

The Forrester Wave™: Private Cloud Solutions, Q4 2013

by Lauren E. Nelson, November 25, 2013

KEY TAKEAWAYS

Private Cloud Tools Are Rapidly Evolving To Meet A Range Of Enterprise Requirements

Enterprises look to private clouds for more than just virtual infrastructure provisioning. Private cloud vendors have started to bundle additional capabilities into their solutions, including pervasive VM management capabilities, design tools for complex application templates, and service catalogs.

Purchasing Commercial Software Is The Top Approach To Private Cloud

Over the next 12 months, more than half of enterprises will prioritize building internal private clouds. Today, the most common approach is through the purchase of commercial software to layer atop existing infrastructure resources. Regardless of the approach you choose, there's no shortage of tools to support your efforts.

Ease Of Use, Platform Heterogeneity, And Hybrid Cloud Enablers Set Leaders Apart

Every private cloud vendor includes basic virtual infrastructure provisioning and management capabilities. Differentiation in this market lies in user experience (and ease of use), support for a range of underlying infrastructure and management tools, and its enablement of complex hybrid cloud scenarios.



The Forrester Wave™: Private Cloud Solutions, Q4 2013

Three Vendors Rise To The Top Of The Private Cloud Market

by [Lauren E. Nelson](#)

with [Dave Bartoletti](#), [James Staten](#), [Doug Washburn](#), [Glenn O'Donnell](#), [Henry Baltazar](#), [Andre Kindness](#), and [Heather Belanger](#)

WHY READ THIS REPORT

In Forrester's 61-criteria evaluation of private cloud solution vendors, we identified the 10 most significant software providers — ASG Software Solutions, BMC Software, CA Technologies, Cisco Systems, Citrix Systems, Eucalyptus Systems, HP, IBM, Microsoft, and VMware — in the category and researched, analyzed, and scored them. This report details our findings about how well each vendor fulfills the breadth and depth of our criteria and where each stands out to help infrastructure and operations (I&O) professionals select the most full-featured private cloud solution. I&O pros can also customize criteria weightings to align with their own private cloud initiative. This report focuses on commercial-software-only private infrastructure-as-a-service (IaaS) cloud solutions and serves as a refresh to Forrester's "Market Overview: Private Cloud Solutions, Q2 2011" report.

Table Of Contents

- 2 **Private Cloud Solutions Have Progressed, But They're Not Mature**
 - Key Private Cloud Solution Trends
- 4 **Private Cloud Solutions Evaluation Overview**
 - Private Cloud Solutions Evaluation Criteria Breakdown
 - Vendor Inclusion Criteria
- 6 **HP Leads The Pack, Followed Closely By Cisco And Microsoft**
- 9 **Vendor Profiles**
 - Sole Private Cloud Leader Rises To Top
 - Strong Performers Battle For Differentiation
 - Contenders Take A Focused Approach
- 13 **Supplemental Material**

Notes & Resources

Forrester conducted product evaluations in June and July 2013 and interviewed over 40 vendor and user companies. These were completed through inquiry calls, customer reference interviews, and vendor strategy briefings.

Related Research Documents

[Four Common Private Cloud Strategies](#)

October 28, 2013

[The Forrester Wave™: Hosted Private Cloud, Q1 2013](#)

January 17, 2013

[Market Overview: Private Cloud Solutions, Q2 2011](#)

May 17, 2011



PRIVATE CLOUD SOLUTIONS HAVE PROGRESSED, BUT THEY'RE NOT MATURE

For the past three years, data from Forrester surveys has shown an increasing level of private cloud interest among enterprise I&O professionals.¹ In 2014, 55% of hardware decision-makers from North American and European enterprises plan to prioritize building an internal private cloud, and 33% have already adopted private cloud.² Today, private cloud encompasses multiple strategies and approaches, which can often lead to confusion around the products themselves and the capabilities they deliver.³ Now the most common approach to private cloud is through the purchase of commercial software (30%) or several private cloud components (16%) that marry IaaS software with hardware and existing management tools (see Figure 1). For I&O professionals, private cloud is the next step along their virtualization journey, providing improved manageability, a way to kick off better automation, and a step toward delivering IT-as-a-service.⁴ For the business, private cloud is (or rather, should be) an internal extension to what users experience with public cloud. It should also enable higher levels of business productivity when compared to traditional virtualized infrastructure. A genuine private cloud enables this through true self-service access and full automation, which is monitored, managed, and incented, rather than restricted, by I&O professionals.⁵ As this market matures, Forrester sees the emergence of both end user and product trends. This report focuses on the current state of private cloud solutions.

Figure 1 The Most Common Private Cloud Approach Is Commercial Private Cloud Software



Base: 379 enterprise hardware decision-makers who are planning/implemented private cloud

Source: Forrsights Hardware Survey, Q3 2013

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Source: Forrester Research, Inc.

Key Private Cloud Solution Trends

As this market matures, Forrester sees the solution within the market expanding to better serve the management focus of the I&O professional, better meet the needs of the developer, and address the hybrid future that awaits many enterprises.⁶ Forrester identifies the following as the top solution trends in the private cloud market:

- **Vendors are focused on IaaS+.** A major development theme for 2013 is the addition of low-level platform-as-a-service (PaaS)-like capabilities for application deployment to private clouds. With these capabilities, cloud administrators can create blueprints describing preconfigured applications and their dependencies and then expose these to developers, rather than just provide raw virtual infrastructure. Forrester calls these features IaaS+ because they lack true PaaS characteristics, but they are nevertheless very useful.⁷ Two things are driving the expansion of IaaS+: 1) a shift in focus on cloud value from the infrastructure to the application layer, and 2) the need to provide developers self-service access to immediately usable application templates. By providing application templates rather than (or in addition to) infrastructure templates, I&O is more confident that the configurations will be appropriate and the best fit for any particular workload. For some enterprises, this was the final barrier to achieving a true private cloud, and this additional control helped them overcome this barrier.
- **DevOps is back on the table.** Organizations have long struggled with assisting both developers and operations professionals.⁸ Each party is incented to prioritize two entirely different goals — speed/completions versus stability/uptime — which leads to breakdowns and inefficiencies in what should be a highly collaborative and repeatable process. Vendors have long promoted tools to solve aspects of the DevOps challenge but often fail to meet the complexity or speed desired by either party.⁹ Although the popularity of these tools ebbs and flows, private cloud has brought the focus back to DevOps. Private cloud vendors see an opportunity to help DevOps through their software by enabling the developer with speed and abstracting the underlying complexity required by the administrators. Success would require simplification of the end user view, full automation of processes, life-cycle management, underlying compliance and security controls, metrics, and a way to collect feedback through the process. Several product development road maps include some of these features in upcoming releases, which reiterate the focus on application life-cycle features over delivery of virtual infrastructure.
- **Capabilities expand to include IT service management functions.** As the private cloud market evolves, vendors often look to add required features by wrapping existing products into a cloud package. More recently, this includes IT service management (ITSM) capabilities. For enterprises starting out with no existing tools, this packaging simplifies adoption, but for those already leveraging their own tools, this can be redundant and an unnecessary cost. For lightweight private cloud deployments, expansive ITSM cloud suites will likely exceed budgets and limit adoption. For this reason, Forrester sees an emphasis on multitiers of private cloud suites that meet the demands of both experienced customers and those supporting smaller agile

environments. Within these more expansive cloud suites, functionality can typically be accessed through the portal and, in some cases, without signing in again. However, the ITSM interface itself remains separate and typically requires additional training. As tools continue to develop, these additional products will be more cleanly wrapped into the product such that there's a single interface regardless of the task.

- **Hybrid cloud falls short.** The term “hybrid cloud” encompasses a range of scenarios, from a basic level where a cloud environment is used in addition to but separately from any number of traditional IT environments to a more advanced scenario in which all IT resources, both cloud and noncloud, are managed, moved, split, and expanded through a single management portal spanning multiple deployment types. While the latter is the goal of most IT pros, current solutions have relatively basic hybrid-cloud-enabling features. Enterprises generally view and manage their internal physical, private cloud, and public cloud resources as separate environments and use each for different workload types. Today, most vendors don't support movement of workloads between environments once deployed or allow for hybrid cloud application design. Support for “hybrid” is typically limited to provisioning or migrating workloads to Amazon Web Services. Workload-bursting scenarios are possible but require some development today. If you're looking to achieve advanced levels of hybrid cloud and cloud-bursting capabilities, it will likely be two to three more years before this is available out of the box.

PRIVATE CLOUD SOLUTIONS EVALUATION OVERVIEW

To assess the state of the private cloud solutions market and see how the vendors stack up against each other, Forrester evaluated the strengths and weaknesses of top private cloud vendors. Forrester reached out to 27 private cloud vendors for qualifying information to identify today's most popular and most widely used private cloud solutions. After assessing qualifier responses, Forrester then selected 10 private IaaS cloud vendors and evaluated them on 61 criteria that break down into three high-level categories.

Private Cloud Solutions Evaluation Criteria Breakdown

After examining past research, user need assessments, and vendor and expert interviews, we developed a comprehensive set of evaluation criteria. We evaluated vendors against 61 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 install base, revenue, and global presence. Forrester used vendor evaluation responses, publicly available financial statements, documentation, and vendor strategy responses to complete this section.

Vendor Inclusion Criteria

Forrester included 10 vendors in the assessment: ASG, BMC, CA, Cisco, Citrix, Eucalyptus, HP, IBM, Microsoft, and VMware. Each of these vendors sells a software-only solution that allows for complete automation and management of the cloud infrastructure provisioning process. 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 supplying their own orchestration capabilities within the suite.
- **Management capabilities.** Private cloud software solutions must include resource, user, and service management capabilities such that administrators can dictate what services and resources are available for request by user/role and can then manage all deployed services/resources within the cloud environment.
- **Monitoring and tracking of resources.** System usage reports must be available through the portal to show basic utilization and tracking of infrastructure resources. Private clouds must track the use of virtual resources so that central accounting can be used to either: 1) chargeback for their consumption, or (as we have found most enterprises prefer today) 2) showback, which is to report on this consumption.

- **API-based.** The IaaS software stack must provide a unified application programming interface (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 CLI. This also allows for greater end user customization and feature enhancement.
- **Generally available by April 1, 2013.** The solution and all the features described in this evaluation had to be available prior to April 1, 2013. Any features added after April 1, 2013, 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.

HP LEADS THE PACK, FOLLOWED CLOSELY BY CISCO AND MICROSOFT

The evaluation uncovered a market in which (see Figure 2):

- **HP leads the pack.** HP obtained the highest scores for both its current offering and market presence. HP stands out from the crowd by providing a clean and navigable interface that wraps substantial breadth and depth of capabilities into the fewest number of interfaces. Unlike other vendors in this space, HP adds functionality into a single interface as a rule without making the overall experience less intuitive.
- **Cisco and Microsoft are close behind.** Cisco leads in terms of top strategy scores, but its current offering score pushes it just out of reach of the Leader category. Microsoft is close behind with strong current offering and strategy scores. Both vendors deliver a breadth and depth of functionality that exceeded that of other solutions, and they both prioritize the end user experience. Each has done a good job of delivering both admin and end user experiences that are intuitive, straightforward, and powerful and have articulated plans to continue to focus on end user ease of access and administrator breadth and depth of control. Cisco and Microsoft also offer low-priced entry points to satisfy a range of cloud strategies and budgets.
- **IBM, VMware, and BMC offer competitive options.** This middle pack of vendors leverages its existing product portfolios and acquisitions to tie together a wealth of capabilities. Functionality is rapidly expanding across each deployment; however, less emphasis has been placed on cleanly tying all this functionality together. Customers that already use products from these vendors often benefit from discounting and tighter integration between existing products and private-cloud-specific products (or something like that). Depending on the tier purchased, costs can quickly escalate.

- Eucalyptus, Citrix, CA, and ASG lack.** This group of vendors typically narrows its private cloud approach to focus on a particular strength and enterprise requirement rather than trying to deliver on breadth. Most of its shortcomings are deliberate, with the intension of tying into third-party products. For the customer, this typically means lower total cost, freedom of choice, and lots of integration.

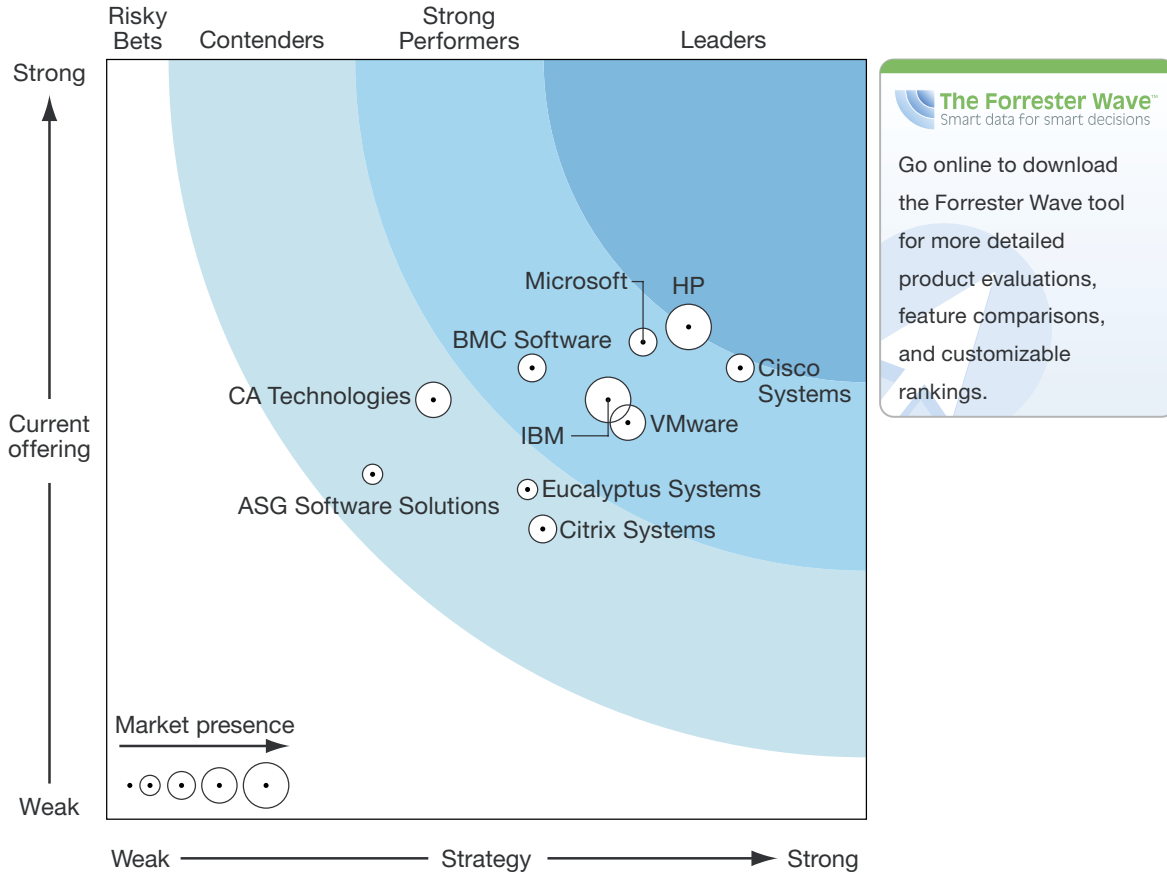
This evaluation of the private cloud solutions market is intended to be a starting point only (see Figure 3). We encourage clients to view detailed product evaluations and adapt criteria weightings to fit their individual needs through the Forrester Wave Excel-based vendor comparison tool. Forrester will be publishing a report that shows four alternative scenarios to this current set of weightings based on four common approaches to private cloud.¹⁰

Figure 2 Evaluated Vendors: Product Information

Vendor	Product evaluated	Version release date
ASG Software Solutions	ASG CloudFactory	December 2012
BMC Software	Cloud Lifecycle Management v3.0 Cloud Operations Management v9.01	September 2012 February 2013
CA Technologies	CA Automation Suite for Clouds v1.6	January 30, 2013
Cisco Systems	Cisco Intelligent Automation for Cloud v3.1.1 Cisco UCS Director v3.4.1	February 2013 March 2013
Citrix Systems	Citrix CloudPlatform Citrix CloudPortal Business Manager 2.0	December 2012 March 2013
Eucalyptus Systems	Eucalyptus Cloud v3.2	December 17, 2012
HP	CloudSystem Enterprise Suite 2013.03 Adaptive Computing Moab Cloud Optimizer Operations Manager Service Intelligence Service Health Reporter Executive Scorecard Tipping Point Network Automation	March 2013
IBM	IBM Service Delivery Manager v7.2.4	December 12, 2012
Microsoft	Windows Server 2012 System Center 2012 SP1	January 2013
VMware	vCloud Suite 5.1	December 2012

Source: Forrester Research, Inc.

Figure 3 Forrester Wave™: Private Cloud Solutions, Q4 '13



Source: Forrester Research, Inc.

Figure 3 Forrester Wave™: Private Cloud Solutions, Q4 '13 (Cont.)

	Forrester's Weighting	ASG Software Solutions	BMC Software	CA Technologies	Cisco Systems	Citrix Systems	Eucalyptus Systems	HP	IBM	Microsoft	VMware
CURRENT OFFERING	50%	2.27	2.97	2.76	2.97	1.91	2.17	3.24	2.76	3.14	2.61
Cloud management and self-service access	40%	2.35	2.73	2.76	3.35	2.59	2.48	3.61	2.58	3.20	2.76
Service management and creation	20%	2.10	2.79	2.16	1.96	0.73	1.51	2.84	2.77	2.52	2.36
Automation capabilities	20%	1.80	3.45	2.95	3.25	1.05	1.65	3.45	2.60	3.60	2.60
Heterogeneity	10%	2.10	3.45	2.95	3.05	1.55	1.80	3.05	2.60	2.60	2.05
Contract terms and support	10%	3.44	2.84	3.36	2.90	3.68	3.66	2.30	4.00	3.76	3.12
Cost	0%	3.75	2.50	4.25	1.50	4.25	4.25	1.50	2.50	5.00	3.25
STRATEGY	50%	1.75	2.80	2.15	4.17	2.87	2.77	3.83	3.30	3.53	3.43
Planned enhancements	25%	3.00	2.00	2.00	4.00	3.00	3.00	4.00	4.00	3.00	3.00
Strategic vision	40%	2.00	3.00	2.00	5.00	2.00	2.00	4.00	3.00	4.00	4.00
Additional hosting options	5%	1.00	2.00	2.00	2.00	0.00	0.00	5.00	5.00	4.00	2.00
Third-party ecosystem	5%	1.00	2.00	1.00	3.00	4.00	4.00	4.00	2.00	3.00	4.00
Partnerships	5%	2.00	2.00	2.00	4.00	4.00	2.00	2.00	3.00	3.00	2.00
Customer experience	20%	0.00	4.00	3.00	3.60	4.60	4.60	3.40	3.00	3.40	3.40
MARKET PRESENCE	0%	2.22	2.42	3.95	2.28	2.92	1.87	4.42	4.07	2.54	3.88
Installed base	65%	2.30	1.80	4.50	1.70	3.60	2.10	4.50	4.30	2.10	3.70
Revenue	30%	1.75	3.50	2.75	3.25	1.25	1.00	4.25	3.50	3.25	4.25
Global presence	5%	4.00	4.00	4.00	4.00	4.00	4.00	4.40	4.40	4.00	4.00

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

Source: Forrester Research, Inc.

VENDOR PROFILES

Sole Private Cloud Leader Rises To Top

- HP.** HP's current offering is based on eight products, including its HP CloudSystem Enterprise Suite, which bundles together its HP Cloud Service Automation, HP Server Automation, HP Operations Orchestration, and HP Database and Middleware Automation solutions. This combined solution scored highest in the evaluation for its current offering and second for its strategy. CloudSystem Enterprise is one of the first OpenStack-based private cloud solutions

and, more importantly, HP has effectively used this head start to develop additional capabilities while presenting a clean and navigable user interface (UI). Today, CloudSystem Enterprise provides a substantial amount of granular features and a broad range of functions for the administrator (e.g., directory federation, application and service-level monitoring decision-trigger automation, and multi-environment application blueprints), while all functions available through the portal can be controlled through APIs. End users access the portal through an intuitive, simplified UI that requires less technical background and minimal training. HP stands out in the evaluation not only in terms of its nicely designed UI but also in terms of hybrid cloud enablement, automation capabilities, template creation, and market presence. Today, a great deal of its traction comes from converged infrastructure purchases and from existing HP customers, but given the strength of the product, it's likely that this solution will introduce new customers to HP.

Strong Performers Battle For Differentiation

- **Cisco.** Since Forrester's last private cloud evaluation, Cisco has purchased newScale and Cloupia and has worked extensively to advance its overall private cloud offering with these products at the center. The combined capabilities of Cisco Intelligent Automation for Cloud (IAC) and Cisco UCS Director (formerly Cloupia) win Cisco a third place (tied with BMC) in the current offering portion of this evaluation. However, it is Cisco's strong road map and strategic vision that earns it top marks for strategy. Cisco envisions private IaaS clouds moving to full ITaaS solutions with complete service catalogs to deliver all IT services, shifting away from infrastructure delivery and toward the application, its life cycle, and SaaS single sign-on (SSO) integration. To make this transition, Cisco will start to add in IaaS+ and PaaS capabilities and improve the deployment of application stacks in a private cloud, with easier handoffs between developers. To more rapidly deliver new functionality, Cisco releases free accelerator toolkits for its customers to add on new features in between version releases. Today, its current offering stands out with its role-based access controls, control options (API and CLI access levels), and automation capabilities but falls short on application templates, advanced cloud-enabled network support options, and contract support guarantees (e.g., its support response time guarantees are weaker than other solutions).
- **Microsoft.** Microsoft Core Infrastructure Server Suite ties System Center 2012 SP1 and Windows Server 2012 together into a single private cloud package. Since Forrester's last evaluation, Microsoft has improved substantially.¹¹ Microsoft stands out with its contract terms, costs, automation capabilities, image library permissions, software license tracking, and hybrid cloud enablement. Today, its areas of weakness include hybrid cloud compliance management, enterprise management tool integration, directory integration and federation, and cloud API compatibility. Microsoft's private cloud strategy centers on the following concepts: 1) app-centric cloud platform; 2) cross-platform from metal-up; 3) foundation for the future (moving from virtualization to a true cloud); and 4) cloud on your terms (flexibility of a hybrid

environment through tools selected by the customer). Forrester believes that Microsoft is well positioned to deliver given its breadth of cloud services across cloud layers (e.g., Office 365, Microsoft Azure, and System Center 2012) and its early focus on IaaS+ capabilities to help tie Microsoft's app-centric vision together. Thus far, it hasn't tied each layer together, but this is on the horizon. Microsoft has made steps toward its heterogeneity-focus.

- **IBM.** IBM released its new IBM SmartCloud Orchestrator (SCO) solution in early 2013 to enhance its existing solution, IBM Service Delivery Manager (ISDM). This evaluation scores only on the combined functionality within these two products, but customers can elect to use add-on products to gain additional functionality outside these products. IBM sees a strong customer need to evolve systems of record while being opportunistic around systems of engagement, with a vision to bridge these two efforts. IBM recognizes new line-of-business (LOB) demands for internal support and portability for cloud-native applications that IT must support through a hybrid enterprise management solution. IBM also sees an opportunity to serve enterprises seeking a modular and open cloud platform. IBM has actively participated in many top standards initiatives and has based IBM SCO on OpenStack APIs. This development will be a strength for IBM but today makes the UIs more difficult to navigate. As IBM continues to develop its solution atop OpenStack APIs, this will likely be minimized. Today, SCO/ISDM's strengths are performance management and monitoring, support for complex blueprints, resource monitoring, contract flexibility, and additional hosting options. Its top weaknesses include end user UI, hybrid cloud enablement, configuration and compliance management, and storage option support.
- **VMware.** VMware's vCloud Suite Enterprise combines its vCloud Director, vCloud Automation Center (vCAC), vFabric Application Director, vCenter Operations Management (vCops), vCenter Site Recovery Manager, vCloud Networking and Security, vCloud Connector, and vSphere Enterprise Plus. Today, this combined packaged is a competitive solution in the private cloud market, but few customers typically use the entire suite. vCloud Suite's strengths include workload prioritization and quality of service (QoS), hybrid cloud enablement, depth of role granularity, and third-party ecosystem. VMware is also one of the only solutions that show capability breadth across multiple categories with few weaknesses, such as maximum role tiers (usage can't be aggregated by department or cloud administrator), integration with enterprise management tools, and control through CLI access.
- **BMC.** Forrester evaluated the combined functionality of BMC's Cloud Lifecycle Management (CLM) and BMC Cloud Operations Management products, which have the following strengths: approvals, usage incentives, resource monitoring, multi-VM templates, security enablement, performance monitoring and management, and support of enterprise management tools. Areas of weakness include development kits, portal navigability, release automation, out-of-the-box service catalog, cloud-bursting capabilities, and minimum entry point. BMC's strategy focuses on hybrid cloud delivery to a variety of consumers that range in technical acumen while still

providing the back-end controls and depth required for an administrator. BMC looks to also provide breadth in services available to support both local and external environments. Part of this strategy is expanding upon its existing strengths in its PaaS capabilities and holistic life-cycle management story.

Contenders Take A Focused Approach

- **Eucalyptus.** Eucalyptus is an open source IaaS product started in 2009 and is aligned to and heavily dependent on Amazon Web Services (AWS). Its strategy is to provide a private alternative to dominant public cloud service (which today, Eucalyptus views as just AWS) by replicating the services, interfaces, and experience. Every aspect of its product is designed to make the experience as consistent as possible when using the solutions together or when transitioning from one environment to another. This includes consistency of monitoring tools, templates, and showback capabilities. Although Eucalyptus' strategy is strong given its tool sets, background, and size, its solution is narrow in focus and tightly aligned to the success of other products within the market (i.e., AWS). Today, enterprises looking to pair AWS with an internal private cloud should strongly consider Eucalyptus to ease the migration process and enable a hybrid cloud scenario.¹² But if you're looking to create complex multitier templates, to manage physical and virtual environments, or to provide advanced automation capabilities, Eucalyptus isn't a fit.
- **CA.** CA's current solution, CA Automation Suite for Clouds, delivers strong control options, depth of permissions, maximum role tiers, approvals, and depth of reports. Its current weaknesses include hybrid cloud enablement, standardized out-of-the box roles, security enablement, performance monitoring and management, and third-party ecosystem. CA's vision of private cloud is an accelerator of continuous delivery to support next-generation applications. CA plans to achieve this through a DevOps suite that includes service virtualization, application release automation, cloud management, and production data mining offerings, which will require support of the developer and the operations professionals and managing the handoffs between them. This strategy is relatively common, but CA looks to take this further than most by providing a true DevOps solution. To embrace this vision, CA will need to increase the level of security and compliance controls that go beyond permission control, provide more tiers for purchase, and improve the end user UI to make it more intuitive. Today, Forrester sees CA as a popular solution among service providers given its relative low costs for a full-feature enterprise-wide rollout and the ability to easily customize its solution.
- **Citrix.** Forrester evaluated Citrix CloudPlatform and CloudPortal Business Manager. CloudPlatform is based on Apache CloudStack and is its most commonly used distribution today. Citrix's focus is delivering a solution that can support both new cloud-native applications and traditional enterprise applications through a single private cloud environment from out-of-the-box functionality.¹³ Today, Forrester most commonly sees Citrix's solutions among

enterprises seeking to successfully provide an internal alternative to public cloud for highly technical users rather than a holistic ITSM suite, a hybrid cloud enabler, or a management tool for virtual machines. In fact, its customer references had the shortest provisioning times out of any others in the evaluation (2 minutes versus 30 minutes). All of the provided customer reference environments were heavily automated, large in size, and supporting both cloud-native and traditional enterprise applications. This approach is emphasized by its strengths (e.g., standard roles, directory access and federation, cost, and customer references) and weaknesses (e.g., basic blueprints, application blueprints, hybrid cloud enablement, and depth of next-generation and smart automation capabilities).

- **ASG.** ASG's CloudFactory is based on Apache CloudStack and a series of its own products, including CloudRobot, CloudShaper, CloudCockPit, and ITASM. The design of CloudFactory isn't that of an advanced infrastructure delivery tool but rather as a platform to deliver the best fit set of templates, tools, and applications to each unique user. Using this concept, ASG includes a single central workspace for users to access calendars, email, applications (both on-premises and SaaS), and provision infrastructure/application templates. ASG gets hit hard in this evaluation for its service catalog focus over advanced IaaS features, hybrid cloud enablement, and third-party ecosystem while also failing to provide any customer references. Overall, ASG takes a different approach to private cloud that emphasizes the importance of a service catalog, SaaS application access, and business user access.

SUPPLEMENTAL MATERIAL

Methodology

Forrester's Forrsights Hardware Survey, Q3 2013, was fielded to 2,306 IT executives and technology decision-makers located in Canada, France, Germany, the UK, and the US from SMB and enterprise companies with two or more employees. This survey is part of Forrester's Forrsights for Business Technology and was fielded from June 2013 to August 2013. Research Now fielded this survey online 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 Forrsights Hardware Survey, Q3 2012, was fielded to 2,330 IT executives and technology decision-makers located in Canada, France, Germany, the UK, and the US from small and medium-size business (SMB) and enterprise companies with two or more employees. This survey is part of Forrester's Forrsights for Business Technology and was fielded from June 2012 to August 2012. LinkedIn Research Network fielded this survey online on behalf of Forrester. Survey respondent incentives include gift certificates and research reports. We have provided exact sample sizes in this report on a question-by-question basis.

Forrester's Forrsights Hardware Survey, Q3 2011, was fielded to 2,343 IT executives and technology decision-makers located in Canada, France, Germany, the UK, and the United States from companies with two or more employees. This survey is part of Forrester's Forrsights for Business Technology and was fielded during July and August 2011. The LinkedIn Research Network fielded this survey online on behalf of Forrester. Survey respondent incentives include a choice of gift certificates or charitable donations. We have provided exact sample sizes in this report on a question-by-question basis.

Each calendar year, Forrester's Forrsights for Business Technology fields business-to-business technology studies in more than 17 countries spanning North America, Latin America, Europe, and developed and emerging Asia. For quality control, we carefully screen respondents according to job title and function. Forrester's Forrsights for Business Technology ensures that the final survey population contains only those with significant involvement in the planning, funding, and purchasing of IT products and services. Additionally, we set quotas for company size (number of employees) and industry as a means of controlling the data distribution and establishing alignment with IT spend calculated by Forrester analysts. Forrsights uses only superior data sources and advanced data-cleaning techniques to ensure the highest data quality.

We have illustrated only a portion of survey results in this document. To inquire about receiving full data results for an additional fee, please contact Forrsights@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 five 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 briefings.** Forrester allotted each vendor 1 hour to present and discuss its cloud and product strategy. Vendors were not given strict guidelines on how to spend this time.

- **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 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 Waves, is conducted according to our integrity policy. For more information, go to <http://www.forrester.com/marketing/policies/integrity-policy.html>.

ENDNOTES

- ¹ Internal private cloud adoption among North American and European enterprise decision-makers. Source: Forrsights Hardware Survey, Q3 2011, Q3 2012, and Q3 2013.
- ² When Forrester surveyed North American and European enterprise hardware decision-makers about its top priorities over the next 12 months, 55% responded that building an internal private cloud was a

critical or high priority. Currently 33% of this group has adopted internal private cloud. Source: Forrsights Hardware Survey, Q3 2013.

- ³ Today the term private cloud is incorrectly used to describe both internal and external environments that often fall short of the core requirements necessary to carry the cloud label. Forrester covers four common approaches to private cloud in the following report. See the October 28, 2013, "[Four Common Private Cloud Strategies](#)" report.

Both software-only and converged infrastructure environments carry the term private cloud. This report covers software-only solutions. If you're interested in learning more about converged infrastructure products, Forrester covers this set of products in its two-part market overview. For more information, see the September 6, 2013, "[Market Overview: Converged Infrastructure Solutions In 2013, Part 1 Of 2](#)" report and see the September 11, 2013, "[Market Overview: Converged Infrastructure Solutions In 2013, Part 2 Of 2](#)" report.

- ⁴ Forrester profiles a private cloud strategy that emphasizes the I&O professional's vision of private cloud and its potential benefits. For more information on this enhanced virtualization scenario, see the October 28, 2013, "[Four Common Private Cloud Strategies](#)" report.

Forrester found that among enterprise hardware decision-makers, the top reported driver for internal private cloud adoption was improved manageability (80%) of its virtualized environment. Source: Forrsights Hardware Survey, Q3 2013.

North American and European enterprise hardware decision-makers reporting private cloud adoption. Eighty percent represents the combined responses of 5 and 4 on the importance of various drivers for internal private cloud adoption from a scale of 1 to 5, with 5 representing very important and 1 representing not important.

- ⁵ Over the past year, Forrester has interviewed and surveyed hundreds of self-proclaimed private cloud creators and found that most of their environments fall short of delivering the autonomy, agility, or cost-efficiency of public IaaS environments. For example, only 31% of self-identified private cloud solutions offer self-service access for end users. In fact, 35% of private cloud offerings reserve self-service access for cloud admins while end users either submit formal requests or tickets — that's not a cloud. Only 13% of the self-identified private clouds met all of Forrester's core criteria. Don't accept a cloud in name alone. Start honing your own cloudwashing detector. If the reported time-to-value is between two hours and two days rather than the public cloud standard of 15 minutes, it is not a cloud. For more information, see the May 8, 2013, "[Case Study: Waste Management Builds A True Private Cloud](#)" report.
- ⁶ Business-aligned developers are aggressively leveraging public cloud platforms to build and deploy new elastic applications and to extend legacy capabilities. They have come to expect speed, choice, and cost transparency. Meanwhile, nearly half of enterprise IT shops claim to be building a private cloud in 2013. The future enterprise IT infrastructure is therefore a hybrid mix of public and private clouds, but who will manage this new IT portfolio? Today, cloud developers are often doing it themselves out of necessity, but they should be focused on coding and testing, not cloud service management. Infrastructure and operations (I&O) professionals have the operations management skills, but they have not yet earned the right to take

over cloud management. In this report, we explain how the I&O role changes in a hybrid cloud world, how I&O pros need to accelerate the cloud application delivery life cycle to exceed business expectations of cloud, and which cloud management capabilities I&O must master to take on the role of hybrid cloud manager. For more information, see the July 30, 2013, "[Cloud Management In A Hybrid Cloud World](#)" report.

- ⁷ Forrester discusses the role of IaaS+ capabilities in the public cloud market in two reports. For more information, see the June 14, 2013, "[The Forrester Wave™: Enterprise Public Cloud Platforms, Q2 2013](#)" report and see the February 22, 2013, "[Predictions For 2013: Cloud Computing](#)" report.
- ⁸ Development + operations = DevOps. DevOps denotes better communication and collaboration between application development professionals and infrastructure and operations (I&O) professionals. DevOps improves collaboration in deploying and running applications and infrastructure to drive better outcomes. Effective enterprise IT organizations have been doing this for years. But new developments in cloud computing are ushering in a new era of on-demand infrastructure, self-provisioning of resources, and elastic application architectures, greatly diminishing the need for developers to interact with operations for releases. A DevOps focus on collaboration evolves into a NoOps focus on automation. For more information, see the April 26, 2011, "[Augment DevOps With NoOps](#)" report.
- ⁹ Organizations have for years sought a means of more quickly delivering business value in the form of working software. Inspired by innovations in Agile software development and the application of the Lean principle of continuous improvement, development and operations have been chipping away at the obstacles that have prevented faster delivery. Joining together, the movement, called DevOps by some, has been gaining momentum and achieving impressive results. The walls between development, operations, and the business are coming down, ushering in a new age of collaboration that, in leading organizations, is already proving itself in delivering real business value faster and more frequently. This report presents the seven main principles of DevOps that have been proven by some of the most dominant technology innovators in the world. For more information, see the September 3, 2013, "[The Seven Habits Of Highly Effective DevOps](#)" report.
- ¹⁰ From surveys, interviews, and inquiry calls, Forrester is seeing an emergence of four private cloud approaches that are driven by very different strategies and thus have variant scope and results. Forrester profiles these common approaches to cloud in the following Forrester report. See the October 28, 2013, "[Four Common Private Cloud Strategies](#)" report.

Forrester plans to publish a report that will adjust the scorings of the Forrester Wave report to reflect these four common cloud approaches.
- ¹¹ In 2011, Forrester published a lightweight evaluation of the private cloud market. For more information, see the May 17, 2011, "[Market Overview: Private Cloud Solutions, Q2 2011](#)" report.
- ¹² Early business-unit-aligned cloud admins were forced to build a cloud from incomplete systems, like the early open source Eucalyptus project, but increasingly these buyers are eschewing the erector-set models for appliances, complete software solutions, or software that is a cloud management tool first and a private cloud second. Today's cloud admins are deploying Citrix's cloud solution based on Apache CloudStack or

OpenStack-based solutions from Morphlabs, Piston Cloud, Cloudscaling, or Rackspace Cloud Builders. They aren't choosing solutions built from the virtualization layer up or built to preserve the traditional enterprise IT management tools that are in place today. It's not that solutions built from the latter aren't fully capable of being clouds, just that developers don't know these vendors and don't see their solutions as aligned with the public clouds with which they want to integrate. The new cloud administrators are starting fresh with new solutions that are designed to integrate with the public cloud first and the rest of the enterprise second. For more information on traditional and cloud native applications, see the February 21, 2013, "[The Rise Of The New Cloud Admin](#)" report.

- ¹³ Traditional enterprise applications and cloud-native applications differ in design and requirements. Generally, applications that sit atop VMware vSphere are traditional Windows and Linux applications that live within a static configuration of resources. They don't scale out, they aren't componentized web services, and they tend to have a fixed and permanent footprint. And these applications never get turned off (at least not on purpose). They were most likely built and configured for purpose and, in most cases, were put into virtual machines (VMs) that mimicked the physical server configuration they ran on. Cloud native apps are elastic or transient. The best-fit applications in the cloud are designed to scale out, are componentized in construction, intercommunicate via web services, and are designed to fail. They are optimized for cloud environments and built under the assumption that they will run on commodity infrastructure and activate cloud economics. Clouds encourage developers to adapt to their capabilities and services, which are highly standardized, as they are shared among many customers. For more information on traditional and cloud native applications, see the February 21, 2013, "[The Rise Of The New Cloud Admin](#)" report.

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