The Forrester Wave™: Continuous Delivery And Release Automation, Q3 2017

Tools And Technology: The Modern Service Delivery Playbook

by Robert Stroud and Chris Gardner

August 30, 2017

Why Read This Report

In our 26-criteria evaluation of continuous delivery and release automation (CDRA) providers, we identified the 15 most significant — Atlassian, CA Technologies, Chef Software, Clarive, CloudBees, Electric Cloud, Flexagon, Hewlett Packard Enterprise (HPE), IBM, Micro Focus, Microsoft, Puppet, Red Hat, VMware, and XebiaLabs — and researched, analyzed, and scored them. We focused on core features, including modeling, deploying, managing, governing, and visualizing pipelines, and on each vendor's ability to match a strategy to these features. This report helps infrastructure and operations (I&O) professionals make the right choice when looking for CDRA solutions for their development and operations (DevOps) automation.

Key Takeaways

IBM, XebiaLabs, Electric Cloud, And CA Technologies Lead The Market

Forrester's research uncovered a market in which IBM, XebiaLabs, Electric Cloud, and CA Technologies rank as Leaders. Clarive, Puppet, Micro Focus, Chef Software, Atlassian, and Flexagon offer competitive options. Microsoft, CloudBees, HPE, and VMware are Contenders. Challenger Red Hat rounds out the field.

CDRA Is A Mix Of Advanced And Core Features

The CDRA market is growing; organizations view these tools as critical building blocks of a continuous delivery and release automation pipeline. CDRA tools model, deploy, and visualize application pipelines, orchestrating existing tools. They also automate the entire delivery and release pipeline between development and production, supporting emerging use cases such as containers, microservices, test data management, and vulnerability tracking.

Automation Across The Complete Pipeline Drives Velocity With Quality

In previous years, CDRA capabilities were the domain of separate tools — but that's no longer the case. Organizations are transitioning to integrated tooling to deliver software with velocity across the complete life cycle, driving outcomes such as improved software quality.

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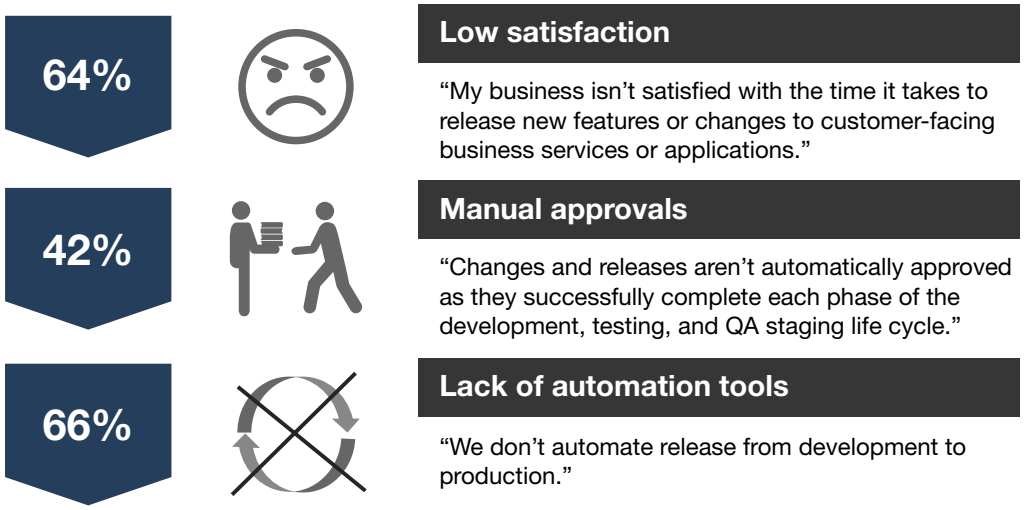
Operational Agility Is A Key Business Differentiator

Today's customer has never had more power: Brand loyalty has given way to customer loyalty. To drive it, your organization must focus on customers and their experiences using your products and services. I&O teams must pursue the rapid delivery of applications to provide differentiated customer experiences that meet accelerating business expectations.[1] Faster delivery alone merely leads to customer disappointment when the software delivery process is substandard, deferring to velocity without quality. Automating the movement and deployment of infrastructure, middleware, and applications through testing is a key pain point for I&O teams today. CDRA tools remove errors from manual deployment and release processes by standardizing and automating the movement of applications between environments; this is a critical step in the delivery pipeline of applications and has a direct impact on customer experience. Unfortunately, most organizations today aren't operationally agile enough to release at the speed that customers and the business demand.

- **Fewer than a quarter of enterprises release at least monthly.** In a recent Forrester survey, 64% of respondents told us their businesses are dissatisfied with the time it takes to release new features for customers (see Figure 1). Only 23% of enterprises are releasing at least monthly (see Figure 2). Release velocity accelerates at the quarterly mark, with 47% of enterprises achieving quarterly releases or faster.[2]
- **A number of factors are encumbering velocity.** Approvals for changes to production environments continue to be manual, with only 58% of changes receiving automatic approval following the completion of all prerequisite stages.[3] The lack of automation across the life cycle impedes velocity: Only 34% of respondents say that the complete life cycle, from development to production, is automated.

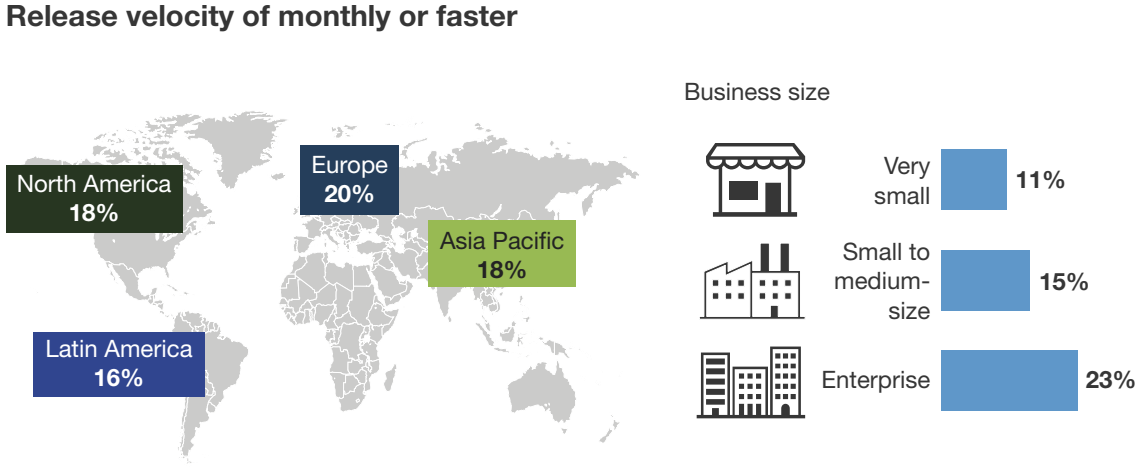
FIGURE 1 Nearly Two-Thirds Of Businesses Are Dissatisfied With Release Velocity

"Please indicate how accurately each of the following statements characterizes the promotion of change in your organization."
(4 or 5 on a scale from 1 [strongly disagree] to 5 [strongly agree])



Base: 237 DevOps professionals
Note: Not all responses are shown.
Source: Forrester's Q1 2017 Global DevOps Benchmark Online Survey

FIGURE 2 Regardless Of Geography Or Business Size, Release Velocity Is Poor

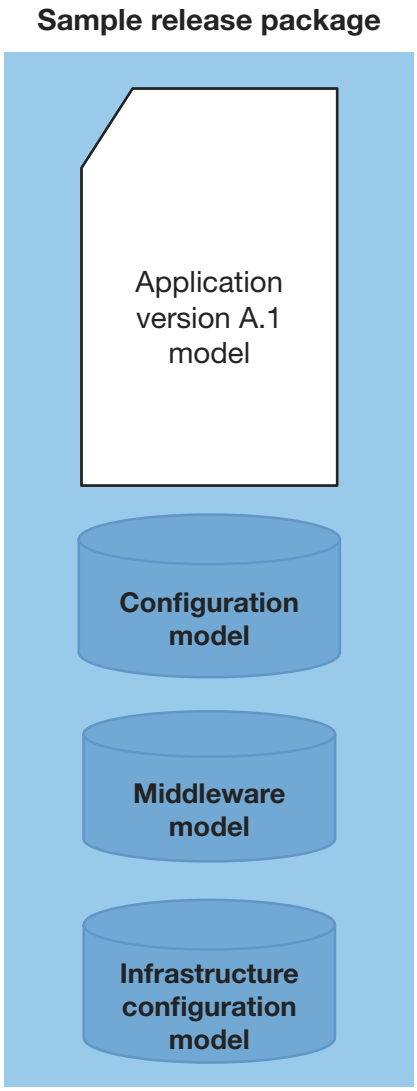


Base: 320 to 1,542 infrastructure decision makers
Source: Forrester Data Global Business Technographics® Infrastructure Survey, 2016

Delivering Velocity Mandates Both Speed And Quality

CDRA tools bundle applications, infrastructure, middleware, and their supporting installation processes and dependencies into release packages that transition across the life cycle (see Figure 3). The packages are deceptive, with the degree of governance dependent on the creation methodology for the model. At the most basic level, the release package model includes a bill of materials for the different prebuilt software components as well as information on the order in which to install them for the application. The greater the granularity of the model, the greater the value. For instance, pairing an application model with configuration, middleware, network, and infrastructure models represents a more complete version of the release package. I&O pros use CDRA tools to track changes to any and all of the components in the model, enabling drift tracking. When changes are unsuccessful, the tools enable the ability to fall back to a previous working version or fail forward, correcting the failure.[4] Furthermore, the model will determine the supporting software required, where to obtain the components, the installation order, and any dependencies needed.

FIGURE 3 Release Packages Are More Than Just Code



Structured And Automated Release Is The Key To Success

For CDRA tools to transition from infancy to maturity and to assure adoption, they must not only be feature-rich but also provide user-friendly features supported with documentation and education. Documentation should include YouTube videos, blogs, forums, or podcasts in addition to product manuals. Equally critical, the tools must support the context in which the user of the software operates, including the ability to use the tool to code workflows in programming languages, API integration, and graphical users' interfaces. Our interviews with CDRA users reveal that the tools remain complex in nature and often include insufficient documentation. These tools need to support:

- **Effective documentation for use throughout the organization.** CDRA customers told us that without proper documentation, it's difficult to consistently leverage CDRA tools and transfer this knowledge to other teams within the technology organization. Today, CDRA vendors' consultants train I&O pros who then educate other teams on how to use the tool. This slows down I&O pros' ability to influence usage of CDRA tools across the enterprise.
- **A flexible experience to drive adoption.** CDRA tools should provide multiple methods of use based on the persona of the user, whether the user is a developer or an I&O professional. CDRA customers identified value in both code-based and GUI interfaces. For instance, a number of them told us that GUI interfaces for modeling the release and workflow allowed the redeployment of lower-priced resources to accelerate adoption. Those who are more coding-savvy said that the ability to leverage code supported adoption within the developer community. The tool experience should mirror the skill sets of those using the tool.
- **The consistent emergence of technologies.** In an era when technology is constantly evolving, tooling must keep pace with emerging technologies such as containers, microservices, and serverless computing. CDRA tools will be foundational to support the velocity and changing deployment processes that these technologies demand.

Continuous Delivery And Release Automation Evaluation Overview

To assess the state of the CDRA market and compare how the vendors stack up against each other, Forrester evaluated the strengths and weaknesses of top CDRA vendors. After examining past research, user needs 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 buckets:

- **A current offering that delivers a minimum set of capabilities.** Evaluated vendors had to provide a minimum set of capabilities, including integration with continuous integration tools; automation capabilities; release package modeling; moving releases; pipeline management; pipeline governance; vendor usage; API coverage; out-of-the-box third-party plug-ins; scalability; and identification and resolution of vulnerable artifacts.
- **A strategy that leads to better offerings in the future.** To assess strategy, we analyzed product strategy, market approach, execution road map, consulting, training, and cost.
- **A market presence that demonstrates vendor stability.** To score market presence, we analyzed installed base, revenue, and corporate profitability.

Evaluated Vendors And Inclusion Criteria

Forrester included 15 vendors in the assessment: Atlassian, CA Technologies, Chef Software, Clarive, CloudBees, Electric Cloud, Flexagon, HPE, Micro Focus, Microsoft, IBM, Puppet, Red Hat, VMware, and XebiaLabs. Each vendor (see Figure 4):

- **Meets eligibility requirements.** Products evaluated were generally available on or before May 1, 2017.
- **Has established itself as a CDRA vendor.** Each vendor has established itself as a key continuous deployment vendor, in accordance with a Forrester review of core features. These features include the ability to deliver release packages such as infrastructure, middleware, and applications.
- **Supplied publicly available documentation.** Each vendor supplied links to product feature documentation. This information is available regardless of business relationship.
- **Has drawn established client interest.** Each vendor has sparked interest (in the form of regular, unprompted mentions and inquiries) from Forrester's client base over the past 12 months.
- **Delivers a minimum set of CDRA capabilities.** Each vendor demonstrated the ability to support major DevOps processes for CDRA, such as integration with continuous integration (CI) tools, package creation and modeling, pipeline modeling and governance, API coverage, vulnerability remediation, and out-of-the-box integrations.

FIGURE 4 Evaluated Vendors: Product Information And Selection Criteria

Vendor	Product evaluated	Version
Atlassian	Bamboo	6.1
CA Technologies	Automic Release Automation Continuous Delivery Director	12.0 6.4
Chef Software	Chef Automate	0.7.239
Clarive	Clarive	6.8
CloudBees	CloudBees Jenkins Enterprise	1.63
Electric Cloud	ElectricFlow	7.3
Flexagon	FlexDeploy	4.3
Hewlett Packard Enterprise	Hybrid Cloud Management Premium Edition (HCM Premium)	2017.05
IBM	UrbanCode Deploy UrbanCode Release	6.2.4 6.2.1
Micro Focus	Micro Focus SCCM Offerings (Dimensions CM, StarTeam, AccuRev, ZMF, PVCS), Micros Focus Release Control	Various (14.3.2, 16.0, 7.0, 8.1) 6.2
Microsoft	Visual Studio Release Management Release Management for Team Services Release Management for Team Foundation Server 2017 Update 1	
Puppet	Puppet Enterprise	2017.2
Red Hat	Ansible Tower	3.1
VMware	vRealize Automation vRealize Code Stream	7.2
XebiaLabs	XebiaLabs DevOps Platform with XL Release and XL Deploy	6.2

FIGURE 4 Evaluated Vendors: Product Information And Selection Criteria (Cont.)

Vendor selection criteria
Each vendor included in this Forrester Wave evaluation:
• Meets eligibility requirements, with a product generally available on or before May 1, 2017.
• Has established itself as a CDRA vendor.
• Supplied publicly available documentation.
• Has drawn established interest from Forrester's clients over the past 12 months.
• Delivers a minimum set of CDRA capabilities.

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 5).

FIGURE 5 Forrester Wave™: Continuous Delivery And Release Automation, Q3 '17

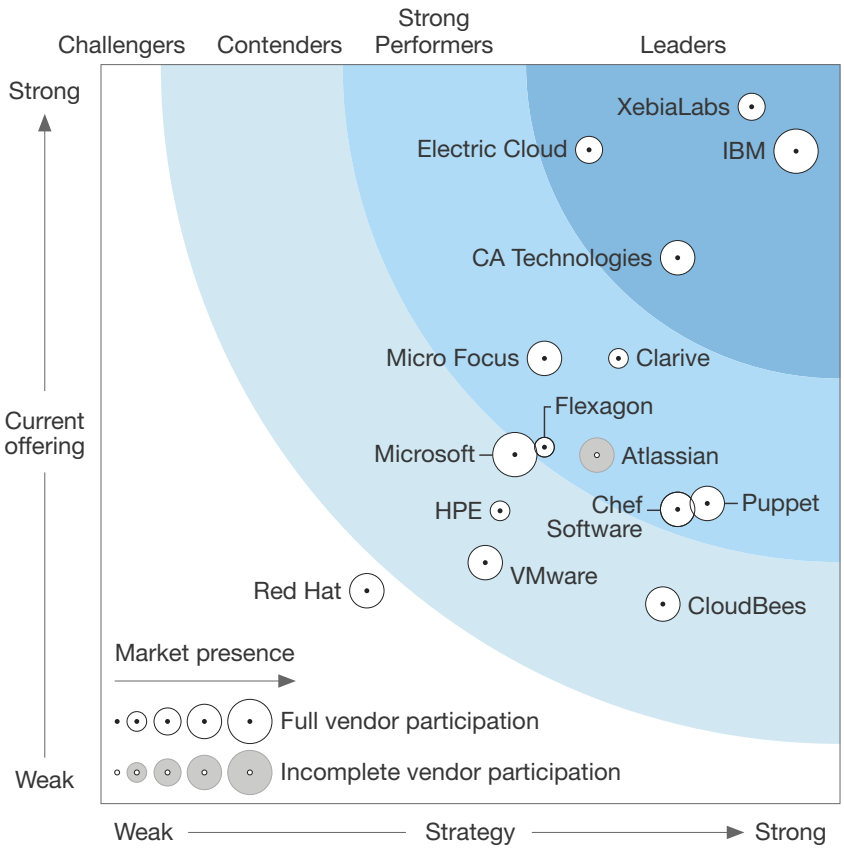


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FIGURE 5 Forrester Wave™: Continuous Delivery And Release Automation, Q3 '17 (Cont.)

	Forrester's weighting	CA Technologies	Chef Software	Clarive	CloudBees	Electric Cloud	Flexagon	Hewlett Packard Enterprise	IBM	Micro Focus	Microsoft	Puppet	Red Hat	VMware	XebiaLabs
Current offering	50%	3.68	1.98	3.00	1.34	4.40	2.40	1.97	4.40	3.00	2.35	2.02	1.43	1.62	4.70
Release package modeling	25%	3.00	1.40	3.80	1.80	4.20	2.20	2.60	5.00	3.40	2.20	1.80	1.80	1.80	5.00
Moving releases across the pipeline	25%	3.80	3.00	2.60	1.80	4.60	2.60	1.60	4.60	3.40	3.00	1.80	1.80	1.40	5.00
Pipeline management	20%	4.60	2.60	3.00	0.60	5.00	2.20	2.60	4.20	2.20	2.20	3.80	1.40	3.00	4.20
Pipeline governance	20%	3.80	0.80	3.00	0.10	4.00	2.80	2.00	3.80	2.80	2.80	0.80	1.00	0.60	4.80
Vulnerability and defect tracking	5%	3.00	3.00	1.00	1.00	5.00	3.00	0.00	3.00	3.00	1.00	3.00	0.00	1.00	3.00
Out-of-the-box third-party plug-ins	5%	3.00	1.00	3.00	5.00	3.00	1.00	0.00	5.00	3.00	0.00	1.00	1.00	1.00	5.00
Strategy	50%	3.90	3.90	3.50	3.80	3.30	3.00	2.70	4.70	3.00	2.80	4.10	1.80	2.60	4.40
Product strategy	30%	4.00	4.00	3.00	3.00	4.00	3.00	2.00	4.00	3.00	4.00	3.00	1.00	3.00	5.00
Market approach	40%	3.00	3.00	5.00	5.00	3.00	3.00	3.00	5.00	3.00	1.00	5.00	3.00	2.00	5.00
Consulting, training, and support	15%	5.00	5.00	1.00	3.00	3.00	3.00	3.00	5.00	3.00	3.00	5.00	1.00	3.00	3.00
Innovation in delivery models and pricing	15%	5.00	5.00	3.00	3.00	3.00	3.00	3.00	5.00	3.00	5.00	3.00	1.00	3.00	3.00
Market presence	0%	3.41	3.08	1.80	3.16	2.41	1.48	1.52	4.56	3.84	4.72	3.92	3.29	3.92	2.89
Installed base	60%	3.75	4.00	2.00	4.00	2.75	1.00	1.00	5.00	4.00	5.00	5.00	3.75	5.00	3.75
Profitability	40%	2.90	1.70	1.50	1.90	1.90	2.20	2.30	3.90	3.60	4.30	2.30	2.60	2.30	1.60

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

Leaders

- **IBM.** IBM UrbanCode includes UrbanCode Deploy and UrbanCode Release. UrbanCode Deploy orchestrates and automates the deployment of applications, databases, and configurations into development, test, and production environments, while UrbanCode Release assists with release planning and pipeline management. UrbanCode excels in package modeling and moving releases across the pipeline and provides extensive native support for a broad range of third-party integrations. Some clients using UrbanCode report that vulnerability tracking and remediation aren't well documented.
- **XebiaLabs.** The XebiaLabs DevOps Platform is an automation solution for DevOps and continuous delivery teams. It includes XL Deploy for deployment automation and XL Release for supporting pipeline management and orchestrating deployments. Both XL Deploy and XL Release demonstrated excellent support across the complete pipeline for modeling, movement of releases, pipeline management, and governance. XebiaLabs has a strong road map that includes analytics and proactive reporting to provide insights and aid decision planning. Excellent two-way integration with Compuware's ISPW provides support for complex mainframe and hybrid cloud deployments. Customers use XL Deploy and XL Release across substantial enterprise deployments. A few clients report long release times, which XebiaLabs has addressed in its most recent release.
- **Electric Cloud.** Electric Cloud ElectricFlow is a unified platform to automate application deployments and coordinate releases. It supports teams standardizing middleware, infrastructure, and application deployments and governs the promotion of applications across development, staging, and production environments. Electric Cloud ElectricFlow's strengths include release packaging and modeling, moving releases, pipeline management, and an extensive set of third-party integrations to support DevOps professionals. Electric Cloud is a founding partner of the DevOps Enterprise Summit and holds the C9D9 podcasts.[5] Clients considering ElectricFlow will have to invest time to configure reporting, as users often need to interpret the data for actionable insights.
- **CA Technologies.** CA Technologies submitted CA Continuous Delivery Director and CA Automic Release Automation to orchestrate and automate complex application release deployments from development to production. The vendor acquired Automic in early 2017 and is now delivering CA Automic Release Automation to all new customers.[6] These products demonstrated good pipeline management across all pipeline stages; movement of complete releases, including applications, infrastructure, and middleware; remediation of vulnerabilities; defect tracking; and out-of-the-box integrations with a broad range of third-party solutions, including configuration management, database management tools, and testing tools. Clients of CA Automic Release Automation report issues with the agent affecting performance when minimum CPU and memory expectations aren't met.[7]

Strong Performers

- **Clarive.** Clarive provides a configurable solution for end-to-end Lean application modeling, delivery, orchestration, and deployment of applications and middleware, supporting traditional and Agile methodologies. Clarive demonstrated solid performance for pipeline creation and modeling, moving releases, pipeline management and governance, and third-party integrations. This vendor is accelerating its market coverage, using well-targeted partners such CollabNet in North America.[8] Due to the shortage of implementation and configuration services with Clarive knowledge, clients may face a challenge obtaining appropriately skilled support.
- **Puppet.** Puppet Enterprise is new to the CDRA Forrester Wave and reflects the expansion of Puppet beyond the configuration and deployment of infrastructure to include applications, middleware, and network. Puppet has exhibited strong support for the management of release pipelines, vulnerability, defect tracking, and resolution. Clients considering Puppet report the lack of a GUI for modeling releases as a concern; the solution requires learning the domain-specific language (DSL), potentially delaying time-to-value. Customers can partly overcome this by using content already created in the Puppet Forge.[9]
- **Micro Focus.** Micro Focus Release Control and supporting standalone software change and configuration management (SCCM) offerings, such as AccuRev, Dimensions CM, PVCS, StarTeam, or ZMF, provide organizations with the capability to configure and deploy releases across cloud, distributed, and mainframe environments. Release Control provides robust modeling and movement of releases across the pipeline, vulnerability identification, remediation, and third-party integrations with both Micro Focus and industry tools for testing. Integration with application lifecycle management (ALM) and source management tools is also available. Some clients report that the pricing model for Release Control is complex. Micro Focus bases pricing on a mixture of deployment agents plus a cost per user for the process component.
- **Chef Software.** Chef Automate became eligible for inclusion in this Forrester Wave after Forrester clients reported using it for continuous delivery and release automation. Chef Automate provides continuous deployment pipelines for infrastructure and applications, automated testing for compliance and security, dashboards, and reporting that leverages three open source components: Chef, Habitat, and InSpec.[10] Chef Automate expresses all processes as code using a Ruby-based desired-state language. Chef Software demonstrated excellent capabilities for assuring that configurations are implemented and maintained according to prescribed models, ensuring compliance. Chef doesn't support a graphical user interface to build releases, so clients will require a thorough knowledge of the Chef Ruby desired-state language before becoming productive.
- **Atlassian.** Atlassian was a nonparticipating vendor in this evaluation. Atlassian Bamboo is part of the Atlassian product suite, which includes Bitbucket, Confluence, HipChat, and JIRA Software, among others. This allows clients to leverage a single vendor for the complete DevOps life cycle. Atlassian Bamboo combines automated builds, tests, and releases in a single workflow, allowing full continuous and automated integration from deployment to execution. Atlassian Bamboo

provides a GUI and command-line approach to building automation. The solution showed strong support for moving packages, integration with testing, and other tools for tailored workflows. Atlassian Bamboo provides no graphical representation of deployment environments and has limited native support for deployment environments, including Cloud Foundry, IBM mainframe, OpenShift, and OpenStack.

› **Flexagon.** FlexDeploy enables the software delivery life cycle by providing automation, controls, and visibility of changes across environments, both on-premises and in the cloud. Flexagon demonstrated good support for moving releases across the pipeline, pipeline management, and governance as well as offering the broadest native support for Oracle applications, middleware, and databases for both on-premises and cloud deployments. Clients of Flexagon report complexity in the role-based GUI for building, moving, and maintaining packages.

Contenders

› **Microsoft.** For its first appearance in a CDRA Forrester Wave, Microsoft submitted Visual Studio Release Management; Release Management for Team Services; and Release Management for Team Foundation Server 2017, Update 1. Organizations deeply invested in the Microsoft ecosystem are primary users for these Microsoft solutions. The solutions demonstrated good support for visual model creation, pipeline management, and maintenance. As Microsoft expands its coverage for non-Microsoft platforms beyond certain applications on Linux, clients should thoroughly review its road map for support.

› **CloudBees.** CloudBees appears in a CDRA Forrester Wave for the first time; multiple clients leveraging Jenkins for continuous integration and release automation identified it. CloudBees has a forward-looking strategy focused on expanding from CI and extending into CDRA. The company presented a solid road map, including future investment in user experience (UX) for DevOps teams; continued emphasis on cloud-native scalability for enterprise stability, curation, and support to increase available plug-ins; and professional services focused on DevOps best practices.

› **HPE.** HPE submitted Hybrid Cloud Management Premium Edition (HCM Premium) for its first inclusion in a CDRA Forrester Wave. It focuses on empowering operations staff to build and orchestrate releases across testing, staging, and production environments on hybrid infrastructure. HCM Premium manages pipelines efficiently, and its road map focuses on the automation of releases from development to production environments. HPE primarily targets HCM Premium at I&O teams to support their transition to DevOps with consistent and repeatable orchestration. Adoption by developers remains unclear, and operations teams' influence within technology organizations will likely affect it.

› **VMware.** VMware submitted vRealize Automation and Code Stream for its first participation in a CDRA Forrester Wave. vRealize Automation model's application dependencies, provisioning, and deployment sequence as blueprints, while vRealize Code Stream models the orchestration process,

including triggering infrastructure, middleware, or application deployments. vRealize Code Stream is still early in its development, and native integrations with external scheduling tools can require customization. Clients heavily invested in the VMware ecosystem should consider this offering.

Challengers

› **Red Hat.** Red Hat Ansible and Ansible Tower extend automation from infrastructure to the complete software deployment life cycle. Ansible leverages a markup language that allows for the development and automation of models that include applications, middleware, and infrastructure. Ansible Tower offers a REST API and GUI, enabling the development of models with minimal training. Ansible and Ansible Tower lack native functionality for pipeline management; moving releases across the pipeline and governance requires extensive client configuration. Red Hat has a solid road map to extend integrations, ease of use, and pipeline management governance.

Supplemental Material

Online Resource

The online version of Figure 5 is an Excel-based vendor comparison tool that provides detailed product evaluations and customizable rankings. Click the link at Forrester.com at the beginning of this report to download the tool.

Data Sources Used In This Forrester Wave

Forrester used a combination of two 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 Forrester on or before May 17, 2017.

- **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.
- **Customer reference calls.** To validate product and vendor qualifications, Forrester also conducted reference calls with three of each vendor's current customers.
- **Vendor demonstrations.** Vendors demonstrated their technologies against a common set of use cases identified by Forrester from client inquiries.

The Forrester Wave Methodology

We conduct primary research to develop a list of vendors that meet our criteria to for evaluation in this market. From that initial pool of vendors, we then 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.

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. For more information on the methodology that every Forrester Wave follows, please visit The Forrester Wave™ Methodology Guide on our website.

Survey Methodology

Forrester's Q1 2017 Global DevOps Benchmark Online Survey was fielded to 623 individuals. Forrester queried respondents on the state of DevOps adoption within their organization, using questions aligned with the CALMSS framework (culture, automation, Lean, measurement and management, sharing, and sourcing). These individuals work in technology organization roles and are aware of their organizations' release frequency and automation tool sets. Respondents selected were those who were able to answer the full scope of DevOps questions.

Forrester Data Global Business Technographics® Infrastructure Survey, 2016 was fielded in June and July 2016. This online survey included 3,503 respondents in Australia/New Zealand, Brazil, Canada, China, France, Germany, India, the UK, and the US from companies with two or more employees.

Forrester Data Business Technographics ensures that the final survey population contains only those with significant involvement in the planning, funding, and purchasing of business and technology products and services. Research Now fielded this survey on behalf of Forrester. Survey respondent incentives include points redeemable for gift certificates.

Please note that the brand questions included in this survey should not be used to measure market share. The purpose of Forrester Data Business Technographics brand questions is to show usage of a brand by a specific target audience at one point in time.

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] Source: Forrester Data Global Business Technographics Infrastructure Survey, 2016.

[3] Source: Forrester's Q1 2017 Global DevOps Benchmark Online Survey.

[4] Source: Mike Maddock, "If You Have To Fail -- And You Do -- Fail Forward," Forbes, October 10, 2012 (https://www.forbes.com/sites/mikemaddock/2012/10/10/if-you-have-to-fail-and-you-do-fail-forward/#70ec1ddd58e5).

[5] C9D9 is an open, biweekly forum where industry practitioners discuss issues and good practices for Agile, DevOps, and continuous delivery.

[6] CA Technologies completed the acquisition of Automic in January 2017 and has subsequently standardized on CA Automic Release Automation as its release automation offering for all new clients. The vendor has advised clients of CA Release Automation, which appeared in the 2016 ARA Forrester Wave, of its continued support of this product for seven years. CA Release Automation's functionality is transitioning to CA Automic Release Automation through inclusion in the product road map.

[7] Source: "ARA System Requirements and Sizing," Automic (https://docs.automic.com/documentation/webhelp/english/ARA/12.0/DOCU/12.0/ARA%20Guides/Content/AWA/Installation/install_AWA_ARA_sys_requirements_sizing.htm).

[8] Source: "Clarive Software and CollabNet Announce Global Partnership to Jointly Develop and Deliver an Enterprise-Class Modern Development Platform Leveraging Application Release Automation (ARA)," CollabNet press release, November 22, 2016 (https://www.collab.net/news/press/clarive-software-and-collabnet-announce-global-partnership-jointly-develop-and-deliver).

[9] The Puppet Forge is a repository of modules contributed by the puppet community. Source: Puppet Forge (https://forge.puppet.com/).

[10] Source: "Chef Automate," Chef (http://www.chef.io/automate); InSpec (http://inspec.io); and Habitat (https://www.habitat.sh/).

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