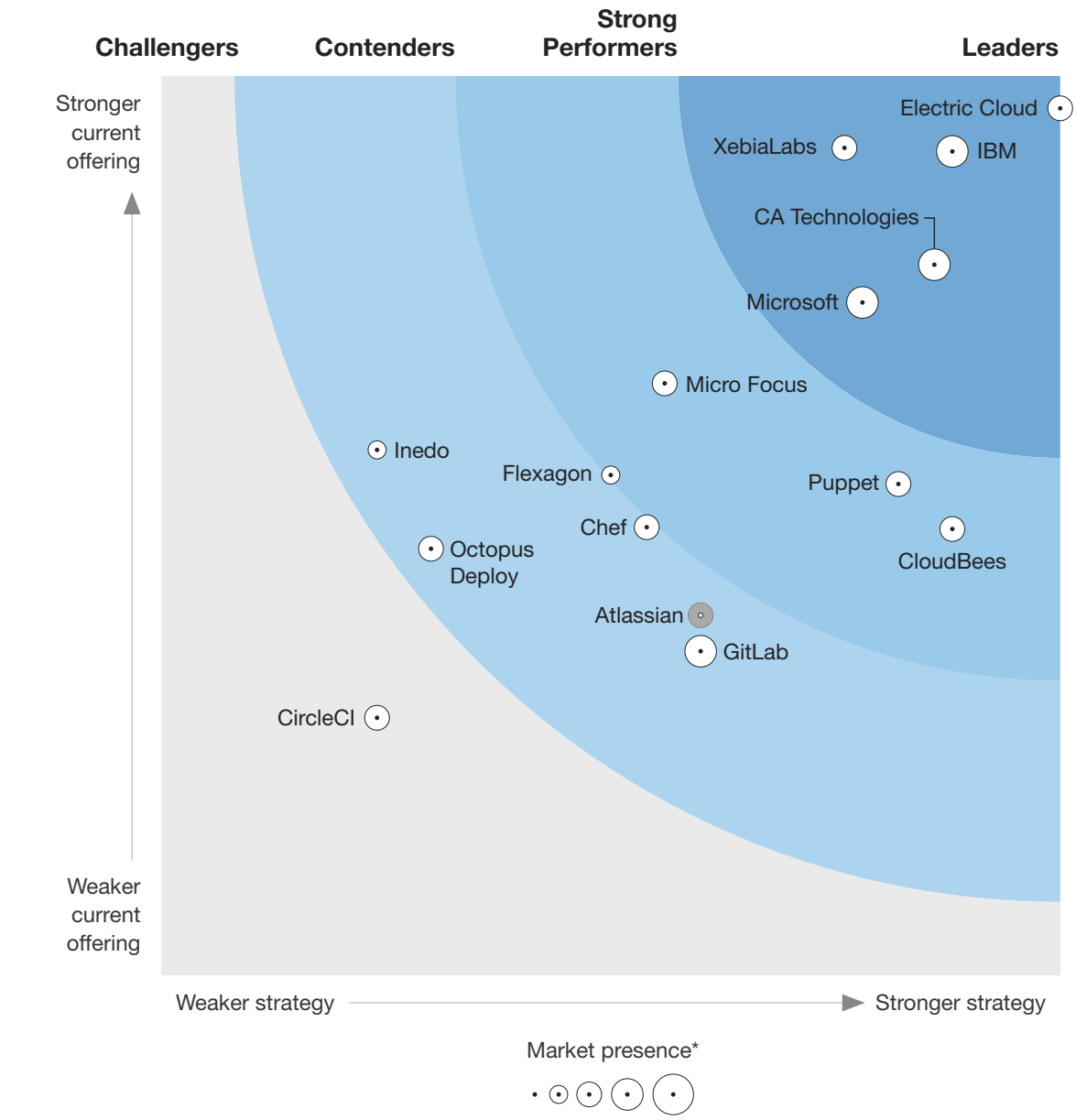
Vendor Profiles

We intend this evaluation of the CDRA market to be a starting point only and encourage clients to view detailed product evaluations and adapt criteria weightings to fit their individual needs through the Forrester Wave Excel-based vendor comparison tool (see Figure 2 and see Figure 3). Click the link at the beginning of this report on Forrester.com to download the tool.

FIGURE 1 Evaluated Vendors And Product Information

Vendor	Product and version evaluated	Product version evaluated
Atlassian	Bamboo	6.6
CA Technologies	CA Continuous Delivery Director and CA Continuous Delivery Automation	6.7 and 12.2
Chef	Chef Automate 2 and Habitat (Chef for configuration and drift)	Build 20180728222031 Habitat v0.60.0
CircleCI	CircleCI	CircleCI 2.0
CloudBees	CloudBees Suite (CloudBees Core and CloudBees DevOptics)	Core release 2.121.2.1 and DevOptics
Electric Cloud	ElectricFlow	8.4
Flexagon	FlexDeploy	4.6
GitLab	GitLab	11.1
IBM	IBM UrbanCode	UrbanCode Deploy 7.0, UrbanCode Velocity 1.0, UrbanCode Build 6.1, and UrbanCode Release 6.2
Inedo	BuildMaster/Otter	6.0 and 2.0
Micro Focus	Micro Focus Hybrid Cloud Management and Micro Focus Release Control	2018.05 and 6.2.2
Microsoft	Azure DevOps Pipelines and Azure DevOps Server (PowerShell DSC for configuration and drift)	2018
Octopus Deploy	Octopus Deploy	2018.7.13
Puppet	Puppet Pipelines (Puppet Enterprise for configuration and drift)	3.1.0
XebiaLabs	XebiaLabs DevOps Platform with XL Release, XL Deploy, and XL Impact	8.1

FIGURE 2 Forrester Wave™: Continuous Delivery And Release Automation, Q4 2018



*A gray marker indicates incomplete vendor participation.

FIGURE 3 Forrester Wave™: Continuous Delivery And Release Automation Scorecard, Q4 2018

	Forrester's weighting	Atlassian*	CA Technologies	Chef	CircleCI	CloudBees	Electric Cloud	Flexagon	GitLab
Current offering	50%	2.00	3.95	2.49	1.43	2.48	4.82	2.78	1.80
Modeling resources and releases	35%	1.60	4.10	2.70	1.00	1.80	5.00	2.80	1.20
Delivering the release	35%	1.80	3.40	2.60	1.45	2.55	5.00	3.00	1.80
CDRA platform and deployment	30%	2.70	4.40	2.10	1.90	3.20	4.40	2.50	2.50
Strategy	50%	3.00	4.30	2.70	1.20	4.40	5.00	2.50	3.00
CDRA vision and value proposition	20%	3.00	5.00	1.00	1.00	3.00	5.00	3.00	3.00
Product innovation	25%	3.00	5.00	1.00	1.00	5.00	5.00	1.00	3.00
Market approach and viability	25%	3.00	3.00	3.00	1.00	5.00	5.00	3.00	3.00
Consulting, training, and support	10%	3.00	5.00	5.00	1.00	5.00	5.00	3.00	3.00
Licensing/pricing models	10%	3.00	5.00	5.00	3.00	3.00	5.00	5.00	5.00
Partner ecosystem	10%	3.00	3.00	5.00	1.00	5.00	5.00	1.00	1.00
Market presence	0%	2.40	3.40	3.00	2.60	3.00	2.80	1.60	3.20
Customer-installed base	40%	3.00	1.00	3.00	5.00	3.00	1.00	1.00	5.00
Average deal size	30%	1.00	5.00	3.00	1.00	3.00	5.00	3.00	1.00
Product revenue	30%	3.00	5.00	3.00	1.00	3.00	3.00	1.00	3.00

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

FIGURE 3 Forrester Wave™: Continuous Delivery And Release Automation Scorecard, Q4 2018 (Cont.)

	Forrester's weighting	IBM	Inedo	Micro Focus	Microsoft	Octopus Deploy	Puppet	XebiaLabs
Current offering	50%	4.58	2.92	3.29	3.74	2.37	2.73	4.60
Modeling resources and releases	35%	4.70	3.40	3.90	3.70	2.20	2.40	5.00
Delivering the release	35%	4.60	3.30	3.00	3.80	2.00	3.50	4.20
CDRA platform and deployment	30%	4.40	1.90	2.90	3.70	3.00	2.20	4.60
Strategy	50%	4.40	1.20	2.80	3.90	1.50	4.10	3.80
CDRA vision and value proposition	20%	5.00	1.00	3.00	3.00	1.00	5.00	3.00
Product innovation	25%	5.00	1.00	1.00	3.00	3.00	3.00	5.00
Market approach and viability	25%	5.00	1.00	5.00	5.00	1.00	5.00	5.00
Consulting, training, and support	10%	3.00	1.00	3.00	3.00	1.00	3.00	3.00
Licensing/pricing models	10%	3.00	3.00	1.00	5.00	1.00	3.00	1.00
Partner ecosystem	10%	3.00	1.00	3.00	5.00	1.00	5.00	3.00
Market presence	0%	3.60	1.80	2.80	3.20	2.60	2.20	2.80
Customer-installed base	40%	3.00	3.00	1.00	5.00	5.00	1.00	1.00
Average deal size	30%	5.00	1.00	5.00	1.00	1.00	3.00	5.00
Product revenue	30%	3.00	1.00	3.00	3.00	1.00	3.00	3.00

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

Leaders

› **Electric Cloud.** Electric Cloud offers one of the deepest CDRA products emerging from the RA market and has maintained a strong commitment to supporting the DevOps community. Electric Cloud provides release automation across a wide variety of current and legacy technologies and, via its ElectricFlow product, provides higher-order release management and end-to-end digital value stream visibility. It also has its own build manager for organizations seeking a single vendor across the digital pipeline. Electric Cloud is ahead of other CDRA products evaluated in applying advanced analytics to continuous delivery (e.g., risk scoring). The solution evaluated at the time of this Forrester Wave lacked a software-as-a-service (SaaS) offering (now released with version 8.5).

Users cited the product's "rock solid" stability and value in accelerating software delivery but mentioned that it needs improved documentation and better reporting. Electric Cloud's focus on building out its cloud-native and predictive analytics capabilities, combined with its existing capabilities to support legacy platforms, should serve the company well. Electric Cloud is ideal for organizations looking for an integrated, on-premises solution with capabilities to support multiple deployment platform technologies (containers, virtual machines, and mainframes) and those seeking the additional control of a dedicated agent. It may be less appropriate for organizations preferring a best-of-breed strategy for individual CI/CDRA functions.

- **IBM.** IBM's CDRA solution is based on its 2014 acquisition of RA vendor UrbanCode, one of the earlier players in that market. UrbanCode Deploy covers a wide variety of platforms and deployment patterns, and the suite includes a native build server (UrbanCode Build) for those wishing to single-source their toolchains. IBM is among the few vendors leveraging machine learning and predictive analytics for evaluating release readiness. It provides robust release management and automation via UrbanCode Release and UrbanCode Velocity; however, the deployment process and pipeline are not fully as-code enabled.

  Users were favorable about the tool's reliability, calendaring abilities, and IBM support. They noted lack of reporting capability in the core tooling (the Velocity module is required for optimum reporting). They also mentioned the need for a full product certification program. IBM wrote the book on selling enterprise software and combines this expertise with a superior understanding of the DevOps ecosystem and market dynamics. IBM's solution is ideal for the largest and most diverse organizations looking for enterprise-class product and support. Organizations with a strong as-code mindset may not find its current version optimal.

- **XebiaLabs.** One of the first vendors in the industry to offer a release automation product, XebiaLabs originated in Europe but has in recent years achieved considerable success in the US. XebiaLabs has extensive functionality in automated resource discovery, BPM-class deployment definition, and support for a full range of deployment styles. It also has broad platform coverage, from mainframe to Kubernetes. XebiaLabs' XLDeploy offering operates without local agents, using remote access instead. It manages to couple this with a declarative, convergent approach to configuration that can detect and remediate drift automatically. It lacks built-in continuous integration and thus doesn't provide a complete end-to-end continuous delivery solution. It's also currently lacking a SaaS offering.

  Users were favorable on ease of deployment, ease of use, and the value the solution provides to their organizations in accelerating software delivery. Users noted that XebiaLabs could improve training and reporting. Predictive analytics are a particular focus for its next product releases. The company targets large global enterprises and doesn't support a freemium or community edition. XebiaLabs' solution is ideal for the most complex and challenging multicloud environments, with a large legacy presence, especially if the organization is pursuing a best-of-breed approach for the CD toolchain. It's less ideal for companies seeking one integrated platform to span the toolchain from end to end.

› **CA Technologies.** CA Technologies' continuous delivery capabilities are grounded in its 2016 acquisition of Automic, with some influences from its 2013 Nolio acquisition. CA Automic has strong element management and deployment capabilities and is one of the few offerings we evaluated that support both agentless and agent-based interactions with deployment targets. It features a full-fledged graphical canvas for describing deployment processes. These processes can also be understood and managed fully as-code and executed in the user's scripting language of choice. CA Automic has no native continuous integration capabilities, nor does it provide an integrated release readiness view.

Users praised CA Automic for its stability and ease of workflow development. An area for improvement is CA's support, especially in onboarding new clients. CA will remain focused on midsize to large enterprises and has good capabilities in supporting managed services providers' needs for multitenant capabilities. Adding machine learning to release and deployment pipelines is on the road map for Q3 2019, a timeline that's behind those of many competitors. CA Automic is ideal for larger enterprises seeking a best-of-breed platform with strong legacy support. It may be less suitable for smaller organizations desiring a completely turnkey, self-service solution.

› **Microsoft.** Microsoft has served developers and operations professionals for years and has expanded from supporting its own platforms to adopt a more heterogenous technology strategy. The company reconceived its Visual Studio Team Services as Azure DevOps, a full-featured, SaaS-based CD pipeline with the ability to deploy to various clouds — not just Azure. Azure DevOps encompasses the entire toolchain, from source control (Git or Team Foundation) through continuous integration, release automation, and even production monitoring. While it supports Windows well, as one would expect, it also supports Linux (as does Azure). The solution's release modeling capabilities support Helm charts as well as Nuget-formatted packages. Higher-level release management (e.g., including calendar views) is lacking, as is support for legacy platforms (e.g., mainframe).

Users were positive on the end-to-end integration, ease of use, and "essentially free" price for the tool. However, they perceived its documentation as still .NET and Windows biased and its reporting as weak. Microsoft is investing heavily to create an easy-to-use continuous delivery toolchain and may eventually dominate this space, especially given its R&D resources. Maintaining its investment in a strong CDRA product will be an asset in driving future Azure adoption, especially if the vendor offers it as an inexpensive value-added service atop its Azure infrastructure-as-a-service (IaaS) services. Microsoft DevOps is ideal for Azure customers, including those running hybrid cloud environments and seeking a consolidated, low-cost toolchain. This offering is less suitable for customers seeking solutions for very diverse legacy environments, including mainframe or traditional Unix variants.

Strong Performers

› **Puppet.** Puppet is well known for its configuration management capabilities. As Docker's and Kubernetes' capabilities expand into Puppet's original market niche, Puppet is making major plays for adjacent continuous delivery territory, notably through its acquisition of release automation vendor Distelli (rebranded Puppet Pipelines). Puppet Pipelines is a full-featured CDRA tool that includes both continuous integration and release automation. In combination with Puppet Enterprise, Puppet Pipelines has strong environment correction (drift management) capabilities. It also supports a wide variety of deployment models. Reporting appears less flexible than that of some competitors, and relatively few integrations are supported out of the box.

Users appreciated the self-service aspects and ease of onboarding but noted room for improvement in release modeling. Puppet understands the convergence of the CI/config/ARA space and is preparing well for it, including a strategy of addressing legacy environments, which will help keep it sticky over the long haul. The company has yet to fully address integrating its core technology and the Distelli acquisition; for example, Puppet Discovery isn't currently leveraged for baselining infrastructure in Puppet Pipelines. Puppet Pipelines is ideal for organizations seeking an end-to-end digital pipeline, especially those already using Puppet Enterprise for infrastructure configuration management or planning to move in that direction. The solution is less suitable for enterprises invested heavily in competing configuration management tools.

› **CloudBees.** Founded in 2009, CloudBees is the company behind the widely used Jenkins continuous integration server. Used by Agile and DevOps professionals worldwide, Jenkins boasts a vigorous community, more than 1,400 plug-ins, and a general reputation as a Swiss Army knife of continuous integration. Jenkins usage (for the most part) typically stops short of deployment. CloudBees has rebranded Jenkins Enterprise as CloudBees Core. The updated product has a broader mission, including addressing the last mile of release automation and, initially, focusing on Docker and Kubernetes environments, with support for other platforms currently lacking.

Users indicated that they like Jenkins and its community. Functionally, users noted that pipeline visibility is a plus, as is ease of pipeline management. Some report stability issues, however, and find fault with the user interface (especially older versions). CloudBees understands that configuration management, continuous integration, and release automation are converging and is adapting its strategy accordingly. With its focus on Docker and Kubernetes, CloudBees, as a CDRA vendor, is best suited for cloud-native organizations and less relevant for those looking for release automation across large legacy environments.

› **Micro Focus.** The product of the 2017 spin merge between Hewlett Packard Enterprise (HPE) and Micro Focus, this CD solution centers on hybrid cloud management and elements of Micro Focus' automation and IT service management (ITSM) portfolios. By integrating diverse technologies such as uCMDB, operations orchestration (OO), cloud service automation (CSA), cloud optimizer, and Codar into its hybrid cloud management product, Micro Focus has a relatively complete CD toolchain with infrastructure modeling and management, application modeling, and deployment

process modeling. A large number of plug-ins are available, with Micro Focus supporting a high proportion of them (as opposed to a community or third party). Reporting is less customizable than with other vendors, and no SaaS version is currently available (although there is a Kubernetes version for on-premises).

Users praised integration with third-party tools and vendor responsiveness to issues; they suggested reducing the complexity of onboarding new applications and improved reporting as areas for attention. Micro Focus has a good understanding of enterprise software and is particularly highlighting an operations-centric vision for its solution. This vendor provides a complete feature set, but it's a complex solution that's difficult for users to navigate. Investing in architectural alignment and simplification should be a top priority for Micro Focus. Its CDRA solution is ideal for organizations with existing commitments to one or more of the component Micro Focus products, for large legacy environments needing strong discovery to baseline a deployable resource set, or for those looking to integrate CMDB with release automation. It's not a fit for organizations seeking a SaaS alternative.

› **Flexagon.** Flexagon is among the smaller vendors evaluated in this Forrester Wave, yet it offers a relatively complete CD pipeline automation solution, including both build and deploy. It's further distinguished for enabling continuous delivery, particularly across Oracle packaged software. Flexagon supports release automation across a wide variety of platforms and assets, including native database functionality we usually see from niche vendors such as Liquibase. The product lacks built-in support for deployment patterns such as canary, although users can configure such approaches on their own.

Users praised "phenomenal" support, minimal scripting requirements, ease of onboarding, and an integrated product spanning both build and deploy. They identified better integration with other pipeline tools and mobile support as growth areas. At first glance, Flexagon appears to be a smaller player in a competitive market. However, the company will continue to differentiate as specializing in Oracle-centric environments, perhaps positioning itself as an acquisition target. The capabilities it's building in the enterprise resource planning (ERP) space might be transferable to other packaged software environments such as SAP, but Flexagon has yet to articulate this as a strategy. Flexagon is well suited for firms aligned to Oracle's platform and vision.

Contenders

› **Chef.** Chef originated from the configuration management space and was an early and dominant player in the industry movement to manage infrastructure-as-code. With the emergence of Docker and Kubernetes, Chef is moving into adjacent markets, including security (with InSpec) and application release automation (with Habitat), all riding on the Chef Automate platform. Infrastructure configuration management is clearly a strength for Chef. Unique to other products in the industry, Habitat provides a different deployment model by presenting the user with a sandbox mode where applications are initially installed with strong control over their dependencies (similar

to Docker), which then are finalized for release. It is, however, heavily command-line oriented. Chef integrates with build managers such as Jenkins, as it has no native continuous integration functionality itself.

Users praised Chef's open source model and application deployment approach but were dissatisfied with the product's overall usability and deep engineering skill requirements. Chef continues to target large enterprises transitioning to DevOps and infrastructure-as-code, and the open source community will continue to be an asset. The company will need to continue to evolve the usability of its Habitat offering to gain broader acceptance in the industry. Chef is ideal for organizations with significant engineering capability and an orientation to open source. It's not as suited for organizations with less deep talent pools or those seeking completely integrated CDRA toolchains.

› **Atlassian.** Atlassian is a well-known provider of development tools; its product suite includes Bitbucket source control, Bamboo (the primary product evaluated here), and JIRA Software, among others. Bamboo originates from the CI space, which is the strength of this tool, supporting build, test, and packaging. The presence of Bitbucket source control is a differentiator, putting Atlassian in the small category of CDRA vendors offering this important capability. Choreography and as-code representation of pipeline is sound, but not full BPM-class, and infrastructure must be manually modeled. Deployment agents are Java-based and thus may have some limitations in supporting full native functionality on various operating systems.

The solution is lacking many of the capabilities of RA-focused vendors, such as native support for different deployment scenarios (e.g., blue/green and canary). Atlassian Bamboo provides no graphical representation of deployment environments. Atlassian has sunsetted the cloud-based Bamboo product (this Forrester Wave evaluates the on-premises version) and appears to be strategically favoring a Bitbucket-based toolchain; this transition will take some time, and the cloud versus on-premises approach based on Bitbucket is unclear. Atlassian Bamboo is ideal for companies already invested in the Atlassian product line or those desiring a best-of-breed CI and willing to cope with less maturity on the release automation side. It's less suitable for companies needing strong deployment capabilities. Atlassian declined to participate in our research. Scores are based on Forrester estimates.

› **GitLab.** GitLab emerges from the continuous integration side of the market and, with its foundation in source control, has strong headwaters capabilities (few other CDRA vendors have their own source control capabilities, more typically requiring users to supply the originating source repository). GitLab supports continuous integration and deployment to cloud-native platforms, but support for legacy platforms is lacking. More recently, the company has added continuous delivery features, including continuous integration and deployment for Kubernetes. The product's application modeling is based on Helm charts, thus requiring Kubernetes to function.

GitLab received high marks from users for providing a unified environment for product owners and developers as well as a single pane of glass across the CD pipeline. Users suggested improvement

in areas such as up-to-date documentation and tighter integration with provisioning technology such as HashiCorp Terraform. GitLab is, in part, funded by GV (the venture capital investment arm of Alphabet, Google's parent company) and is now officially a unicorn (a startup with a valuation of over $1 billion). The firm's strategy is grounded in a very active open source community, coupled with a clear ability to execute on this business model. At this writing, GitLab's release automation is ideal for cloud-native, Kubernetes-centric organizations. It has much further to go to fully support the broader legacy world.

› **Inedo.** Releasing its first CDRA product in 2010, Inedo now provides a suite of CD tools. Among the smaller vendors reviewed for this Forrester Wave, Inedo has particular strength with Microsoft environments while still also supporting other platforms. Inedo offers a comprehensive CD toolchain, from low-level element configuration management through release and deployment automation. The solution also extends to higher-level release management, including calendars and resource locking. Inedo features a highly automated desired-state-based drift management capability. Deployment is currently on-premises only, with a SaaS version planned for 2019.

Users appreciated the tool's ease of use and simplification of complex release pipelines. Areas for improvement include customer support and documentation. Inedo has a highly integrated, architecturally consistent platform backed by a mature, multipronged sales strategy (enterprise, direct, and value-added reseller). The company is clearly pursuing a Microsoft-first approach while still supporting the Linux world. Inedo would be best for organizations primarily focused on Microsoft technologies that want a fully mature process engine and integrated platform capable of scaling to more diverse environments. It's less suited for Linux-centric environments.

› **Octopus Deploy.** Octopus was founded in Australia in 2012. From RA origins, the company is focused on building out more comprehensive pipeline coverage. It entered the market as a Microsoft-centric tool but has expanded to support Java, Linux, Node.js, and other technologies. Octopus Deploy supports a variety of deployment patterns (canary, rolling, and blue/green) and offers deep capabilities in deploying across multitenant architectures, a challenging and specialized problem. It has a highly flexible, API-first architecture; Octopus and its user and partner community offer more than 300 plug-ins and adapters. Support for legacy platforms (e.g., mainframe) is limited, and its process designer isn't as flexible as those of some competitors. There's neither as-code functionality for deployment process nor any native build/CI functionality.

Octopus received high marks from users for usability and a small, powerful, reliable agent. Reporting is a weakness, and users noted limitations in importing/exporting configurations from one environment to another. In Octopus' words, it seeks to "create a deployment automation tool that developers want to use." The company believes that adoption of tools is driven from the bottom up in organizations and that products with superior flexibility and usability will win out. The solution is ideal for developer-led organizations but less suitable for organizations seeking an end-to-end solution or with I&O departments heavily involved in the CD process.

Challengers

› **CircleCI.** CircleCI's origins are in continuous integration; however, the company has expanded its coverage to address more aspects of the digital pipeline, and we've therefore included it in this evaluation. CircleCI's strengths reflect its origins in continuous integration, and it's adept at managing the build pipeline. Many customers use the product to deploy digital systems through pipelines all the way to production. CircleCI takes what it calls a "nonopinionated" approach to deployment, which means it's nonprescriptive. This translates to the customer writing a lot of scripts. It also doesn't provide a view into release readiness or provide visibility to deployment plans.

Customers appreciated CircleCI's support for end user process customizations and configurations and its depth in continuous integration. They reported concerns around integration with other tools. The company is paying particular attention to the intersection of continuous delivery and big-data-centric development. To support this vision, CircleCI is launching new integration capabilities with a range of partners in the second half of 2018. CircleCI is ideal for organizations looking for a robust build manager with some deployment capabilities and that are willing to invest time and skill in developing the necessary automation scripts across deployment targets.

Supplemental Material

Online Resource

The online version of Figure 2 is an Excel-based vendor comparison tool that provides detailed product evaluations and customizable rankings. Click the link at the beginning of this report on Forrester.com to download the tool.

Data Sources Used In This Forrester Wave

Forrester used a combination of questionnaires, strategy briefings, demos, product documentation, product marketing, and other publicly available data sources to assess the strengths and weaknesses of each solution. We evaluated the vendors participating in this Forrester Wave, in part, using materials that they provided to us by June 5, 2018.

- **Vendor surveys.** Forrester surveyed vendors on their capabilities as they relate to the evaluation criteria. Once we analyzed the completed vendor surveys, we conducted vendor calls where necessary to gather details of vendor qualifications.
- **Product demos.** We asked vendors to conduct demonstrations of their products' functionality. We used findings from these product demos to validate details of each vendor's product capabilities.
- **Customer reference calls.** To validate product and vendor qualifications, Forrester also conducted reference calls with three of each vendor's current customers.

The Forrester Wave Methodology

We conduct primary research to develop a list of vendors that meet our criteria for evaluation in this market. From that initial pool of vendors, we narrow our final list. We choose these vendors based on 1) product fit; 2) customer success; and 3) Forrester client demand. We eliminate vendors that have limited customer references and products that don't fit the scope of our evaluation. Vendors marked as incomplete participants met our defined inclusion criteria but declined to participate or contributed only partially to the evaluation.

After examining past research, user need assessments, and vendor and expert interviews, we develop the initial evaluation criteria. To evaluate the vendors and their products against our set of criteria, we gather details of product qualifications through a combination of lab evaluations, questionnaires, demos, and/or discussions with client references. We send evaluations to the vendors for their review, and we adjust the evaluations to provide the most accurate view of vendor offerings and strategies.

We set default weightings to reflect our analysis of the needs of large user companies — and/or other scenarios as outlined in the Forrester Wave evaluation — and then score the vendors based on a clearly defined scale. We intend these default weightings to serve only as a starting point and encourage readers to adapt the weightings to fit their individual needs through the Excel-based tool.

The final scores generate the graphical depiction of the market based on current offering, strategy, and market presence. Forrester intends to update vendor evaluations regularly as product capabilities and vendor strategies evolve. Vendors marked as incomplete participants met our defined inclusion criteria but declined to participate in or contributed only partially to the evaluation. For more information on the methodology that every Forrester Wave follows, please visit The Forrester Wave™ Methodology Guide on our website.

Integrity Policy

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

Endnotes

[1] For more information on the business imperative to rapidly deliver and deploy software while focusing on customer experience, see the Forrester report "DevOps: The CIO's Guide To Velocity."

[2] Base: 1,103 global infrastructure technology decision makers whose firms prioritize servers (working at firms of 20-plus employees). Source: Forrester Analytics Global Business Technographics® Infrastructure Survey, 2017.

[3] For more information, see the Forrester report "Deliver On The Promise Of DevOps With Continuous Delivery And Deployment."

[4] Source: Teri Radichel, "Case Study: Critical Controls that Could Have Prevented Target Breach," SANS Institute, August 5, 2014 (https://www.sans.org/reading-room/whitepapers/casestudies/case-study-critical-controls-prevented-target-breach-35412).

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