

Accelerating Cloud Deployment with Pre-Configured Cloud Solutions

Comparison of offerings from HP, IBM, and VCE

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Executive Summary

Porter Consulting first analyzed the cloud infrastructure market in December 2012. Since then, there have been several new product announcements, and market conditions have evolved. IBM, HP, and VCE all have recent new product and service offerings that strengthen their integrated cloud solutions. OpenStack has grown rapidly in acceptance as the future direction of cloud deployments, with HP and IBM endorsement of this open platform. It therefore became apparent that we needed to update this report due to these changing market conditions.

Each vendor has taken a different approach to packaging cloud infrastructure. All solutions provide shared access to a pool of compute, storage, and network resources, but the robustness of these pools varies widely. Management and automation capabilities range from what we consider limited to ones that are rich and automated.

After all the available information for this market is reviewed, the scorecard shows the following results.

1. HP CloudSystem is the choice for organizations of any size looking to deploy a cloud environment with the most open architecture and the richest set of cloud enablement software. Support for heterogeneous resource pools and multiple hypervisors provides customers with choice today and the flexibility of deployment options going forward. CloudSystem provides the fastest road to the cloud.
2. IBM PureFlex System provides an architecture that is open in some areas but is also restricted, because it does not allow the incorporation of existing installed servers. The focus appears to be on the IBM installed base of AIX servers and WebSphere customers. For customers with long-term investments in AIX, DB2, and WebSphere, IBM FlexSystem is a good choice as IBM cloud automation tools are geared toward these products.
3. VCE Vblock systems are pre-tested systems assembled with components from Cisco and EMC specifically to provide an infrastructure for VMware. The system is a restricted architecture that does not include support for other compute or storage resources or for other hypervisors. Although VMware is the current market share leader, many customers prefer the flexibility to deploy other hypervisors. True application orchestration is not provided “out of the box” but requires add-on software. VCE provides a very good point solution for VMware but is not a good fit for customers planning open cloud deployments. Concerns about the commitment of the members to the alliance behind VCE add a level of risk for customers choosing this direction.

In the following sections, we explain the current market and our evaluation criteria, examine the vendor solutions, and present a detailed evaluation relative to the criteria.

Market Situation

Movement of enterprises to the cloud is now inevitable, and we expect cloud computing to realize strong growth, with total associated spending exceeding \$200 billion by 2016. Initially, there was some resistance to the adoption of cloud technologies within IT organizations at mid-management levels. This pushback was expected as IT professionals were concerned about job security and protection of their knowledge domains. We now see better recognition of the benefits of cloud technologies at all organizational levels and no longer see this broad internal resistance observed earlier.

As IT management and business leaders evaluate application implementation platforms, they are faced with a range of alternatives to traditional internal data center deployments. An organization looking to move applications to the cloud typically evaluates private, public, and hybrid cloud deployments. A private cloud is built for a specific group or organization, with strict access control. Public clouds can be accessed by anyone with an Internet connection. A hybrid cloud is a combination of private and public clouds built to meet a specific purpose. We anticipate that most applications in the future will run in hybrid cloud implementations because of the need to flexibly deploy incremental compute resources. The use cases for these resources include meeting peak business demands, accessing temporary application test and development resources, and connecting with customers and suppliers.

We have observed two emerging trends since the previous study was completed in December 2012. First, companies that are not cloud service providers are opening their private clouds for use by other organizations, such as customers and suppliers, on a pay-as-you-go basis. Chargeback systems that were primarily the domain of cloud service providers have gathered interest from this broader customer base. Customers are including showback and chargeback capabilities among private cloud software specifications. The second growing trend is customer preference for systems that will incorporate OpenStack into their cloud solutions.

Acceptance of OpenStack

The most startling shift that we have observed is customer recognition of OpenStack as a key component of future cloud technologies. OpenStack started as open source code developed by a broad community of participants to offer cloud management software. The OpenStack Open Source Cloud's stated mission is "to produce the ubiquitous Open Source Cloud Computing platform that will meet the needs of public and private clouds regardless of size, by being simple to implement and massively scalable." There are a series of interrelated projects, working on different aspects such as block storage, object storage, network, security, and shared services. Ultimately, OpenStack will make it easier to scale in hybrid cloud deployments.

At the simplest level, OpenStack promises to do for the cloud what Linux did for UNIX operating systems and break the vendor lock-in that often limits innovation and growth. Some organizations may not consider OpenStack to be enterprise-ready, but the early adopters are beginning to experience success using it. For other organizations, OpenStack is a strategic direction. In the last few months, customers have started to include support for OpenStack in their evaluation criteria. Six months ago, we thought that it offered great promise, but at that time, it seemed to be just a promising open source technology that a few vendors supported but did not emphasize.

When HP and IBM joined the OpenStack Foundation as Platinum Members with seats on the Board of Directors, this open source community rose to prominence in any discussion about future cloud plans. Both companies will continue to contribute code to the open source but, more importantly, will use APIs to interface their infrastructure and software. OpenStack Foundation Platinum Members provide a significant portion of the funding to achieve the Foundation's mission of protecting, empowering, and promoting the OpenStack community and software. Each Platinum Member's company strategy aligns with the OpenStack mission, and each company is responsible for committing full-time resources toward the project.

Challenges

One of the key cloud building blocks is the ability to combine resources into shared pools. Many customers have already taken this step with the deployment of server virtualization technology; VMware is the most noteworthy of these technologies in the x86 space. Most organizations are now in their second generation of server virtualization and are looking to expand capabilities to reduce cost and improve time to deployment. They are taking steps toward creating a service-oriented infrastructure for their supported lines of business. Logic and experience will enable organizations to first deploy an in-house private cloud environment in order to enable self-service provisioning groups for technology-driven users. Moving to an infrastructure supporting hybrid or public cloud operations is a logical next step.

Many IT organizations want to build on their VMware expertise as they develop their own clouds. However, the growing market acceptance of virtualization software from Microsoft, Red Hat, and others could require IT organizations to adopt and support various virtualization solutions. Choosing a cloud solution based on the premise that a single platform will be the only virtualization technology in the long term seems risky. Such a decision could cause issues in the near future, with a given organization being unable to adopt emerging, newly mainstream, technologies quickly.

As customers review their options for building out private, public, or hybrid clouds, they should consider how the delivery of the target application may evolve. Customers should expect that services may bridge private and public clouds and plan for that capability. Ideally, customers should be able to design, provision, control, and monitor infrastructure services uniformly across private, public, or hybrid clouds. This enables secure and reliable hybrid cloud access. Open source tools and standards such as OpenStack are emerging to facilitate workload portability across clouds.

Evaluation Model

Porter Consulting has reviewed the cloud solutions from HP, IBM, and VCE to help customers understand the pros and cons associated with each vendor's approach. These three companies represent a large share of the cloud computing infrastructure marketplace. Each provides customers solid features aimed at reducing risk for cloud deployments. All integrate network, compute, and storage resources in shared resource pools configured at the factory with a layer of management software. The focus of this discussion is the value realized from the customer's viewpoint, which forms the basis of our evaluation criteria.

These criteria in the following table reflect business needs for risk management, competitive advantage, flexibility, and operational excellence.

Business Criteria	Purpose of Evaluating
Investment Protection	Can an existing infrastructure be redeployed in the cloud? Can the offer scale as demands grow?
Ease of Use	How easy is it to implement and train staff? Is incremental training required?
Time to Cloud Deployment	How quickly can the initial cloud be deployed, and how easy is it to change?" Does the cloud enablement toolset provide for rapid setup of new instances?
Open	Can the products be integrated with a range of virtualization technologies? What is the commitment to OpenStack? Is there broad support for mixed heterogeneous infrastructure of compute, storage, and network technologies as part of the resource pools? How easy will it be to integrate emerging products in the future?
Risk	What level of success is probable? Can the vendor be counted on in the future to provide innovation and support? Are the underlying technologies critical products in the vendor portfolios?
Support	What support is provided from implementation throughout the lifecycle? How supportable are these clouds for customer IT staff?

Also included is a review of the components of each cloud product – compute, storage, network, and automation layers.

Technology Criteria	Purpose of Evaluation
Compute	Is there broad acceptance of the platform outside the cloud so that there is a support base? Are there options for Linux, Windows, and UNIX?
Storage	Do storage options provide sufficient power utilization efficiency to meet the demands of a virtualized environment? Are there robust replication technologies to protect the data?
Network	Does the internal cloud network provide the low latency and high throughput required to move data between the VMs?
Virtualization	Is there support beyond VMware for multiple hypervisors? Does this support include the ability to create server system pools, deploy virtual appliances, and implement services across all hypervisors?
Management/ Automation	How robust and mature are the products that make up this layer? Can these tools be used to manage heterogeneous infrastructure across different vendors? Is integration with other enterprise-wide management platforms possible?

Security	Is multi-tenancy available to allow for secure sharing of resources supported in the offering? Is security built into the offering, or are additional security tools required?
Templates	How many fully tested application templates are available to help customers get started quickly? How easy is it to modify or build new templates? Is there support for the most popular applications, such as Exchange, SQL, SAP, and Oracle?
Hybrid Deployment	Can application and infrastructure services be brokered with the same toolset in the hybrid cloud? How easily can integration with public clouds be established, such as Amazon EC2?

Although each company provides some level of cloud capability, there are quantifiable differences. For each vendor, we considered only products and services publicly available today in the preconfigured offerings. A 5-point scale was used to assess how these capabilities may impact the business:

5 – Best in class, clearly exceeds other competitive offerings currently available

4 – Exceeds, in some aspects, the other competitive products

3 – Can achieve expected results

2 – Meets expectations with some deficiencies

1 – Does not meet expectations

HP CloudSystem

HP positions Converged Infrastructure as an open approach to helping clients virtualize, consolidate, and automate their historical silos of servers, storage, and networking within the datacenter. Over the past four years, HP has made investments to integrate these technologies to add value for customers requiring cloud infrastructure. However, as cloud adoption expands, organizations are increasingly challenged to manage different types of clouds, including public, private, and hybrid. To address this demand, HP has extended its cloud strategy to HP Converged Cloud. The HP Converged Cloud architecture offers business and IT a simplified, integrated architecture that provides management consistency and workload portability across private, public, and hybrid clouds.

HP CloudSystem is a complete, integrated, and open platform that enables organizations and service providers to build and manage services across private, public, and hybrid clouds. CloudSystem, built upon HP Converged Infrastructure and HP software, is optimized for HP hardware as a resource pool. However, CloudSystem also protects customers' existing investments by supporting the inclusion of other servers (Dell, IBM and Cisco), storage (EMC and NetApp), and Cisco networking components. Choice extends to virtualization, where hypervisors VMware ESX/ESXi, Microsoft Hyper-V, Red Hat KVM, and HP Integrity VMs are supported. This system is an open and choice-driven model that provides incremental on-ramps to the cloud while protecting existing investments. For example, existing HP BladeSystem customers can easily add on HP orchestration software to deliver Infrastructure-as-a-Service through a self-service portal.

For customers wanting to build a cloud, HP offers CloudSystem, a unified architecture that combines hardware, software, and services. Three models are available to address project, enterprise, and service provider needs.

- HP CloudSystem Matrix is the entry-level offering that provides Infrastructure-as-a-Service (IaaS) for IT organizations, by allowing infrastructure to be provisioned and managed within minutes.
- HP CloudSystem Enterprise is designed for customers that require a more robust cloud deployment with self-service capability for less technical line of business teams. This model provides unified management of all services across private and public cloud-based and traditional IT environments. In addition, there is advanced lifecycle management of cloud services for intelligent resource allocation, provisioning, monitoring, compliance, and retirement – from infrastructure to application.
- HP CloudSystem Service Provider is designed specifically for service providers and helps them with aggregating services from internal and external entities, as well as with pricing, bundling, managing, and delivering the services portfolio to customers. These additional capabilities are not needed by most customers building out their own cloud and therefore are outside the scope of this discussion.

Building a Custom Private Cloud Based on HP Software

The CloudSystem portfolio also offers standalone software options that allow customers to choose among several on-ramps to the cloud adoption models. For customers that want to leverage existing infrastructure and are seeking a quick on-ramp to the cloud, HP offers two CloudSystem software options.

- Build Infrastructure-as-a-Service (IaaS) with CloudSystem Matrix software that allows customers to build an IaaS cloud for virtualized environments within a day. The customer-installable software includes a drag-and-drop service designer, a self-service portal for IT, automated provisioning, and capacity planning. The software runs on all servers supported by VMware and Microsoft Hyper-V, from HP and other vendors.
- Build Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS) with HP Cloud Service Automation (CSA) software, with which customers can automate cloud application lifecycle management. The open and extensible architecture includes a graphical service designer and a self-service portal. CSA includes compliance and security capabilities such as role-based access control and multi-tenant catalogs. Additional capabilities exist for integration with HP TippingPoint for Network Intrusion Protection and Detection services and HP Asset Manager. For customers that want to perform financial showback or chargeback costs by user, CSA was designed to integrate seamlessly with HP Asset Manager for Cloud cost analysis.

HP CloudSystem customers can apply HP Cloud Maps to create a catalog of applications. HP lists more than 200 Cloud Maps that are ready to use. HP Cloud Maps are pre-configured service catalog entries covering a wide range of mainstream applications such as Exchange, SQL Server, Oracle Database, and SAP. This reduces the time to deliver a new application from weeks or months to often less than an hour. These maps can also be customized or used as a starting point for new applications. HP also provides more than 4,000 proven workflows that reduce the time to define a service while ensuring consistency and reliability.

HP has a clear commitment to OpenStack. HP is part of the OpenStack Foundation and is a major contributor of code to the community. HP already supports provisioning of some infrastructure components with integration with OpenStack compute, images, and security out of the box. Hybrid delivery through OpenStack is also supported. We expect this integration will expand as open source capabilities grow.

The most powerful message in these HP offerings is open heterogeneous resource pools supported by robust cloud automation. HP supports the broadest array of different technologies within its cloud, which provides customers with choices and protects existing investments. For the storage pool, HP CloudSystem is optimized for HP 3PAR StoreServ arrays but supports EMC and NetApp products as well as other HP storage. The compute pool can consist of HP blade or rack servers, but non-HP servers are supported for virtualized environments. Network support consists of HP Virtual Connect and support for a broad range of Cisco and Brocade devices. Virtualization options include VMware, Microsoft Hyper-V, Red Hat KVM, and HP Integrity VMs, all managed through HP Cloud Service Automation. No other company offers customers this range of choice and flexibility in cloud deployment.

HP – Scorecard Analysis

Business Criteria/Score	Comments
Investment Protection 5	HP allows the use of HP physical servers and HP Blades (both x86 and Itanium-based) that are already installed at a customer site for the compute resource. HP also supports the integration of server, storage, and network components from other vendors that may already be installed at customer sites. HP CloudSystem provides the most flexible offering available in the market today.
Ease of Use 4	HP CloudSystem includes several underlying software tools for orchestration, lifecycle management, and self-service portals. There were initial issues with the inconsistent look and feel of these tools, but with the most recent release of CSA, HP has made great strides in delivering a cleaner and simpler user experience.
Time to Cloud Deployment 4	Ordering and shipping appear to be within 30 days. Cloud Maps provide the templates and proven methods to accelerate implementation of strategic applications. Extensive consulting services that range from workshops to full cloud rollouts are available.
Open 5	Multiple hypervisors are supported by HP CloudSystem, including VMware ESX/ESXi, Microsoft Hyper-V, Red Hat KVM, and HP Integrity Virtual Machines. In addition, HP Cloud Maps can be deployed across various devices, from HP and other vendors, including rack-based servers and SAN-based arrays. HP already supports infrastructure provisioning through OpenStack.
Risk 4	HP CloudSystem has been evolving for more than two years and continues to show tremendous improvement with each new release. Turmoil at the senior executive level appears to have quieted and has not negatively affected commitment to the strategy.
Support 3	HP offers a broad range of support options with varying degrees of features and response times. If a customer decides to purchase a fully integrated HP CloudSystem, they can – with a single call – expect to enjoy the highest degree of support across all layers. Testing of firmware releases across CloudSystem is comprehensive. If customers take advantage of the open architecture and deploy the cloud across other platforms, then some of the support burden will fall on the customer's shoulders.

Technology Criteria/Score	Comments
Compute 5	HP Blades account for approximately 50% of the installed base of the x86 blade market worldwide. The choice of Intel or AMD blades and management tools makes HP the clear leader in this area. The inclusion of support for physical servers, x86 Blades, and Integrity Blades for HP-UX is a benefit for this customer base. HP CloudSystem also extends this support to other x86 physical servers.
Storage 3	With the acquisition of 3PAR for SAN and LeftHand Networks for iSCSI, HP now has the most modern and feature-rich product line in the industry. HP deserves credit for offering the ability to integrate the older XP and EVA arrays in CloudSystem, but customers should consider CloudSystem, which includes HP 3PAR StoreServ, because it is optimized for the cloud. Purchasing HP storage is not a requirement because HP supports the use of storage from EMC and NetApp with CloudSystems.
Network 4	HP Virtual Connect provides SAN and TCP/IP connectivity with network virtualization and “wire once and change on the fly” infrastructure, which are critical to the cloud. There is also an emphasis on east/west network communications, critical for inter-application communication and movement of virtualized instances across the chassis.
Virtualization 4	HP CloudSystem provides customers a choice of products from HP, VMware, Microsoft, and Red Hat. HP addresses the large installed base of VMware sites with extended VCloud Director integration. HP CloudSystem includes auto flexing technology that can scale the entire cloud stack in minutes.
Management/ Automation 4	All CloudSystem solutions provide hardware and application provisioning, monitoring, access to performance advice, and the ability to use the library of Cloud Maps for rapid deployment. Customers can manage applications to infrastructure throughout the entire lifecycle via a single services view. The Cloud Service Automation software adds the self-service portal, lifecycle management, and chargeback/showback features. CloudSystems are designed to integrate with additional HP cloud empowerment software, such as Tipping Point and Asset Manager. It is the most complete cloud management offering supported by a single vendor.
Security 3	As part of CloudSystem, HP supports multi-tenancy, allowing all cloud resources to be shared dynamically and securely. Three levels of roles can be defined (console, organization administrator, and self-service portal), each of which has control of its own virtual I/O system. Roles are defined through a series of templates that ensure consistency and are integrated with Active Directory. With the addition of HP TippingPoint to CloudSystem Enterprise, customers can extend the firewall protection and intrusion detection technology beyond the traditional physical data center to the virtualized environment with, for example, integration in VMware vShield products.
Templates 4	HP Cloud Maps provide the fastest way to create new application services by delivering consistent, proven deployments, which lower risk and assure optimized performance and service levels. These customizable catalogs of application services and workflows allow for push button deployment for leading business applications such as Microsoft Exchange, SharePoint, IBM DB2, SQL Server, Oracle Database, Oracle E-Business Suite, SAP, and IBM WebSphere. Customers can choose from more than 200 different Cloud Maps to use right out of the box, to modify, or to build new to meet their requirements. HP Cloud Maps can also deploy applications on other environments, such as rack-based servers and non-HP hardware.
Hybrid Deployment 3	HP CloudSystem provides out-of-the-box capabilities to extend into other private or public clouds. Workload can be shifted for additional computational capabilities on a pay-as-you-go basis. With CloudSystem, customers can connect from one CloudSystem to another to share resources and obtain optimum utilization. Customers can become their own in-house service providers and manage internal resources and capacity. Supported public cloud providers include Savvis, Amazon EC2, and HP Cloud Services. HP has also published specifications that will allow other partners to certify their own hybrid connectors, so this list should quickly increase. HP supports Hybrid Cloud delivery through OpenStack.

HP CloudSystem Total Score = 55

IBM PureSystem

IBM PureSystem is IBM's family of integrated infrastructure solutions. One of these solutions is the IBM PureFlex System. It provides the integrated infrastructure of server, storage, network, management, and security in a bundled configuration designed specifically for the cloud. The IBM PureFlex System is offered in several implementation options, from small business up to enterprise-class configurations. Each option includes a set of compute, storage, management, and automation software. IBM Flex System Manager is designed to consolidate resource pool management so IT can manage the workload rather than the supporting infrastructure. Current IBM WebSphere and DB2 customers are encouraged because the service catalogs include support for those products.

IBM PureSystem was released in the spring of 2012 to offer an integrated cloud product set. The stated goals of these products were to build in expertise, integrate by design, and simplify customer experience. The PureSystem family of products includes several solutions:

- IBM PureFlex System is the basic infrastructure packaging for cloud implementations. It contains the resource pooling, web-based provisioning portal, and operations automation that allow customers to implement a cloud quickly.
- IBM PureApplication Systems are bladed appliance-based solutions with middleware and VMware pre-installed. This platform is designed and tuned specifically for web-based transactional and database applications. It is built upon the infrastructure of the PureFlex System.
- Pure Data Systems are appliances for specific transaction types and for data analytics, which are powered by the Netezza software.

The latter two solutions provide interesting values for certain business needs, but they are outside the scope of this analysis. The IBM PureFlex System provides the infrastructure and cloud enablement software that more directly compares to the other solutions included in the study.

The IBM PureFlex System provides the basic infrastructure for IBM's vision for the cloud. This system integrates bladed processors, storage, networking, and software. IBM does not allow customers to use existing IBM products. These systems must be purchased as a bundled solution. The one exception appears to be storage, which is based on the Storwize V7000. The V7000 can visualize other, non-IBM arrays. Customers will be able to protect their current storage investment with this feature if they do not mind introducing this storage virtualization management layer into their storage environment. For compute resources, the PureFlex System uses x86 and POWER7+ nodes. These compute nodes use a new chassis that is not backward compatible with IBM BladeCenter and cannot use existing blades.

IBM provides support for a broad range of operating systems, including Microsoft Windows, AIX, IBM i (AS400), Red Hat Linux, and SUSE Linux. The supported hypervisors are VMware, HyperV, KVM, and PowerVM. In that sense, the architecture is more open than a competitor such as VCE. There is also support for DB2 and WebSphere middleware, and the IBM-installed base can leverage their existing knowledge base in this software.

IBM Flex System Manager software is pre-installed on a dedicated server appliance in the PureFlex System cabinet. This software integrates the management of the x86 or POWER compute nodes, hypervisors, workloads, storage, and networking resources found in the PureFlex System. There is a graphical view of the chassis to aid with trouble shooting. The goal is to allow IT to manage the workload rather than the individual components. It is a single point of control for physical and virtual devices. For additional functionality, such as asset management and executive dashboard, the Tivoli service management portfolio can also be leveraged through Flex System Manager.

SmartCloud Entry (SCE) provides most of the private cloud enablement features. It is pre-installed on Standard and Enterprise editions of PureFlex Systems. This software is designed to build on a hypervisor virtualization infrastructure. A web-based interface allows users to request and provision an environment quickly. Access can be secured through a process known as "Projects," which controls which team members can access which resources. System managers can monitor the entire cloud infrastructure to improve utilization and efficiency. Multiple Flex System Manager appliances and VMware instances can be managed through SCE.

IBM also provides “patterns of expertise,” pre-tested service catalogs, to automate infrastructure deployments and manage solutions based on IBM software products, such as DB2, WebSphere, and applications from IBM partners. These patterns can include features such as high availability, multi-tenancy, and security. These patterns allow VM instances with software to be copied, reused, and moved to other clouds. Customers can deploy these out of the box or can modify them to suit specific requirements. There are three types of patterns:

- Infrastructure to implement server, storage, network, and virtualization elements.
- Platform patterns to support middleware and databases.
- Application patterns to guide business-level app rollouts.

Recently, IBM announced plans to participate in the OpenStack Foundation as a Platinum Member. This change in strategy is a major new commitment by IBM. Which portions of the OpenStack code that IBM will support is not clear at this time. Even though the plans are still evolving, this announcement is good news for IBM and for this important open source community.

IBM – Scorecard Analysis

Business Criteria/Score	Comments
Investment Protection 3	The IBM PureSystem is completely disruptive hardware technology because it cannot use an existing BladeCenter chassis or other servers. This shortcoming is disappointing considering the large IBM-installed base of x86 and Power platforms. Scalability (at least scale-out) appears robust. IBM also includes support for DB2 and WebSphere, so current customers may be able to leverage their knowledge base easily in those products.
Ease of Use 4	The IBM Workload Deployer tool has administration and self-service portals in a single interface. However, other tools, such as IBM Flex System Manager, are required to manage the full environment. Further tool integration is required to improve this score.
Time to Cloud Deployment 4	IBM claims delivery within 30 days of receipt of order. IBM patterns of expertise provide methods and processes to set up services quickly. However, manual scripting appears necessary to optimize deployments. IBM offers a broad range of implementation services and expertise to help customers during startup.
Open 3	IBM supports the full range of hypervisors. The integration of other storage through the IBM Storwize V7000 virtualization capability provides a certain level of openness. The inclusion of other heterogeneous infrastructure components is disappointing and will raise the cost of these implementations.
Risk 4	IBM is always a low-risk partner for customers, but it may take some time to get products and people ramped up. Although the PureFlex solution is relatively new, the underlying technologies are proven. It may be a safe choice, but it has limitations for customers who are not committed to IBM software.
Support 3	IBM has the expertise and organization to provide very high levels of support that can meet customer needs. The base technologies within the PureFlex systems are well known and widely supported, so technology support should not be a problem.

Technology Criteria/Score	Comments
Compute 3	IBM offers customers the choice of POWER7+ or x86 servers. Although IBM blade sales have recently lagged behind the market, they still provide a solid foundation in this area. Support for POWER7+ is a niche advantage for existing IBM customers.
Storage 3	IBM claims that the Storwize V7000 can provide the required IOPS to satisfy the demands of the PureFlex System. Performance could be an issue when other vendors' storage is accessed through the virtualization capability of the V7000.
Network 3	The IBM PureFlex System network supports a wide range of network connectivity components that are virtualized and managed. Inter-chassis communication appears adequate.
Virtualization 3	Support for a broad range of offerings, including VMware, AIX, and Linux KVM, appears strong; however, the functionality for VMware and Microsoft Hyper-V appears to be limited to only deploying virtual machines.
Management / Automation 4	IBM loosely integrates multiple products to achieve the full range of capabilities for a private cloud. Today, IBM FlexSystem Manager is a management island that can manage only the IBM PureSystem, not external or heterogeneous resources. IBM Workload Deployer and Smart Cloud Entry provisioning tools are also required to round out the offering.
Security 3	The centrally controlled access and permission should provide a typically-desired level of security for the private cloud.
Templates 3	IBM provides "patterns of expertise" that offer templates and best practices to help customers accelerate implementation. The list appears extensive, but many of these patterns are for AIX, which is not of interest to many customers. There is deep integration with IBM WebSphere and DB2. Expect this list to evolve given IBM's broad reach and experience. For customers primarily interested in using AIX, DB2, or other WebSphere products, add one point to this rating.
Hybrid Deployment 2	IBM patterns of expertise allow customers to create and migrate proven instances between private, public, or hybrid clouds. Support for OpenStack has been announced, but the interface with the product set to aid with hybrid deployment is not yet available.

IBM Pure Systems Total Score = 45

VCE Vblock

VCE was formed as a joint venture by Cisco and EMC, with minor investments from VMware and Intel, to provide integrated infrastructure products. The results of this partnership are VCE Vblock products based on Cisco UCS servers, Cisco network components, EMC storage arrays, and the VMware virtualization suite. The four base systems differ primarily in the number of blade servers and the type of storage array connected. The bundled systems are designed for customers looking to build out VMware infrastructure with pre-configured systems. Additional software from other companies such as CA Technologies or BMC Software is required to build out a private cloud. Since this cloud management software from CA or BMC is not provided as part of the VCE Vblock products, it is not included in this evaluation.

Each Vblock has a base model with room to add to the server, storage, and network pools. The Vblock Series 320 and smaller systems are based on the EMC CLARiiON VNX array, while the Vblock Series 720 features the EMC VMAX. The much smaller Vblock 100 and 200 systems are aimed at mid-market-sized customers and the remote sites of larger organizations. These Vblock systems are based on a closed architecture that cannot leverage a customer's existing investments in infrastructure. The Vblock is essentially a hardware platform bundled with VMware. Thus, Vblock has limited capabilities to build out a fully automated and orchestrated cloud system for customers. Customers have found that upgrades are restricted, typically in Vblock increments.

EMC Ionix Unified Infrastructure Manager/Provisioning (UIMp) is the recommended Vblock provisioning tool, but it is optional. The goal is to have UIMp replace all native management tools that manage and provision the compute, storage, and network resources. Over time, UIMp has improved, but some access to native tools may be required for specialized functions. Overall, UIMp does appear to provide basic provision capabilities. One shortcoming with UIMp is that it sees only what has been allocated to vCenter and has no access to resources that have not been assigned.

Vblock – Not Quite a Complete Private Cloud Solution

Vblock is often positioned as a private cloud solution, thus its presence in this analysis. However, we caution buyers that Vblock is an incomplete private cloud offering. For Vblock to provide cloud functionality that is similar to HP and IBM, customers must purchase additional management software from VMware or another company. VMware vCloud Suite provides this cloud enablement software for private clouds. It includes familiar VMware software, such as Site Recovery Manager, vCloud Connector, and vCloud Director. With vCloud Suite, customers can enable a private cloud with policy-controlled self-service portals. vCenter Operations Manager provides performance monitoring and proactive alerting. The Enterprise edition includes features for chargeback, configuration management, and application dependency mapping of VMware VMs. VCE does not directly support vCloud Suite but relies on VMware for this support.

The management message for VCE becomes more confusing because of different levels of support from VMware for certain functionality. For example, vCloud Suite includes vCloud Automation Center to combine lifecycle management with self-service provisioning. The VMware vCloud suite supports HyperV, Xen, and KVM across HP, IBM, and Dell platforms but VCE does not support these hypervisors on VCE Vblock. This support must come directly from VMware. Since VMware also supports the vCloud Suite on HP and IBM infrastructure, vCloud Suite fails to provide any real differentiation for VCE.

VCE recently announced its first piece of intellectual property. Vision Intelligent Operations Software collects discovery, compliance, and error logging information from the underlying hardware technologies. The software has native integration with the VMware vCenter and vCenter Operations Manager. The software also contains open APIs for integration with other higher-level management tools.

Customers that want to round out VCE products and provide a unified management solution across cloud and traditional IT infrastructures will need software from another vendor, such as CA Technologies or BMC Software. HP and IBM already provide one-stop shopping for a full catalog of cloud enablement and IT infrastructure management across heterogeneous environments. The bottom line is that customers will obtain a more unified management solution from HP and IBM.

The market is moving beyond VMware-only solutions with the emergence of other hypervisors and OpenStack. Cisco, EMC, and VMware all support OpenStack today with announced plans to use it for provisioning their different technologies. However, there is no evidence that VCE has plans to support OpenStack and, therefore, runs the risk of falling behind HP and IBM, who are aggressively supporting it.

The larger concern for customers making this investment is the question as to whether this partnership will survive. Cisco and EMC claim continued support and faith in this arrangement, but their actions show that they are actively pursuing alternatives. Cisco works with NetApp on the FlexPod converged infrastructure offering, but this is not a complete cloud offering. EMC has signed a deal with Lenovo to make and sell X86 servers that will be embedded in selected EMC storage systems. VMware purchased Nicira, a software-defined network company, which competes against Cisco offerings. The history of alliances shows that they are not built for the long term but fit only an immediate need that members cannot individually fulfill with current products. What will happen to customers when the alliance fails? Customers should consider this before investing in VCE technologies.

VCE – Scorecard Analysis

Business Criteria/Score	Comments
Investment Protection 2	VCE does not permit the inclusion of any other products, even identical hardware from VCE partners. Customers must order a new freestanding environment.
Ease of Use 3	Setting up this new environment should be relatively easy for customers because VMware technologies are already in use at many customer sites.
Time to Cloud Deployment 3	VCE offers a simple process to order one of the pre-designed systems with delivery in 30 days. The time required to stand up the virtualized environment is not stated, but it should be relatively fast because VCE's rigid product offerings keep the scale limited. However, setting up a VM is a more limited capability than standing up an application, so this offering is less complete than HP's or IBM's.
Open 2	VCE is focused on VMware and does not offer support for other hypervisors. The environment is very closed, with no connectivity to other vendors' components. All server, storage, and network resources must be purchased as part of Vblock. OpenStack is not included.
Risk 2	The VCE partnership of EMC and Cisco is more than reference architecture but it is much less than a stable company. Events of the last several months call into question the partners' commitment. EMC announced a partnership with Lenovo for x86 servers, and VMware acquired Nicira, a network management software company, which was also being courted by Cisco. In addition, NetApp's work with Cisco on FlexPod, a more limited cloud product, is causing strain. Customers wanting full cloud features are required to invest in software from BMC, CA, or limited offerings from VMware, which further complicates the entire rollout. In our opinion, the long-term prospects for this partnership are not good and compound the risks associated with this offer.
Support 3	As VCE is focused on a limited product set, the support should be good. They promise that a single contact will be able to provide support across the technology stack. Problems may occur when more complex problems arise, which may require inter-partner teams to resolve. This problem can only increase as customers add cloud management software.

Technology Criteria/Score	Comments
Compute 3	Cisco claims sales of UCS blades have moved them to second place in terms of the U.S. blade market share. They may be gaining traction, but product capabilities still lag well behind HP, who is both the worldwide and U.S. market leader.
Storage 4	EMC VNX and VMAXe storage arrays are the core of the VCE Vblock and are the strongest part of the product set. EMC's tight alignment with VMware product direction ensures that this storage will perform well in this environment. VCE also offers integration with EMC Avamar and Data Domain backup/deduplication products as an option for additional data protection, a first among the vendors.
Network 3	Cisco Nexus and MDS switches are included in Vblock, and Cisco is the largest player in the network industry. However, internal cloud performance demands low latency and high throughput east/west communications. VCE uses traditional north/south communication paths, which can generate bottlenecks during peak I/O periods, such as when using vMotion. The critical in-cloud communications drive performance and end-user satisfaction.
Virtualization 3	As VMware provided initial funding for VCE, the integration of this hypervisor should be very tight. The lack of inclusion for support of other hypervisors negatively impacts this rating. Even if VCE starts to offer other hypervisors, it will have limited experience compared with competitors.
Management/ Automation 2	Vblock includes Vision Intelligent Operations to mediate communication between the hardware and the other companies' tool sets. VCE does not offer any cloud enablement software, which forces customers that want to build out a private cloud to purchase this functionality from other companies. Customers that want an integrated cloud solution from a single vendor should consider this shortfall before making this choice.
Security 3	VMware vShield allows customers to secure remote access, meet compliance requirements, and share infrastructure. There is no support for resources that sit outside the cloud. Additional software from another vendor should be considered if management extends beyond Vblock.
Templates 3	VCE does not appear to offer templates above and beyond what is commercially available from VMware. There are ways to set up VMs and initiate ways to make them portable within their cloud, but this capability is true of any VMware site. Partnerships with other companies, such as CA and BMS, are required to fulfill this capability.
Hybrid deployment 2	Access to other clouds is limited to the portability of VMs. It is possible to create a copy of a VM and port or replicate that copy to another VMware-enabled cloud. There is nothing unique about this capability because customers can implement it across IBM or HP infrastructures, which run VMware.

VCE Vblock Total Score = 38

Conclusion

Based upon the results of this cloud technology review, HP CloudSystem has the top scorecard: HP – 55, IBM – 45, and VCE – 38. We noted that all three vendors need to improve their methods of integrating management and automation tools into a tight and coherent set with a similar look and feel.

Several points stand out in HP's favor:

1. **Open heterogeneous resource pools** – HP has tested and supports the inclusion of heterogeneous computing, storage, and network technologies from other vendors. Neither IBM nor VCE offers this capability.
2. **Broad range of hypervisor support** – HP supports hypervisors from VMware, Microsoft, and Red Hat, and has tested most of the available functionality. This support provides customers' choice in the initial implementation as well as choice for future deployments.
3. **Easy entry for cloud enablement** – As HP does not require a complete replacement of existing hardware, customers can begin their cloud implementation by adding CloudSystem Matrix software or CSA to their environment.
4. **Hybrid deployment** – HP has built and tested the connection to key public cloud providers, including HP Cloud Services, Savvis, and Amazon EC2. With the ability for customers to increase the compute and storage capabilities of their hybrid cloud, the on-premises cloud can be much smaller.
5. **Lowest risk** – HP has a complete portfolio of cloud capabilities and services to ease entry into the cloud. The open nature of these offerings ensures an initial low-cost entry point and provides a clear path to scale.

HP demonstrated the ability to leverage current investments in server blades, storage, networking, and software into cloud-based solutions. The functionality in HP's Cloud Service Automation software leads the market. We recommend HP leverage their strength in server blade technology to gain a leadership role in cloud computing solutions. HP is the one vendor that is strong across all necessary product areas for building a cloud.

With HP, customers can begin the journey to the cloud at various entry points and can rest assured that open choices can be maintained over the long term. The benefits of rapid provisioning, self-service portals, and automated life-cycle management can be reaped without vendor lock-in. Current HP BladeSystem customers have a low risk path to deployment. Add HP Virtual Connect, and the hardware infrastructure is cloud-ready. With the addition of CloudSystem Matrix software, this system can pool resources, provide the self-service portal, and start to provision.

IBM's score brought it in at second place. Among the most significant issues lowering the company's score were shortcomings in support for the features of VMware and Microsoft Hyper-V, such as the ability to capture and deploy virtual servers and workloads. IBM does not fully embrace the same level of openness as HP and does not protect customers' investments in its current blade infrastructure. However, IBM customers that use AIX, DB2, and WebSphere should be pleased that these products are supported. IBM customers that do not use these tools will be less impressed with the patterns of expertise and this portfolio. It appears at this time that IBM is most interested in protecting their software-installed base. We found, through discussions and interviews, that IBM does not have its hand in as many competitive deals as do HP and VCE. This would indicate that IBM's first push is into their installed base.

VCE Vblock has an excellent story about VMware implementation, but there is no support for other hypervisors. The architecture is closed with fixed configurations and no support for a customer's existing infrastructure. This will often result in higher acquisition costs. For a VMware-only implementation, Vblock should work well. In the long run, these limitations could hurt customers that want to leverage the competitive advantages of emerging technologies. The Vblock locked-down configurations make it easier for VCE to provide support, but escalating support issues to multiple partners could lengthen the time-to-problem resolution. Vblock is adequate for a certain set of situations but does not provide enough functionality for customers that want open enterprise cloud computing. Vblock does not provide a complete private cloud solution, because it lacks the orchestration and provisioning of HP and IBM cloud solutions. Customers that do not want to be locked to a vendor should invest in other technology. The scorecard in our evaluation supports this conclusion.

Scorecard Summary

Evaluation Criteria	HP	IBM	VCE	Comment
Investment Protection	5	3	2	Only HP provides support for servers from other vendors, physical rack servers, and storage from EMC and NetApp. In addition, more virtualization options are available from HP.
Ease of Use	4	4	3	VCE's rating is skewed higher by the fact that only VMware is available as a virtualization choice and that this software is a well understood product. In the long run, HP's and IBM's fully automated solutions will prove easier to use and have lower operational costs.
Time to Cloud Deployment	4	4	3	All reviewed vendors promise 30-day delivery. The difference will be in how fast applications can be set up. IBM and HP have a clear advantage in their pretested templates, but HP Cloud Maps cover a wider range of applications.
Open	5	3	2	HP's open architecture approach provides customers with more flexible deployment options. IBM supports the full range of hypervisors and OpenStack but cannot use heterogeneous resource pools. We consider VCE a closed environment that does not offer alternatives.
Risk	4	4	2	HP and IBM are safe choices, but the IBM PureFlex System is still relatively new and more focused on the IBM installed base. The VCE coalition is high-risk for a long-term roadmap.
Support	3	3	3	VCE support promises integration of all involved coalition partners, but customers should expect conflicts during complex outages.
Compute	5	3	3	HP has the advantage because of the dominant market position of its BladeSystem products. Although IBM blade sales have lagged, the support of AIX servers helps IBM's score.
Storage	3	3	4	The integrated storage solutions from HP, IBM, and VCE provide different advantages without a clear-cut leader. VCE has an advantage with the inclusion of EMC Avamar and Data Domain advanced backup and replication tools. HP and IBM have yet to integrate their equivalent backup products.
Network	4	3	3	HP's score is higher because HP's offering is optimized for inter-chassis communication within the cloud.
Virtualization	4	3	3	HP's support of capabilities within Microsoft and VMware hypervisors is more complete than IBM's.
Management / Automation	4	4	2	VCE's score is low because yet another partner is required to bring these systems to equivalent functionality that would be similar to the other cloud offerings.
Security	3	3	3	All the reviewed products provide adequate security within the base product offerings. Customers should be prepared to invest in additional levels of security to extend firewall protection and intrusion detection capabilities.
Templates	4	3	3	HP Cloud Maps address common commercial applications while IBM is more focused on its installed base of WebSphere and DB2 customers. HP and IBM offer application-aware maps to allow customers to set up applications quickly. VCE offers standards only for VMware instances.
Hybrid Deployment	3	2	2	Extending to other cloud environments offers customers a good opportunity to size initial cloud implementations small and to scale them as needed. These current capabilities are still evolving. Customers should see features expand and the list of supported partners grow with new standards such as OpenStack.
Total	55	45	38	

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