

# The Forrester Wave™: Private Cloud Software Suites, Q1 2016

How The Top Nine Private Cloud Software Suites Stack Up

by Lauren E. Nelson

January 19, 2016

## Why Read This Report

In Forrester's 40-criteria evaluation of private cloud solution vendors, we identified the nine most significant software providers — BMC Software, Cisco Systems, Citrix, Hewlett Packard Enterprise, Huawei, IBM, Microsoft, Red Hat, and VMware — in the category and researched, analyzed, and scored them. This report details our findings to help infrastructure and operations (I&O) professionals select the optimum private cloud solution. I&O pros can customize criteria weightings to align with their own private cloud initiative. It is a refresh to Forrester's "The Forrester Wave™: Private Cloud Solutions, Q4 2013" report.

## Key Takeaways

### **Red Hat, VMware, IBM, And HPE Lead The Pack**

Forrester's research uncovered a market in which Red Hat, VMware, IBM, and Hewlett Packard Enterprise lead the pack. Microsoft, Citrix, Cisco, BMC, and Huawei offer competitive options.

### **I&O Pros Look For Speed, Control, And APIs**

This market is growing because more I&O professionals see private cloud as the platform to enable their customer experience transformation. When selecting a solution, enterprises look for speed to provision, control of access, and fully published APIs.

### **Current Offerings Are Closely Matched**

Almost every evaluation criteria includes a widespread spectrum of scores. However, each vendor's strengths and weaknesses balance out, with very close overall scores in the Current Offering category. I&O pros evaluating private cloud software suites should customize the criteria weights to reflect their own use case to best distinguish optimum choices.

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Forrester conducted demo-based product evaluations in August 2015 and interviewed more than 25 vendor and end user companies: Customer references are anonymous and confidential.

### Related Research Documents

[Applying The Forrester Wave™: Private Cloud Solutions, Q4 2013](#)

[The Forrester Wave™: Private Cloud Solutions, Q4 2013](#)

[TechRadar™: Private Cloud, Q3 2015](#)

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## Enterprises Are Finally Building True Private Clouds

Enterprises of all types and sizes have embraced cloud computing as an important catapult for their business technology (BT) agendas. While public cloud services (e.g., Amazon Web Services [AWS], Microsoft Azure) have received the most attention, in practice, many I&O professionals sought their own cloud infrastructure, so-called private cloud services. The first private clouds hit the market seven years ago. Many private cloud solutions met with little success in the early years. Technology was immature. Deployments rarely met return on investment (ROI) expectations and lacked the basic characteristics of a cloud solution: standardization, automation, and self-service access.<sup>1</sup> At the core of the struggles was a shift in goals. What started as replicating the public cloud concept internally, quickly became an overhaul of the entire virtual environment. This endeavor was time- and resource-intensive.<sup>2</sup>

### Private Cloud Mentality Started To Change In 2012

Although some groups continued the transformation, many started to section off a small environment while leaving existing environments and policies alone. It was not uncommon for a single enterprise to have two separate private cloud initiatives underway — one driven by I&O and one driven by application developers. Communication between each group was rare. And, yet, few organizations were ready to acknowledge this strife and the need for a fundamental change in the way they were approaching private cloud.

### The Private Cloud Picture Is Brighter In 2015

As the age of the customer gains momentum, building out new, custom applications that help redefine the customer/citizen experience is key to the future success of every enterprise and government entity. This development will be fast, constant, and massively growing over time. Cloud is a fundamental technology approach to enable this development. With this in mind, enterprises understand the urgency of self-service access to resources for developers. They acknowledge that a technology management overhaul directly conflicts with the speed to deliver this initiative. For some, this reality means aggressive adoption of external cloud options like software-as-a-service (SaaS), hosted private cloud, or public cloud, rather than trying to overcome the obstacles required to become an internal private cloud provider. In many cases, this means a more hybrid approach, leveraging both technologies. For others, this means maintaining two internal initiatives — one focused on IT-to-BT transformation and the other focused on building a true cloud. Ultimately, the best mix of cloud technologies depends on your use cases, compliance requirements, existing investments, application portfolios, developer skill sets, and future investment plans in specific staff skills.

### Private Cloud Interest Is Consistent, Adoption Growing

Looking at the numbers, our 2015 survey showed that 67% of enterprise hardware decision-makers consider building an internal private cloud a high priority, and 43% report adoption of the technology.<sup>3</sup>

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This represents consistent interest in private cloud over the past three years and increased adoption from 38% to 43% over the past year.<sup>4</sup> Enterprise adopters primarily make software-only investments to build out their private clouds (51%); however, 12% exclusively leverage open source software, 18% use existing infrastructure and automation tools, and 13% purchase converged infrastructure solutions – which is consistent with prior years (see Figure 1). Private cloud software suites remain the top consumption model for private cloud deployments.

**FIGURE 1** Software Suites Represent The Most Common Approach To Private Cloud

Base: 748 global hardware decision-makers who work with servers, storage, or the data center and are planning/implemented private cloud (1,000+ employees)

Note: “Other” and “don’t know” responses are not shown.

Source: Forrester’s Global Business Technographics® Infrastructure Survey, 2015

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**Key Criteria Sought By Private Cloud Adopters**

As I&O professionals consider private cloud software suites, there are three core criteria that matter most during the selection process:

- › **Speed to provision.** Competitive enterprise technology management organizations envision the goal of their private cloud to provision basic resources in 15 minutes or less and more complex templates in less than an hour. Few have achieved this reality today, but they see this vision as the key to success. Enterprises seek vendor partners with confirmed customer examples hitting these objectives, demos that confirm this capability on their own infrastructure, and significant automation tooling built out around the product to enable this in provisioning, permissions, and situational automation based on real-time monitoring.
- › **Control of the user experience.** Rarely do you find an enterprise that wants to open the floodgates to self-service provisioning. Bank of America did so in an early private cloud deployment and found that its developers overprovisioned resources.<sup>5</sup> Without chargebacks or other incentives in place, it is difficult to get the level of efficiency required. Enterprises seek granular permissions to control the request options for each developer and track system usage; template creators to present standardized templates to its users; quotas and limits for each group/user; and the ability to associate cost to the request process either through showback or a chargeback feature to incentivize purchasing decisions. Most solutions hit on all of these core requirements but differentiate on the depth and breadth of these capabilities.
- › **Fully published APIs.** Fully published representational state transfer (REST)-based APIs translate into three specific benefits for I&O pros: 1) Some developers are more productive working through direct API access rather than working through a web GUI; 2) your admin team can build out integrations not already built out by your cloud provider; and 3) you have the ability to swap out certain portal functions for alternative market solutions (e.g., configuration management tools).<sup>6</sup> Out-of-the-box prebuilt integrations save time but vary in terms of depth, updates, and breadth of vendor products. Throughout our evaluation, we grant credit for integrations to public cloud platforms, element management and monitoring tools, IT service management (ITSM) suites, and developer tools that vendors have already built out. However, vendors that expose all admin and end user functionality through APIs put the power in the enterprise's hands to establish its own integrations, expand its developer experience options, and swap out certain tools that might be redundant with tools already in use.

**Key Private Cloud Trends**

As this market matures, Forrester sees the solution stabilizing with the current scope of functionality. Rather than focusing on a long list of net-new functionality, vendors are generally focused on maturity of automation tooling, exposure of its APIs, and trying to establish its solution as a hybrid cloud management tool. Forrester identifies the following as the top solution trends in the private cloud market:

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- › **Network services are a work in progress.** During the early days, private clouds suffered from a complete lack of network automation technology, network protocols to enable movement between data centers (DCs) or cloud environments, or the ability to attach various network security policies. In the past few years, vendors have taken some strides forward. Support of virtual extensible local area network (VXLAN) is common for kernel-based virtual machine (KVM) cloud deployments. Virtual network devices can be managed and provisioned. Leading solutions allow teams to create network security policies around quality of service (QoS), access control lists (ACLs), and bandwidth. But rarely do you find support for Ethernet over MPLS (EoMPLS), network virtualization using generic routing encapsulation (NVGRE), overlay transport virtualization (OTV), or for physical device management.
- › **OpenStack is supported.** Almost every vendor in this evaluation supports OpenStack as an alternative private cloud platform or uses it as its core platform beneath its solution. This reemphasizes OpenStack's role as a cloud platform standard within the market. Although many solutions support OpenStack, the level of that support varies. Some simply provide basic integration into OpenStack, swapping out their proprietary platform for those that request it. Many use their own enhanced flavor of OpenStack as their suite's default platform, while others leverage pure OpenStack as their private cloud platform, leveraging customization only for the management portions of their stack. Keeping closer to code means faster updates and less lock-in at the platform level.
- › **Self-service has been tackled.** At the time of the last report, vendors had ambitious plans to add in platform-as-a-service (PaaS) capabilities behind their existing infrastructure-as-a-service (IaaS)+ capabilities. Today, vendors have defined developer experiences that cater to the different tiers of developers — and accept limiting these experiences to separate tool sets. Private cloud software suites now provide basic infrastructure configuration request forms, infrastructure and application templates, and direct API access for resource requests. Outside of the suite, vendors provide alternative experiences through integrated development environment (IDE) tool sets in PaaS offerings, simple developer provisioning tools, container software, or support integration with existing tools like ServiceNow, Git, or Microsoft Visual Studio for developer access.
- › **Public cloud integrations are weak.** Private cloud software suites aspire to be the management portal that becomes your single pane of glass for all cloud platforms — public and private. Those making a credible play at this vision face steep competition from standalone cloud management solutions that focus on becoming the hybrid cloud management solution of choice with a clean lightweight offering. Although many of these private cloud software suite solutions match, and even surpass, the monitoring capabilities and granularity of permissions of these standalone offerings, they are bulky, expensive, and lack breadth in out-of-the-box integration with public cloud platforms. Many hybrid-bound adopters seek cleaner products that don't try to be everything to everyone and deliver just enough functionality to serve its purpose.

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- › **Higher tiers of support are a must.** One sobering part of this process was the consensus across all vendors' customer references that if you don't purchase the higher tiers of support, you can't expect fast responses or trained experts to answer support calls. One customer reference described heroic efforts to navigate through the organizational politics to finally get in touch with knowledgeable vendor support staff and ultimately decided to purchase the higher tiers of support the next time. Each reference confidently described this as a basic fact for the private cloud market. If you're looking for responsive support staff — regardless of which private cloud vendor you select — the higher tiers of support don't seem optional. Include these estimates in your RFP for a true apples-to-apples comparison.

## Private Cloud Software Suites Evaluation Overview

To assess the state of the private cloud software suite market and see how the vendors stack up against each other, Forrester evaluated the strengths and weaknesses of top private cloud software suite vendors.

### Private Cloud Vendors Are Closely Matched Across Current Offerings

After examining past research, user need assessments, and vendor and expert interviews, we developed a comprehensive set of evaluation criteria. We evaluated vendors against 40 criteria, which we grouped into three high-level buckets:

- › **Current offering.** Each vendor's position on the vertical axis of the Forrester Wave graphic indicates the strength of its current product offering. The key current offering criteria are cloud management and self-service access, service management and creation, automation capabilities, heterogeneity, contract terms and support, and cost. Combined, these criteria provide a detailed look at the current usability, customization options, enablement for more complex configurations, speed, certifications, out-of-the box security features, and consumability. Forrester used a combination of vendor evaluation responses, documentation, demos, pricing scenarios, and customer references to complete this section.
- › **Strategy.** A vendor's position on the horizontal axis indicates the strength of its go-to-market strategy. Forrester evaluates strategy with planned enhancements, strategic vision, additional hosting options, third-party ecosystem, partnerships, and customer experience. Forrester used a combination of vendor evaluation responses, documentation, vendor strategy briefings and strategy survey responses, demos, and customer references to complete this section.
- › **Market presence.** The size of the vendor's bubble on the chart indicates its market presence. Forrester evaluates market size with installed base, revenue, and global presence. Forrester used vendor evaluation responses, publicly available financial statements, documentation, and vendor strategy responses to complete this section.

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**Private Cloud Software Suite Vendors Qualifier Criteria**

Forrester included nine vendors in the assessment: BMC, Cisco, Citrix, Hewlett Packard Enterprise (HPE), Huawei, IBM, Microsoft, Red Hat, and VMware. Each of these vendors sells a software-only solution that allows for complete automation and management of the cloud infrastructure provisioning process (see Figure 2).

The following are all the core qualifier criteria for this evaluation:

- › **Self-service portal and role-based access.** This software presents an interface for separate authenticated end users — via role-based access controls (RBACs) — to select options for deployment. It must have unique policy controls per tenant and user role and the ability to present unique catalogs per user or group. In most cases, this portal presents a web interface but may also be accessible in other ways, such as through a mobile client or command-line interface (CLI).
- › **Infrastructure provisioning capabilities.** All private cloud solutions must be able to automatically provision infrastructure resources by connecting to element orchestration and monitoring tools or by supplying their own orchestration capabilities within the suite.
- › **Management capabilities.** Private cloud software suites must include resource, user, and service management capabilities such that administrators can dictate which services and resources are available for request by user/role and can then manage all deployed services/resources within the cloud environment.
- › **API-based.** The IaaS software stack must provide a unified API for third-party product integration and programmatic control. As the most common users of private clouds are developers, it's often their preference to request resources and subsequently control those resources via API. This also allows for greater end user customization and feature enhancement.
- › **Generally available by July 1, 2015.** The solution and all the features described in this evaluation had to be available prior to July 1, 2015. Any features added after July 1, 2015, didn't receive credit in this evaluation.
- › **More than 100 unique customers.** Forrester set a minimum of 100 unique cloud customers for each product suite evaluated to focus on today's most popular private cloud software solutions.

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**FIGURE 2** Evaluated Vendors: Product Information And Selection Criteria

<b>Vendor</b>	<b>Product evaluated</b>	<b>Version release date</b>
BMC Software	Cloud Lifecycle Management 4.5	May 2015
	TrueSight Capacity Management 10.0	December 2014
Cisco Systems	Cisco ONE Enterprise Cloud Suite: Cisco Prime Service Catalog, with Application Stack Monitoring (utility included with catalog) Cisco UCS Director Cisco Virtual Network Services (VACS) UCS-based Integrated Infrastructure	February 2015
Citrix	Citrix CloudPlatform	January 2015
	Citrix CloudPortal Business Manager	April 2015
	Citrix Lifecycle Manager	May 2015
HPE	HPE CloudSystem Enterprise 8.1	August 2014
	HPE Cloud Service Automation 4.5	July 2015
	HPE Operations Orchestration 10.2	December 2014
	HPE Matrix Operating Environment 7.4	October 2014
Huawei	FusionSphere 5.1	June 2015
IBM	PureApp Software v2.1.0.1	June 2015
	IBM Cloud Manager with OpenStack v4.3	June 2015
	IBM Cloud Orchestrator v2.4	October 2014
	IBM UrbanCode Deploy with Patterns	May 2015
Microsoft	Microsoft System Center 2012 R2	October 2013
	Microsoft Windows Server 2012 R2	October 2013
Red Hat	Red Hat Cloud Suite (Red Hat Cloud Infrastructure 6)	June 2015
VMware	VMware vRealize Enterprise Suite 6.0: vRealize Automation vRealize Application Services vRealize Orchestrator vRealize Business Standard vRealize Operations NSX Puppet Enterprise vSphere (vCenter)	June 2015

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**FIGURE 2** Evaluated Vendors: Product Information And Selection Criteria (Cont.)**Vendor selection criteria**

**Self-service portal and role-based access.** This software presents an interface for separate authenticated end users to select deployment options, and it must have tenant policy controls and the ability to present unique catalogs per user or group.

**Infrastructure provisioning capabilities.** All private cloud solutions must be able to automatically provision infrastructure resources by connecting to element orchestration and monitoring tools or by supplying their own orchestration capabilities within the suite.

**Management capabilities.** Private cloud software suites must include resource, user, and service management capabilities such that administrators can dictate which services and resources are available for request by user/role and can then manage all deployed services/resources within the cloud environment.

**API-based.** The IaaS software stack must provide a unified API for third-party product integration and programmatic control. As the most common users of private clouds are developers, it's often their preference to request resources and subsequently control those resources via API. This also allows for greater end user customization and feature enhancement.

**Generally available by July 1, 2015.** The solution and all the features described in this evaluation had to be available prior to July 1, 2015. Any features added after July 1, 2015, didn't receive credit in this evaluation.

**More than 100 unique customers.** Forrester set a minimum of 100 unique cloud customers for each product suite evaluated to focus on today's most popular private cloud software solutions.

## Private Cloud Software Suite Evaluation

The evaluation uncovered a market in which:

- › **Red Hat, VMware, IBM, and HPE lead the pack.** Four vendors rise to the top of this evaluation. Red Hat and IBM stand out with OpenStack environments that keep platform functionality true to code. They fully expose their APIs, enabling users to cleanly swap out certain functionality for popular market tools. VMware and HPE are also in the Leader category with solid current offerings delivering great strength in functionality across almost every category. Both offer well-known distributions of OpenStack.
- › **Microsoft follows closely behind.** Microsoft, the only nonparticipating vendor in this evaluation, delivers a strong solution that prioritizes integration with its own products over integration with external products.
- › **BMC, Cisco, Huawei, and Citrix offer competitive options.** Citrix comes to market with a competitive but lightweight solution despite its much lower price tag. Cisco brings its redesigned solution to this evaluation with strong steps forward in network support and fully exposed APIs.



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**FIGURE 3** Forrester Wave™: Private Cloud Software Suites, Q1 '16 (Cont.)

	Forrester's Weighting	BMC	Cisco	Citrix	HPE	Huawei	IBM	Microsoft	Red Hat	VMware
<b>CURRENT OFFERING</b>	50%	3.17	2.92	2.92	3.47	3.00	3.38	2.89	3.64	3.77
Cloud infrastructure services	15%	3.10	3.20	3.90	3.35	3.70	3.15	3.15	3.05	3.60
Automation and orchestration	25%	3.55	3.00	3.65	3.60	3.00	3.75	3.10	3.35	4.15
Cloud service administration and consumption	20%	2.90	2.90	2.40	3.60	2.55	3.35	2.55	3.55	3.55
Cloud governance	15%	3.45	2.50	1.90	3.35	2.40	3.05	3.65	4.50	4.20
Cloud operations	10%	3.30	3.00	1.35	4.10	3.00	3.40	2.60	3.85	5.00
Integrations and APIs	10%	2.25	3.10	3.55	2.70	3.50	3.90	1.95	4.10	1.85
Support services	5%	3.25	2.50	3.25	3.25	3.50	2.25	2.50	3.25	3.25
Pricing	0%	2.70	3.00	5.00	2.15	3.00	1.00	4.00	3.00	1.00
<b>STRATEGY</b>	50%	2.35	2.55	2.50	3.60	2.45	3.85	3.00	4.15	3.65
Product vision	25%	2.00	2.00	2.00	3.00	2.00	4.00	3.00	5.00	4.00
Execution road map	25%	3.00	3.00	4.00	3.00	3.00	3.00	3.00	4.00	3.00
Market approach	30%	2.00	2.00	2.00	4.00	2.00	4.00	3.00	4.00	4.00
Partner ecosystem	10%	2.00	3.00	2.00	4.00	3.00	4.00	2.00	4.00	3.00
Supporting products and services	10%	3.00	4.00	2.00	5.00	3.00	5.00	4.00	3.00	4.00
<b>MARKET PRESENCE</b>	0%	2.15	3.15	2.40	3.60	2.60	4.35	3.35	2.85	3.60
Number of customers	40%	2.00	4.00	3.00	3.00	2.00	4.00	3.00	2.00	3.00
Product revenue	35%	1.00	3.00	2.00	4.00	3.00	5.00	4.00	3.00	4.00
Average deal size	25%	4.00	2.00	2.00	4.00	3.00	4.00	3.00	4.00	4.00

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

## Vendor Profiles

### Leaders

- › **Red Hat.** Red Hat — with its Cloud Infrastructure 6 (RHCI) and CloudForms solutions — leads the evaluation with its powerful portal, top governance capabilities, and a strategy built around integration, open source, and interoperability. Rather than trying to build a custom approach for completing functions around operations, governance, or automation, Red Hat provides a very composable package by leveraging a mix of market standards and open source in addition to its own development. Red Hat also commits to contributing all changes upstream to OpenStack rather than maintaining proprietary enhancements. Its API exposure and ability to swap out core functionalities for a long list of pre-integrated market tooling sets it apart from others in the evaluation. Red Hat received top marks for workflow life-cycle automation, administrative portal

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usability and experience, permissions, compliance tracking, capacity monitoring, platform APIs, ITSM and developer tools, and configuration management tool integration. Its weaknesses are out-of-the-box public cloud platform support and network services. Red Hat plans to build out container-based provisioning and predictive analytics and continue to simplify onboarding over the next 12 months.

- › **VMware.** VMware's vRealize Enterprise Suite 6.0 provides a powerful and intuitive administrative interface with granular permissions and a wealth of tracked operations metrics. This suite provides best-in-class resource discovery and onboarding, quotas and limits, and performance monitoring. It also shares the lead for a long list of additional capabilities, including storage services, automated provisioning, configuration management, speed-to-provision, decision-trigger automation, and compliance tracking. VMware suite weaknesses are few in number: ITSM and developer tool integration, public cloud integration options, and costs for both pilot pricing and large implementations. As a private cloud software suite, this product is strong. Over the next 12 months, VMware plans to focus on hybrid cloud enablement, build out platform integrations, provide deeper integrations with software-defined data center (SDDC) technology, and simplify the solution. Since the start of this evaluation, the latest version of the Suite (v7.0) was released.
- › **IBM.** During the last evaluation, IBM was early in a major transformation of its cloud offering. In this current evaluation, IBM's Cloud Orchestrator suite delivers its management tooling atop an OpenStack distribution, which keeps surprisingly true to the pure core OpenStack projects. Its strengths include its decision-trigger automation, full exposure of platform APIs, depth of templates, directory services integration, and configuration management. Its weaknesses include administrator portal usability, speed to provision, compliance tracking, network services and platform support, cost of pilot and large implementations, and configuration management integration options. IBM has spent much of the past few years optimizing its various developer experiences through a series of tools, some of which are included within this management suite. IBM plans to extend its capabilities to support container-based provisioning and support portability across its portfolio of cloud tools over the next year.
- › **Hewlett Packard Enterprise.** HPE CloudSystem Enterprise Suite leverages its own management tools on top of a commercial distribution of an OpenStack-based platform, all tied together with an intuitive portal for easier navigation. Despite its navigation ease, this suite is composed of a long list of separate products. The result is a massive software suite with significant depth in management capabilities. HPE was early to the OpenStack community and has since reinforced its commitment in recent years with over 50 dedicated developers contributing upstream to OpenStack, preserving its status as one of the top contributors to OpenStack. HPE receives top scores for automated provisioning, depth of templates, compliance tracking, and cost monitoring. Its weaknesses include quotas and limits, storage services and platform support, speed to provision, and cost of a large implementation. Over the next 12 months, HPE plans to focus on hybrid cloud enablement through its CSA solution.<sup>7</sup> Since the start of this evaluation, the latest version of the Suite (v9.0) was released.

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**Strong Performers**

- › **Microsoft.** Microsoft was the only nonparticipating vendor in the evaluation, with its product entry in the Forrester Wave evaluation being the Microsoft System Center suite.<sup>8</sup> Overall, Microsoft brings its success in the public cloud space with its Azure offering, together with its existing Hyper-V, Windows, and .NET customer bases to target the enterprise client. Its top priority is providing consistency between its public and private cloud solutions such that the same templates can be used for both its private and public cloud solutions. However, this consistency doesn't carry over to other vendors' platforms and management tooling. Microsoft stood out with its directory services and storage options and support. Its weaknesses include cost monitoring, depth of templates, compute services and platform support, and integration with alternative on-premises cloud platforms like OpenStack. Microsoft plans to support even greater portability and consistency across its cloud products over the next year.
- › **BMC Software.** BMC Cloud Lifecycle Management 4.5 (CLM) and TrueSight Capacity Management 10.0 deliver a strong, but heavy, solution. BMC stands out with its workload life-cycle automation, granular permissions, compliance tracking, public cloud integrations, and cost-monitoring capabilities — with the ability to create different prices by user and by any single component of a template. Since the last evaluation, BMC redeveloped its developer self-service portal to much success, providing a far more intuitive experience. However, its administrator portal remains the same less intuitive portal but with a wealth of granular controls. Its weaknesses include storage services, platform support, performance monitoring, configuration management tool integrations, and the high cost of pilot implementations. BMC plans to use the next 12 months to focus on tying private cloud to application release automation, including container-based solutions.
- › **Cisco Systems.** Cisco just underwent a major suite rewrite. Its existing customers are in the process of transitioning to the new environment. The new suite's strengths include platform APIs, speed-to-provision, and network services. At the time of our previous evaluation, network services support was a surprising weakness, which has certainly been enhanced in its recent rewrite. Its weaknesses are largely integration with other solutions including alternative private cloud platforms, public cloud platforms, ITSM and developer tools, and configuration management tools. With a fully published API, customers can overcome the lack of prebuilt integration options while they wait for Cisco to extend its out-of-the-box integration options. Other weaknesses include compliance tracking, database support, and decision-trigger automation. Cisco is focused on furthering its lead in network functionality and building out its hybrid cloud functionality over the next 12 months.
- › **Huawei.** Huawei FusionSphere is an OpenStack-based software suite with top scores in network services support, automated provisioning, workflow design interface, and support services. Huawei was the only provider in this evaluation that had guaranteed resolution times and could escalate service issues to on-premises support as part of its highest service-level agreement (SLA) tier. Its primary weaknesses include out-of-the-box tools and integrations, such as its breadth of existing templates, and integration into public cloud platforms and configuration management tools.

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However, customers can easily build out their own templates through its design portal and integrate with desired tools. This is due to its full exposure of platform APIs across operations, infrastructure, and governance. Huawei also receives low scores for speed-to-provision and decision-trigger automation. Over the next 12 months, Huawei plans to focus on enabling software-defined network (SDN), supporting container-based deployments, and building out integrations with traditional enterprise tooling.

- › **Citrix.** Citrix CloudPlatform is a lightweight solution that meets all the core requirements of building a private cloud environment. Although it lacks compliance tracking, performance and capacity monitoring, and out-of-the-box integrations into public cloud platforms, ITSM, and developer tools, its reduced price compensates for these drawbacks. Citrix receives top scores in storage and compute service support, automated provisioning, decision-tree automation, full exposure of its platform APIs, configuration management, and cost both for small and large implementations. For enterprises focused on building a purpose-built cloud environment without purchasing a massive set of management tooling, Citrix provides a clean, lightweight option. Citrix's biggest strategy hurdle is being based on Apache CloudStack. Although CloudStack is a technically strong open source project, its momentum is waning at the hands of the more popular open source movement, OpenStack. Citrix will spend the next year focusing on container provisioning and extend its bare-metal support services.

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## Supplemental Material

### Survey Methodology

Forrester's Global Business Technographics® Infrastructure Survey, 2015, was fielded to 3,592 business and technology decision-makers located in Australia, Brazil, Canada, China, France, Germany, India, New Zealand, the UK, and the US from companies with 2 or more employees. This survey is part of Forrester's Business Technographics and was fielded from May 2015 to June 2015. ResearchNow fielded this survey on behalf of Forrester. Survey respondent incentives include points redeemable for gift certificates. We have provided exact sample sizes in this report on a question-by-question basis.

Forrester's Business Technographics provides demand-side insight into the priorities, investments, and customer journeys of business and technology decision-makers and the workforce across the globe. Forrester collects data insights from qualified respondents in 10 countries spanning the Americas, Europe, and Asia. Business Technographics uses only superior data sources and advanced data-cleaning techniques to ensure the highest data quality.

We have illustrated only a portion of the survey results in this document. To inquire about receiving full data results for an additional fee, please contact [data@forrester.com](mailto:data@forrester.com) or your Forrester account manager.

### Online Resource

The online version of Figure 3 is an Excel-based vendor comparison tool that provides detailed product evaluations and customizable rankings.

### Data Sources Used In This Forrester Wave

Forrester used a combination of four data sources to assess the strengths and weaknesses of each solution:

- › **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 product's functionality. Forrester mandated that vendors follow the provided demo script that includes four sections lasting 55 minutes. Demos were recorded and referred to throughout the evaluation process.
- › **Strategy survey.** To ensure that the same core information was collected from each vendor, vendors also had to complete a 10-question strategy survey.
- › **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™: Private Cloud Software Suites, Q1 2016**

How The Top Nine Private Cloud Software Suites Stack Up

## The Forrester Wave Methodology

We conduct primary research to develop a list of vendors that meet our criteria to be evaluated 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 document — and then score the vendors based on a clearly defined scale. These default weightings are intended only as a starting point, and we 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, go to <http://www.forrester.com/marketing/policies/forrester-wave-methodology.html>.

## Integrity Policy

All of Forrester's research, including Forrester Wave evaluations, is conducted according to our Integrity Policy. For more information, go to <http://www.forrester.com/marketing/policies/integrity-policy.html>.

## Endnotes

- <sup>1</sup> By building a private cloud the right way, Waste Management (WM) reduced resource deployment time from two and a half months to around 20 minutes and gave existing public cloud users a satisfactory alternative. This refuse disposal and recycling leader got private cloud right by engaging with the customer from the beginning and working with an experienced partner to craft a solution focused on ensuring agility and sustainability. For more information on Waste Management's success with private cloud, see the "[Case Study: Waste Management Builds A True Private Cloud](#)" Forrester report.
- <sup>2</sup> Cloud is an essential component of every enterprise tech management strategy, but sifting through market noise to design a robust cloud strategy isn't easy. Despite reported high private cloud adoption, Forrester continues to see enterprises struggle with their private cloud build-out. Success with a private cloud comes only through embracing the true cloud model of self-service, full automation, and business and developer agility. But most technology managers lack enough hands-on experience with public clouds to truly understand the end user experience priorities and how to translate them to their own environments. This Forrester report outlines the top 10 facts every tech management pro should know about private clouds to avoid over-investment, missed deadlines, and strategies that limit better engagement with your internal customers. See the "[Top 10 Facts Every Tech Management Leader Should Know About Private Cloud](#)" Forrester report.

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## How The Top Nine Private Cloud Software Suites Stack Up

<sup>3</sup> Source: Forrester's Global Business Technographics Infrastructure Survey, 2015.

<sup>4</sup> Source: Forrester's Business Technographics Global Infrastructure Survey, 2014.

<sup>5</sup> Bank of America told its story through the use of an optimization tool called Cirba that retroactively brought its environment back to efficiency by identifying overprovisioned resources and avoiding millions in additional hardware acquisition. Source: "Videos on Demand," Cirba (<http://www.cirba.com/videos/Cirba-Bank-of-America-Journey-to-the-Cloud-webcast.htm>).

<sup>6</sup> We recommend that you consult a three-part Forrester report series on API design. The first report, examines industry data and directions for positioning REST within your API strategy and provides overall guidance on REST API design. See the "[API Design, Part 1: REST Is The Leading But Not Only Option For Your APIs](#)" Forrester report.

The next report in the series focuses on designing messaging styles using REST, SOAP, MOM, and other special API messaging styles. See the "[API Design, Part 2: Design Messaging Styles By Balancing Reach With Your Other Design Goals](#)" Forrester report.

The final report centers on best practices for ensuring that detailed API designs are readily understandable and support robust solutions. See the "[API Design, Part 3: Make Transactions And Error Handling Clear In Your API Designs](#)" Forrester report.

For a rundown on the tools and services for application development and delivery pros provided by 22 public cloud platforms, see the "[Which Public Cloud Platforms Have The Right Developer Tools And Services?](#)" Forrester report.

<sup>7</sup> HPE Cloud Service Automation is software that delivers application services. It provides a user portal for requesting resources from different cloud environments, automates and orchestrates workflows across different platforms, functions as a single pane-of-glass monitor for these environments, and the has the ability to act as a cloud broker.

<sup>8</sup> Microsoft is a nonparticipating vendor because it failed to meet documentation deadlines required for timely completion of this Forrester Wave evaluation. Forrester evaluated its product fairly, based on information available via public documents and Forrester analyst engagements with clients and other industry players.

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