Abstract

Data center virtualization (the virtualization of servers) has provided dramatic benefits to IT organizations through improved economics driven by server consolidation, and by allowing many servers of many different types to be abstracted into virtual machines which can then be managed more efficiently and with greater IT agility.

However, the virtualization of servers and the associated benefits is just the first step on a journey towards a more fundamentally agile, efficient, dynamic, and responsive IT organization - one that is a true asset to the business, and one that is a source of true business agility and competitive advantage to the business.

Realizing these benefits means that IT organizations will need to continue the virtualization of complex multi-tier business critical applications, the self-service aspects of IT delivery commonly associated with public clouds, the use of a mixture of private, hybrid and public clouds, and highly automated IT operations and service delivery into one Cloud and service delivery model with the ability to measure and track costs across cloud execution options.
Running IT with the agility and cycle times associated with a public cloud while addressing the business-critical enterprise class workloads that IT is counted on to be able to support will require an entirely new stack of management software than what has prevailed in the legacy physical and static data center. This paper outlines the criteria for such a new management stack and then compares the VMware vRealize™ Suite and several leading alternatives against those criteria.
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I. Introduction - The Software-Defined Data Center

VMware and other providers of data center virtualization software have proven that there are significant cost savings and improvements to operational agility that come from the virtualization of the CPU and memory resources (collectively referred to as “compute” in the diagram below).

The Software-Defined Data Center (the SDDC) expands upon the virtualization of compute resources in several important respects:

- The SDDC includes the virtualization of not just compute, but also the virtualization of storage and networking. Once the ability to virtualize all of the resources in the data center exits, the configuration of the resources in the data center will be done in the virtualization platform, allowing for a unified configuration model for the SDDC, and allowing for these unified configurations to follow workloads as they migrate across servers, clusters, and clouds.

- Many data center services that today rely upon dedicated and specialized hardware will be replaced or significantly augmented by software services that plug into the SDDC. This will allow for the configuration of these services to be added to the unified configuration model of the SDDC.

- Cloud Management software will take advantage of the ability to configure the SDDC in software by surfacing services and applications in a service catalog and then provisioning those services in an automated manner - while following the policies that apply to those services and the users requesting those services.

- Many organizations have adopted heterogeneous approaches to public clouds and heterogeneous approaches to the Software-Defined Data Center.
The above factors combine to create a new for a new approach that can effectively manage IT Operations, Cloud Operations, and costs across these environments.

II. Legacy Management Approaches

Heavyweight Legacy Management Frameworks
Over the course of the last 30 years, major management vendors like IBM, BMC, HP and CA have built and acquired large suites of management software. The objective of these suites was for one product to be able to “see and manage everything” and to give the enterprise “a single pane of glass” for the management of their environment.

Unfortunately, the promise of management frameworks was not kept. Acquired products never got completely integrated resulting in multiple consoles and multiple databases. This lack of integration prevented these frameworks from accomplishing their most important task - allowing IT to operate with the agility required in the mobile and cloud era. The fact that most management frameworks are in reality poorly integrated Franken-Monitors simply prevents these products from doing the job that customers spend a great deal of time and money to achieve. Customers needing tight integration often had to spend a small fortune on services from the framework vendor to create and maintain these integrations. This problem is made worse by the fact that in some cases vendors have built brand new components for cloud management to address market needs, but these new components are not integrated with the rest of their management frameworks. These frameworks are now combinations of new and old components that will never operate as a cohesive whole for their users.

Silos of Non-Integrated Management Tools
Since the enterprise management frameworks were most often collections of poorly integrated acquired products, the individual products ended up being far from “best of breed”. While senior management may have thought that the management problem has been solved when the ELA for the framework got signed, the people who had to use the tools to do their jobs faced the reality that many of the point products in the framework were not up to the task. This resulted in most companies buying additional products that met specific needs, which resulted in many companies owning over 100 different management tools to manage different silos and layers of their environment.

ITIL Based Processes and Products
ITIL was an attempt to standardize the processes and procedures by which IT operated. An entire generation of management products was then delivered which was declared by the vendors to be “ITIL compliant”. Included in this attempt at standardization was the requirement to document processes and apply changes to the environment to a change control process. However the net
effect of the ITIL processes and the tools that implemented them was to impede the agility of the IT department by attempting to slow down the rate of change. Agile Development and DevOps are both new processes that were invented in order to allow enterprises to more effectively respond to the needs of the business through continuous integration and delivery. Management tools that cannot operate at the speed of Agile Development and DevOps are simply out of date.

**Scripts**

To the extent to which automation of any kind was implemented it was often implemented via custom scripts written by one or more IT operations staff. These scripts proved to be impossible to maintain and proved to be a completely unsuitable foundation for a robust strategy to automate the operation of the dynamic data center.

### III. SDDC and Cloud Management Challenges

**Dynamic Operating Environments**

Everyone who has implemented server virtualization understands that something as simple as a vMotion provides for a level of dynamic operation that was simply impossible in the physical world. The SDDC will take this level of dynamic behavior much further as the configuration of compute, memory, networking and storage will all be done in the virtualization platform. Centralizing the control of all of these functions will allow for them to be changed very quickly - for example as workloads are moved around. Responsibility for the execution of some of these functions will now also be done in software. Some of the network I/O and some of the storage I/O will now occur in the virtualization platform itself before being handed off to hardware.

**Scaled Out (not Up) Deployment Models**

The continued improvements in the price/performance of commodity Intel based servers along with the emergence of lower cost open source alternative application platforms like Linux, JBoss Application Server, and Apache Tomcat means that it is now much less expensive to have large numbers of “smaller” commodity servers than it is to have a small number of high end servers that maximize CPU count and memory size.

The economics of commodity hardware and open source application platforms have made it inexpensive to scale server farms out not up. The combination of agile development, modularized software, and scaled out deployment models means that we now have application systems that run on hundreds and in some cases thousands of interconnected servers instead of just a few very large and expensive boxes.

**Distributed (Cloud) Deployment Models**

Workloads are increasingly being distributed across data centers owned by the enterprise, and distributed across data centers not owned by the enterprise (hybrid and public clouds). Management
tools need to be able to follow the workloads around as they are moved from one data center or cloud to another.

**Agile Development**

The unrelenting pressure to deliver more application functionality in less time has given rise to a revolution in the process by which software is developed and updated.

Agile Development focuses upon having one small team of developers responsible for each component of an application system, and then having those developers work as a self-coordinating team to deliver new functionality into production on regular and short time intervals (every week, two weeks or at most a month).

The combination of Agile Development, scaled out deployment models, distributed deployment models and dynamic/shared execution environments (virtualization) creates a set of requirements that legacy tools cannot meet. These tools simply have too much administrative overhead and are too costly to keep up with the pace of change in these new agile environments.

**DevOps**

DevOps has come into being in order to allow rapidly changing applications to be effectively supported in production. DevOps requires that Operations and Cloud Management tools support the continuous iteration and tight workflows between applications and operations teams; needs unmet by legacy management tools.

**IV. The VMware vRealize Management Suite**

The VMware vRealize Suite is a suite of management solutions which collectively provide for the Cloud Operations, Cloud Automation, and Business Management services needed to manage a Software-Defined Data Center and any combination of a private, hybrid or public cloud components).
VMware’s vRealize Management Suite consists of several specific products. Those include vRealize Operations™ which provides for the performance, capacity and configuration management of the SDDC, heterogeneous environments (multi-hypervisor, physical) and hybrid clouds., vRealize Log Insight™ which collects and analyzes unstructured performance data (logs), vRealize Automation™ which allows for the automated provisioning of infrastructure services and platform services from a service catalog, and vRealize Business™ which provides for detailed and transparent costing of all of the cloud environments and cross-cloud cost comparisons, allowing IT to be run like a business. It is important to stress that VMware offers the most comprehensive and integrated suite of management and automation solutions to address the nature of management in the Software-Defined data center and the cloud.
V. Point Operations Management Solutions

Products that compete with the vRealize Operations portion of vRealize Suite broadly fall into two categories. There are legacy solutions that were built for the physical and static data center that preceded the current modern virtualized and dynamic environment. Vendors of these legacy solutions have been trying to modernize them to address data center virtualization. But these solutions were designed around a set of assumptions that no longer hold true in the modern data center. Specifically these legacy solutions assumed workloads dedicated to servers, and a very low rate of change. These assumptions drove the design of these legacy solutions, and have made it impossible for these legacy vendors to fully modernize these solutions for the modern dynamic and shared data center.

The second set of competitors are products that consume the standard vSphere API data, and just the standard vSphere API data. These products store that data in a database, provide a dashboard for that data, provide alerts on that data and provide reports on that data. The problem with these products is twofold. The first is that by being reliant on the same data that everyone else is reliant upon, these products struggle to provide unique and differentiated value to the customer. The second is that they all rely upon manual thresholding instead of automated analytics to understand the difference between normal and abnormal behavior. Manual thresholding simply imposes an unreasonable maintenance burden upon the users of an operations management tool - as in a dynamic environment the rate of change is too high and there are too many metrics of interest for humans to be able to correctly set and maintain thresholds. Most of these products also fail to combine unstructured log data with the standard structured performance data from the vSphere® API.

IBM, BMC, CA, HP Legacy Frameworks

Many enterprises have substantial investments in legacy management frameworks from IBM, BMC, CA and HP. These frameworks typically manage the entire physical hardware infrastructure of the data center including the storage arrays, the SAN, the internal IP network, the servers, and the WAN between data centers and the WAN between the data centers and the users or branch offices.

These legacy frameworks consist of the following operations management components:

- IBM - the Tivoli product line
- BMC - the legacy Patrol product line, and the current replacement for that product line - BMC ProactiveNet Performance Management including the entire BMC Cloud Operations Management suite
- CA - the legacy UniCenter product line, the legacy Spectrum product line which was originally the eHealth product line from Concord communications, and the currently marketed set of products which include Capacity Manager, Virtual Placement Manager, and Visual Infrastructure.
• HP - the legacy OpenView product line, and its current replacement, HP Operations Manager and the companion agentless solution - SiteScope

What all of these products have in common is broad and deep support for the legacy physical data center including all of its various hardware and software infrastructure components. What they also all lack is a modern design focused upon the operations management of a modern environment that consists of data center virtualization, private clouds, hybrid clouds, public clouds, and the forthcoming Software-Defined data center. Therefore for customers with a deep investment in these technologies, replacing them with vRealize Operations is not feasible - however neither is it feasible to expect these legacy management solutions to be able to manage the new dynamic and distributed Software-Defined data center. Customers with substantial investments in legacy frameworks from IBM, BMC, HP and CA should therefore augment those investments with deployment of vRealize Suite in order to be able to manage new, dynamic, and distributed environments.

CA Unified Infrastructure Management
CA Unified Infrastructure Management (formerly Nimsoft) is a low end and simple agentless commodity network and server monitoring solution. Nimsoft was originally designed for service providers, and was successful in this market because it provided a simple and affordable monitoring solution with multi-tenancy to this audience. CA acquired Nimsoft in March of 2010. Since the acquisition, CA has replaced most of the Nimsoft management team with CA veterans, who have made Nimsoft more expensive and more difficult to deploy.

CA Unified Infrastructure Management is now distinguished as being a low-end agentless monitoring solution with no analytics, no deep integration with virtualization platforms, no integration with cloud platforms and no companion log management solution sold at typically higher than acceptable CA pricing.

Since CA Unified Infrastructure Management has not been modernized to be able to keep up with the Software-Defined Data Center and the Cloud, customers would be well served not to consider it for these use cases and should instead focus on solutions like vRealize Operations which have modern up to date capabilities.

Dell Foglight for Virtualization, Enterprise Edition
Dell Foglight for Virtualization, part of the Dell Foglight product line (acquired as a part of the Quest Software acquisition), includes components for managing hardware, servers, networks, storage, and applications. The major benefit of Foglight for Virtualization is that other Foglight components that monitor deeper into the stack (like those that monitor physical servers, networks and storage) and those that monitor higher up in the stack (like those that monitor application performance) can be plugged into Foglight for Virtualization creating an end-to-end management solution.
The issue with Foglight for Virtualization is that Dell does not have an integrated cloud management suite of which Foglight is a part. Dell has no counterpart to either vRealize Business, or vRealize Log Insight.

Therefore, enterprises with a substantial investment in the vSphere platform, would be better served implementing an integrated management suite that covers Operations Management, Log Management, Cloud Management and Business Management. vRealize Suite covers these fronts and has the additional advantage of being deeply integrated into the vSphere platform, with excellent coverage of both on premise assets and assets running in public clouds.

**Microsoft Systems Center Operations Manager (SCOM)**

Microsoft Systems Center is the leading operations, performance, capacity, configuration (through System Center Configuration Manager) management solution for the Microsoft Windows platform, and the Microsoft provided infrastructure applications (SQL Server, IIS, SharePoint, and Exchange Server) that run on the Microsoft platform and its associated virtualization layer - Microsoft Hyper-V (through System Center Virtual Machine Manager).

Therefore, enterprises with a substantial investment in the Windows platform, and Microsoft server based applications running on that platform are making a rational choice when they choose to use Microsoft Systems Center to manage their Windows assets as Systems Center contains deep management capabilities for the Windows environment not offered by other management software vendors.

However, when it comes to managing a modern virtualized data center with a private or hybrid cloud built on top of it, and the forthcoming private/hybrid/public cloud environments, especially one based upon the VMware vSphere platform, Microsoft System Center has the following significant gaps:

- System Center is missing the cross-hypervisor and cross cloud operations management capabilities present in vRealize Operations.
- System Center is missing the cross-hypervisor and cross cloud automation capabilities present in vRealize Automation.
- System Center is missing the cross-hypervisor and cross cloud business management capabilities present in vRealize Business.
- System Center is missing the ability to collect and analyze log data present in vRealize Log Insight.
- Systems Center is missing the ability to apply sophisticated self-learning analytics to IT Operations metrics and log data - which are core capabilities of vRealize Operations.

Therefore enterprises with a substantial investment in the Windows platform may well choose to manage physical Windows servers, virtualized Windows OS instances, and the Windows applications that run on these instances with SCOM. However for a customer with a joint and heavy investment
in VMware vSphere and Microsoft Windows, VMware vRealize Operations is a better choice to manage the operations, performance, capacity, configuration and chargeback for the virtualization platform and the clouds that run on this platform. VMware vRealize Operations has the following advantages of Microsoft SCOM in this respect:

- vRealize Operations provides an integrated operations, performance, capacity, and configuration solution that supports vSphere and all of the guest operating systems that run on vSphere, as well as the Microsoft Hyper-V platform through the use of the Hyperic agents for Windows.

- vRealize Operations is based upon self-learning performance and capacity analytics that automatically and continuously learn the normal state and behavior of the environment. This leads to a dramatically lower cost of ownership and dramatically lower admin requirements as the product reacts automatically to the changes that occur in a dynamic, shared and cloud based environment.

- vRealize Suite includes vRealize Log Insight. This allows for Operations Management decisions to be based upon a combination of vSphere Operations metrics and log data, a capability completely missing from System Center.

- vRealize Suite includes vRealize Business which tracks the true costs of operating clouds across various options for implementing clouds, include in house private clouds, hybrid clouds and public clouds like Amazon and Azure.

- For customers with a substantial investment in Windows and SCOM, vRealize Operations is integrated with SCOM via its SCOM connector. This allows data from SCOM to be fed into vRealize Operations, combining detailed Windows metrics with the vSphere metrics that vRealize Operations collects for automated modeling and thresholding via vRealize Operations self-learning analytics.

In summary, enterprises with a substantial investment in both VMware vSphere and Microsoft Windows may well choose to manage their Windows assets with Microsoft SCOM. But the operations management of the data center virtualization, private cloud, and hybrid cloud environment, even if it spans VMware vSphere and Microsoft Hyper-V, is better accomplished with VMware vRealize Operations for the reasons cited above.

**SolarWinds**

SolarWinds Virtualization Manager is an Operations Management solution for VMware vSphere and other virtualization platforms. Virtualization Manager offers basic dashboards, capacity management, performance management, sprawl detection, and configuration drift detection. The focus of the solution is smaller environments which are complemented by a download driven evaluation and sales model.

SolarWinds Virtualization Manager is not an enterprise grade Operations Management solution. The lack of self-learning analytics makes it unable to deal with large scale, complex, and dynamic environments like private clouds, hybrid clouds and the forthcoming Software-Defined data center.
SMB and SME customers who do not have the need for enterprise grade operations management solutions and who have smaller environments should consider SolarWinds Virtualization Manager as a point solution. But those doing so should be aware that just because you do not have a large environment does not mean that you will not want to have a private cloud, a hybrid cloud, or take advantage of the Software-Defined data center in the future. Forward looking customers with these types of environments might then be better served by starting out with vSphere with Operations Management™ which is a cost-effective bundle of the VMware vSphere virtualization platform and vRealize Operations Management.

**Splunk**

Splunk has the long term potential to be the most formidable competitor of VMware vRealize Operations in the Operations Management space of any vendor covered in this document. This is because today Splunk has a big data back end into which it stores log data that it collects from a variety of sources, as well as Operations Management data via its Splunk App for VMware.

However, the key to understanding Splunk does not lie with the capabilities of its own product. Rather it lies in understanding its ecosystem strategy. Splunk has partnered with a wide variety of vendors like Palo Alto Networks, Cisco, F5, AppDynamics, AppEnsure, Boundary, Compuware, ExtraHop, Prelert and Netuitive all of whom add value to the Splunk Enterprise Platform. Therefore, competing with Splunk is not just a matter of competing with Splunk, but rather with Splunk and its entire ecosystem.

However, Splunk has two significant weaknesses. The first is that Splunk is priced on the basis of the amount of data that is ingested per day. This creates a situation where no vendor is currently putting all of their data into Splunk since if they were to do so, it would force the customer to buy an extremely expensive Splunk license. This exposes a significant weakness in the Splunk ecosystem argument as the integrations between the third-party vendors and Splunk tend to be ad-hoc and weak as opposed to the promise of “all of your data in one place”.

The second weakness is that Splunk is, by its very nature, an after the fact troubleshooting tool. The customer has to wait for a problem to occur. Then they have to know enough about the problem to be able to write a Splunk query to find all of the things that relate to that problem. Only after all of this happens can Splunk provide the customer a meaningful answer. Now it is possible for Splunk to automatically send alerts based upon periodic queries and manual thresholds, but this relies upon someone knowing enough to write the query and knowing enough to set and maintain the threshold. Splunk has no counter-part to the self-learning analytics in vRealize Operations, nor does Splunk have any way to automatically set thresholds based upon learned behavior. The only way to get this level of functionality with Splunk is to buy a third-party add-on analytics package from either Prelert or Netuitive.
**VMTurbo**

VMTurbo is an Operations Management solution for VMware vSphere and other virtualization platforms that contains a unique economic scheduling engine. This economic scheduling engine allows customers to assign budget in terms of priority to their workloads. The scheduling engine then assures that the workloads with the highest budget (the most important ones) get the resources that they need. Other than this one unique feature, VMTurbo is a standard virtualization focused Operations Management solution with the expected set of performance management and capacity management features.

However, despite the one unique feature in VMTurbo, VMTurbo is lacking the comprehensive set of features that are required for operations management of a modern virtualized data center, private cloud, hybrid cloud or the forthcoming Software-Defined data center. VRealize Suite delivers these missing capabilities which include:

- **Self-learning analytics for all of the operational metrics in the virtualized environment, not just those pertinent to a workload migration decision.**

- **Through vRealize Configuration Manager™ (included in the Enterprise Editions of vRealize Suite), vRealize Operations includes the ability to manage and ensure the configuration of the virtual environment and its guest operating system. vRealize Advanced includes the ability to manage the configuration of the virtual and physical infrastructure. vRealize Enterprise includes the ability to manage the configuration of the guest operating systems in the virtual machines. These capabilities are missing in VMTurbo.**

- **Through vRealize Navigator™ (included in the Advanced and Enterprise Editions of vRealize Suite), vRealize Operations includes the ability to automatically discover the topology of the environment from the perspective of the workloads running in the guest operating systems. This holistic view of application systems is completely missing from VMTurbo.**

- **Through vRealize Business (included in the Advanced and Enterprise Editions of vRealize Operations), vRealize Operations includes the ability to charge constituents of data center services based upon the resources consumed by their workloads in the virtualized data center. This is a critical capability especially for business constituents that are self-provisioning workloads out of a service catalog presented by a cloud automation solution like vRealize Automation. The ability to chargeback business constituents is completely missing from VMTurbo.**

- **With the addition of vRealize Log Insight, and the bidirectional integration between vRealize Log Insight and vRealize Operations, vRealize Operations now benefits from the information in unstructured log data. VMTurbo is completely blind to this source of data.**

In summary, enterprises with a small number of very high priority workloads and a larger number of low priority workloads may well choose to use VMTurbo to ensure that the most important workloads get the resources that they need. However, even if VMTurbo is chosen in this role it is not a substitute for a complete operations management solution like vRealize Operations.
Xangati

Xangati is a performance management solution for vSphere environments that focuses upon collecting the normal metrics from vSphere and complementing those metrics with detailed metrics from a variety of network sources like netflow, SNMP, DNS AAA/Radius, and LDAP. These metrics are then processed in a performance management engine and displayed on a real-time streaming dashboard.

Xangati’s solution is most appropriate when real time network performance can be a constraint to virtualized servers and desktops. For example in a VDI scenario, the exact nature of the VDI workload and the exact configuration and capacity of the network between the end user and the virtualized desktop can have a huge impact upon the response time of the VDI environment and therefore the end user experience.

Despite Xangati’s real time focus upon network performance as a component of the overall operation of a virtualized environment, it is not a generalized operations management solution, and therefore not a substitute for VMware vRealize Operations, including vRealize Operations for Horizon® View™.

Xangati is lacking the comprehensive set of features that are required for operations management of a modern virtualized data center, private cloud, hybrid cloud or the forthcoming Software-Defined data center. VMware vRealize Operations delivers these missing capabilities that include:

- Self-learning analytics for all of the operational metrics in the virtualized environment, not just those pertinent to a workload migration decision.

- Through vRealize Configuration Manager (included in the Enterprise Editions of vRealize Suite), vRealize Operations includes the ability to manage and ensure the configuration of the virtual environment and its guest operating system. vRealize Advanced includes the ability to manage the configuration of the virtual and physical infrastructure. vRealize Enterprise includes the ability to manage the configuration of the guest operating systems in the virtual machines. These capabilities are missing in Xangati.

- Through vRealize Infrastructure Navigator (included in the Advanced and Enterprise Editions of vRealize Suite), vRealize Operations includes the ability to automatically discover the topology of the environment from the perspective of the workloads running in the guest operating systems. This holistic view of application systems is completely missing from Xangati.

- Through vRealize Business (included in the Advanced and Enterprise Editions of vRealize Operations), vRealize Operations includes the ability to charge constituents of data center services based upon the resources consumed by their workloads in the virtualized data center. This is a critical capability especially for business constituents that are self-provisioning workloads out of a service catalog presented by a cloud automation solution like vRealize Automation. The ability to chargeback business constituents is completely missing from Xangati.
• With the addition of vRealize Log Insight, and the bidirectional integration between vRealize Log Insight and vRealize Operations, vRealize Operations now benefits from the information in unstructured log data. Xangati is completely blind to this source of data.

In summary, enterprises sensitive about network performance may well choose to use Xangati to ensure that the users of these applications get an acceptable end user experience. However, even if Xangati is chosen in this role it is not a substitute for a complete operations management solution like VMware vRealize Operations.

Zenoss

Zenoss Service Dynamics is a family of products designed to deliver end-to-end assurance of environment availability and performance across physical, virtual and cloud based environments. Zenoss collects data from a wide variety of data sources including physical servers, networks, storage devices, as well as converged infrastructures and virtualization layers. Zenoss then constructs a model of the environment which understands how elements of the environment are related and are dependent upon each other.

This model-based approach to understanding the physical and virtual topology of the entire environment makes Zenoss well suited to understanding where and how failures in elements that comprise the system are impacting key business services. Therefore Zenoss can be viewed as an effective and modern replacement for the legacy event management and correlation frameworks from IBM, BMC, HP and CA.

However, for customers with a heavy investment in VMware vSphere and who are building private and or hybrid clouds on the vSphere virtualization platform, Zenoss is not a substitute for VMware vRealize Operations as a complete enterprise grade operations management solution. As an enterprise grade operations management solution, Zenoss is missing the following key functionality with respect to VMware vRealize Operations:

• Self-learning analytics for all of the operational metrics in the virtualized environment. Zenoss manages events and a performance event in Zenoss is based upon the violation of a manually set resource utilization threshold.

• Through vRealize Configuration Manager (included in the Enterprise Editions of vRealize Suite), vRealize Operations includes the ability to manage and ensure the configuration of the virtual environment and its guest operating system. vRealize Advanced includes the ability to manage the configuration of the virtual and physical infrastructure. vRealize Enterprise includes the ability to manage the configuration of the guest operating systems in the virtual machines. These capabilities are missing in Xangati.

• Through vCenter Infrastructure Navigator (included in the Advanced and Enterprise Editions of vRealize Operations), vRealize Operations includes the ability to automatically discover the topology of the environment from the perspective of the workloads running in the guest operating systems. Service Level views exist in Zenoss, but they must be manually defined on a per service basis.
• Through VMware vCenter™ Chargeback Manager™ (included in the Advanced and Enterprise Editions of vRealize Operations), vRealize Operations includes the ability to charge constituents of data center services based upon the resources consumed by their workloads in the virtualized data center. This is a critical capability especially which business constituents are self-provisioning workloads out of a service catalog presented by a cloud automation solution like vRealize Automation. The ability to chargeback business constituents is completely missing from Zenoss.

In summary, Zenoss is an appropriate replacement for legacy event management frameworks from IBM, BMC, HP and CA. However, Zenoss is not a substitute for an enterprise grade Operations Management solution that addresses performance, capacity, configuration, and chargeback management for virtualized and cloud based environments - in particular those headed towards the Software-Defined data center and combinations of private, hybrid and public clouds.
VI. Operations Solutions Comparison Table

The table below provides a summary comparison of the operations management functionality of the vendors and products detailed in the previous section. As the table shows, VMware vRealize Operations is the most functionally rich operations management solution in the virtualization market.

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<th>VMware</th>
<th>Legacy Frameworks</th>
<th>CA</th>
<th>Dell</th>
<th>Microsoft</th>
<th>SolarWinds</th>
<th>Splunk</th>
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<tbody>
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<td>Physical Windows Operating System Monitoring</td>
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- 〇 The product does not implement the capability
- 〇 The product partially implements the capability
- 〇 The product fully implements the capability
VII. Point Cloud Management Solutions

A Note on OpenStack

HP, IBM, and Red Hat’s cloud offerings are based upon OpenStack. This is reflected in the image below which shows which vendors have provided the most contributions to the latest release of OpenStack (IceHouse). The important point to make here is that the inventor of OpenStack, Rackspace, is now only the fourth-place contributor suggesting that Rackspace is backing away from OpenStack. Furthermore IBM, HP and Red Hat all have very different commercial interests regarding OpenStack. Red Hat wants its OpenStack distribution to be the extension of its middleware offerings for cloud management. IBM and HP each want their OpenStack distributions to give them viable offerings in competition with Amazon Web Services in the public cloud and VMware in the private and hybrid cloud markets. Given these highly divergent commercial interests it is likely that IBM, HP and Red Hat are going to have a very difficult time agreeing on the path forward for OpenStack, and that OpenStack will fracture into multiple offerings with a common OpenStack core.

For example, both IBM and HP need public and on premise cloud offerings. For their public cloud offerings they need to be price competitive with AWS. That means that they cannot afford to pay license or support fees to anyone, including Red Hat. Which means that it is highly likely that IBM and HP will not be running the Red Hat supported distribution of OpenStack in their public clouds.

Contributions to OpenStack (IceHouse) By Vendor

The problem of having different vendors agree on the technical direction for OpenStack and the implementation of OpenStack is exacerbated by the complexity of OpenStack. The diagram below shows the major components of OpenStack and how they relate to each other. The complexity of OpenStack, the divergence of interests on the part of its members, and the fact that all of the
vendors who rely upon OpenStack will have to compete with VMware, Microsoft and Amazon, raise questions about the long term viability of OpenStack (see “Is OpenStack Dead”).

**BMC Cloud LifeCycle Manager**

BMC Cloud LifeCycle Manager is a fully featured on-premise cloud management offering. It has support for all of the popular hypervisors and public clouds. With respect to vRealize Suite, BMC Cloud LifeCycle Manager is missing the following key capabilities:

- Granular control of policies and capabilities by user and by group. With vRealize Automation, various levels of authority and capability can be easily delegated to various groups and constituents. This turns provisioning of cloud services into a cooperative workflow between IT and its business constituents.

- “Anything as a Service” and in particular, “Applications as a Service”. Business constituents have little use for a rapidly provisioned operating system. What business constituents want and need are rapid delivery of application services, and rapid on-boarding of users and contractors. The ability to rapidly deliver these high level services is a key differentiating feature of vRealize Automation and is missing from BMC Cloud LifeCycle Manager.

- The ability to accurately measure the true cost of each cloud service across cloud service options (an internal implementation of vSphere, an implementation of vCloud® Air™, or an implementation of a service on Amazon or Microsoft Azure, is a key differentiating feature of vRealize Business, a component of vRealize Suite. This ability to manage IT as a business is completely missing from BMC Cloud LifeCycle Manager.

- Integrated Log Management. The vRealize Suite includes vRealize Log Insight, a robust and easy to use log analysis solution. Log Insight is also integrated with vRealize Operations allowing for insights from both log
data and metric data to be shared across the two products. BMC has no comparable log management solution.

Cisco UCS Director and Cisco Intelligent Automation for Cloud

The focus of Cisco UCS Director (UCSD) is the provisioning of physical converged infrastructures like the Cisco UCS, VCE vBLOCK and NetApp Flexpods, as well as then providing the ability to build Infrastructure-as-a-Service clouds on top of these infrastructures.

For a converged infrastructure like a UCS, a vBLOCK or a FlexPod there are substantial benefits to combining the provisioning of the physical infrastructure with the cloud services that use the infrastructure. This is true in the case of these converged infrastructures since they are more configurable via software than traditional combinations of servers, networks and storage.

However, Cisco UCS Director is not an effective or complete substitute for the combination of VMware vRealize Automation. With respect to the VMware offerings Cisco UCS Director is missing the following capabilities:

- Support for diverse hardware. While Cisco UCS director can provision and configure the hardware layer in converged infrastructures that include a Cisco UCS, it cannot provide this capability for the general hardware in place in virtualized data centers.

- Therefore as soon as the hardware is not a UCS, UCS Director is simply a cloud management solution that can provide Infrastructure as a Service in a service catalog with automated provisioning of those services.

- vRealize Automation provides a much richer set of functionality when it comes to implementing private and hybrid clouds than does UCS Director. For example, vRealize Automation has a sophisticated role based access capability that enables the ability to define services to be distributed to various business constituencies with the appropriate controls for each constituent. vRealize Automation includes the ability to define groups of VM’s as one service, allowing either the entire software infrastructure for an application or an entire N-tier application system to be defined as one integrated service.

- Encapsulation of applications. vRealize Automation takes private and hybrid clouds to a new level, allowing for the provisioning of the actual applications which run on the platforms in the virtual machines to be automated and encapsulated.

In summary Cisco UCS Director is an acceptable solution to build infrastructure as a service clouds on top of converged infrastructures that include a Cisco UCS. It is not a general purpose enterprise cloud management platform that supports the breadth of environments supported by vRealize Automation, and it does not extend the ability to deliver application level services into clouds as does VMware vRealize Code Stream™.

Cisco Intelligent Automation for Cloud (CIAC) is Cisco’s full cloud automation solution. It is capable of delivering a wide variety of services through a service catalog, but is missing the ability to encapsulate entire application systems and deliver complete applications as a service as vRealize Automation can do.

CSC Agility Platform

CSC has acquired ServiceMesh, and the ServiceMesh Agility Platform is now the CSC Agility Platform. It is an enterprise-grade cloud platform suitable for building infrastructure as a service, platform as
a service and application-level services across a wide variety of environments. CSC offers enterprise
grade policy enforcement, security, role based access, and most importantly the ability to manage
the life cycle of actual applications in private and hybrid clouds.

While the CSC Agility Platform is an enterprise grade cloud management platform, customers with
substantial investments in the VMware vSphere platform should evaluate CSC not just against
vRealize Automation, but against the entire vRealize Suite. Customers should take this approach
because the combination of VMware private and hybrid clouds and various public clouds requires the
following approach:

- Integration of Software-Defined Networking, specifically VMware NSX™ with vRealize Automation, vRealize
  Operations, and vRealize Log Insight. The ability to define a network in software is useful only to the
  extent to which this capability is then automated in a cloud management solution that brings the benefit
  of rapid network configuration to the customer in a service catalog. vRealize Automation integrates with
  NSX allowing for the automated configuration and deployment of NSX software network segments as a part
  of the deployment of a N-Tier application system. Similarly NSX will create new opportunities for real time
  understanding of end-to-end network latency and the impact of network latency upon application
  performance. The combination of vRealize Operations and vRealize Log Insights creates an operations
  management platform that is able to ingest real time performance information in the form of log events
  (through vRealize Log Insight), and then apply self-learning analytics to these events (through vRealize
  Operations).

- Integration of Software-Defined Storage via VMware Virtual SAN™, with vRealize Automation, vRealize
  Operations, and vRealize Log Insight. The ability to define storage in software is useful only to the extent
  to which this capability in then automated in a cloud management solution that brings the benefit of rapid
  storage configuration to the customer in a service catalog which is present in vRealize Automation.
  Similarly storage virtualization will create new opportunities for real time understanding of end-to-end
  storage latency and the impact of storage latency upon application performance. The combination of
  vRealize Operations and vRealize Log Insight creates an operations management platform that is able to
  ingest real time performance information in the form of log events (through vRealize Log Insight), and then
  apply self-learning analytics to these events (through vRealize Operations).

Customers should also be aware that the CSC Agility Platform is a complex solution to implement
requiring a great deal of vendor provided services.

Finally, enterprise customers who are going to follow VMware’s product evolution towards the
Software-Defined Data Center should choose a suite of management solutions that can manage the
SDDC, and keep up with VMware’s evolution of that SDDC. Deploying such a SDDC management suite
will be essential order for enterprises to realize the full benefits of the SDDC.

**Dell Cloud Manager**

Dell Cloud Manager is notable for its ability to deploy applications across private and hybrid clouds
like those based upon VMware vSphere, and also public clouds like Amazon AWS, BlueLock,
CloudStack, Eucaplytus, GoGrid, the HP Cloud, the IBM SmartCloud, Joyent, OpenStack, Rackspace,
Terremark and Windows Azure. However, Dell Cloud Manager is missing the following key capabilities present in vRealize Suite:

- **Granular control of policies and capabilities by user and by group.** With vRealize Automation, various levels of authority and capability can be easily delegated to various groups and constituents. This turns provisioning of cloud services into a cooperative workflow between IT and its business constituents.

- **“Anything as a Service” and in particular, “Applications as a Service”**. Business constituents have little use for a rapidly provisioned operating system. What business constituents want and need are rapid delivery of application services, and rapid on-boarding of users and contractors. The ability to rapidly deliver these high level services is a key differentiating feature of vRealize Automation.

- The ability to accurately measure the true cost of each cloud service across cloud service options (an internal implementation of vSphere, an implementation of vCloud Air, or an implementation of a service on Amazon or Microsoft Azure) is a key differentiating feature of vRealize Business, a component of vRealize Suite.

- **Integrated Operations Management.** VRealize Suite includes vRealize Operations which provides for robust performance and capacity management based upon sophisticated self-learning analytics. This allows vRealize Operations to manage the performance and capacity of services deployed by vRealize Automation in a seamless manner.

- **Integrated Log Management.** VRealize Suite includes vRealize Log Insight, a robust and easy to use log analysis solution. Log Insight is also integrated with vRealize Operations allowing for insights from both log data and metric data to be shared across the two products. Dell has no comparable log management solution.

**Embotics**

Embotics vCommander 5.1 is designed to be an easy to deploy infrastructure as a service offering that includes integrated basic monitoring and integrated basic chargeback. The target audience for vCommander is organizations that just need to stand up a simple IaaS cloud. This most often includes simple test and development scenarios and well as cloud deployments in small to mid-size businesses. Due to its focus upon simplicity, ease of installation, and smaller customers,
vCommander is missing key enterprise scale cloud management features like:

- **Granular control of policies and capabilities by user and by group.** With vRealize Automation, various levels of authority and capability can be easily delegated to various groups and constituents. This turns provisioning of cloud services into a cooperative workflow between IT and its business constituents.

- **“Anything as a Service” and in particular, “Applications as a Service”**. Business constituents have little use for a rapidly provisioned operating system. What business constituents want and need are rapid delivery of application services, and rapid on-boarding of users and contractors. The ability to rapidly deliver these high level services is a key differentiating feature of vRealize Automation.

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**HP Helion**

Helion is HP’s distribution of OpenStack which is based upon the IceHouse release of OpenStack with HP’s value added components including HP Cloud Services Automation. The core OpenStack components of Helion are shown in blue below. And the HP additions are shown in green. This points out a core weakness of OpenStack. The open source distribution of OpenStack alone is not an enterprise grade cloud management platform - which is why an adopting vendor like HP has to add so many unique components to it. But once these unique components are added, OpenStack ceases to become any kind of a compatible and open platform across vendors, which was its supposed original intent.
In addition to being an inelegant combination of an open source project and vendor proprietary additions, HP Helion is missing the following key functionality when compared with vRealize Suite:

- Granular control of policies and capabilities by user and by group. With vRealize Automation, various levels of authority and capability can be easily delegated to various groups and constituents. This turns provisioning of cloud services into a cooperative workflow between IT and its business constituents.

- “Anything as a Service” and in particular, “Applications as a Service”. Business constituents have little use for a rapidly provisioned operating system. What business constituents want and need are rapid delivery of application services, and rapid on-boarding of users and contractors. Helion does include a distribution of CloudFoundry, but it is not the officially supported version of CloudFoundry from Pivotal.

- The ability to accurately measure the true cost of each cloud service across cloud service options (an internal implementation of vSphere, an implementation of vCloud Air, or an implementation of a service on Amazon or Microsoft Azure) is a key differentiating feature of vRealize Business, a component of vRealize Suite.

- Integrated Operations Management. vRealize Suite includes vRealize Operations which provides for robust performance and capacity management based upon sophisticated self-learning analytics. This allows vRealize Operations to manage the performance and capacity of services deployed by vRealize Automation in a seamless manner.

- Integrated Log Management. vRealize Suite includes vRealize Log Insight, a robust and easy to use log analysis solution. Log Insight is also integrated with vRealize Operations allowing for insights from both log data and metric data to be shared across the two products.
**IBM Cloud Manager with OpenStack**

IBM Cloud Manager with OpenStack is the IBM Cloud Manager (with IBM Smart Cloud Orchestrator) product layered on top of OpenStack. Therefore like HP Helion, it is a hybrid of an open source offering and numerous vendor proprietary extensions. The basic management of resources is done via the OpenStack components and all of the features that target the enterprise use case come from IBM proprietary extensions. The IBM extensions are on the left of the diagram below under the Cloud Manager API.

As is the case with HP Helion, there is nothing open or standard about IBM Cloud Manager with OpenStack. The extensions from IBM are incompatible with the extensions from HP creating two different and proprietary solutions.

Even with the extensions from IBM, Cloud Manager is missing the following enterprise grade capabilities present in vRealize Suite:

- Granular control of policies and capabilities by user and by group. With vRealize Automation, various levels of authority and capability can be easily delegated to various groups and constituents. This turns provisioning of cloud services into a cooperative workflow between IT and its business constituents.

- “Anything as a Service” and in particular, “Applications as a Service”. Business constituents have little use for a rapidly provisioned operating system. What business constituents want and need are rapid delivery of application services, and rapid onboarding of users and contractors.

- The ability to accurately measure the true cost of each cloud service across cloud service options (an internal implementation of vSphere, an implementation of vCloud Air, or an implementation of a service
on Amazon or Microsoft Azure) is a key differentiating feature of vRealize Business, a component of vRealize Suite.

- **Integrated Operations Management.** VRealize Suite includes vRealize Operations which provides for robust performance and capacity management based upon sophisticated self-learning analytics. This allows vRealize Operations to manage the performance and capacity of services deployed by vRealize Automation in a seamless manner.

- **Integrated Log Management.** VRealize Suite includes vRealize Log Insight, a robust and easy to use log analysis solution. Log Insight is also integrated with vRealize Operations allowing for insights from both log data and metric data to be shared across the two products.

**Red Hat CloudForms**

Red Hat has integrated the old CloudForms with the acquired ManageIQ EVM into the new Red Hat CloudForms product. CloudForms is therefore Red Hat’s strategic cloud management offering for its own KVM and OpenStack based clouds. Therefore this new product will be the cloud management and operations management solutions for Red Hats infrastructure as a service and platform as a service clouds. CloudForms supports the VMware, Microsoft and Amazon platforms as well as the Red Hat KVM and OpenStack platforms.

For customers with a substantial investment in VMware vSphere, this then boils down a choice between vRealize Suite (vRealize Operations, vRealize Automation, vRealize Business) vs. CloudForms. Customers should consider the following factors in making this decision:

- **VRealize Suite includes extremely strong cross hypervisor and cross cloud Operations Management functionality.** CloudForms is completely missing the performance management, capacity management, log management and self-learning analytics that are the core of a robust operations management solution.

- **VRealize Suite includes extremely strong cross-hypervisor and cross-cloud automation functionality.** CloudForms is missing support for Hyper-V, and is missing the ability to deliver full multi-tier applications as a service.

- **VRealize Suite includes strong business management functionality in the form of vRealize Business which delivers accurate cost analyses across Software-Defined Datacenter architecture, private, hybrid and public clouds.** CloudForms is completely missing this functionality.

In summary, the VMware vRealize Suite is a mature set of capabilities for managing all three layers of cloud services (infrastructure, platform and application) across private and hybrid clouds today. VRealize Suite will be the first management suite to be able to manage the VMware Software-Defined Data Center and combinations of private, hybrid and public clouds. Enterprises who have a substantial investment in vSphere and who intend to capitalize upon the extended benefits of the SDDC, VMware vCloud Air and other public clouds should choose vRealize Suite to manage the environments.
RightScale Cloud Portfolio Management

The RightScale Cloud Portfolio Management suite consists of the following components:

- RightScale Self-Service is a portal for developers, application teams, and business users to provision applications and technology stacks into cloud environments.
- RightScale Cloud Management is a management solution that enables IT teams to manage applications in the cloud and create policies that govern the use of cloud resources across the enterprise.
- RightScale Cloud Analytics provides a dashboard for technical, business, and financial users to visualize, forecast, and optimize cloud spend.

RightScale Multi-Cloud Platform is the foundation of RightScale CPM, providing a single connection point and API that spans a wide variety of public and private clouds as well as virtualized environments.

RightScale therefore seeks to be an operational and cloud management layer on top of the hypervisors and cloud management solutions that it supports. It offers a robust set of functionality, but this comes at a steep price, which is that services built to take advantage of RightScale are locked into the RightScale API and templates making it very difficult to migrate those applications and services away from RightScale.
RightScale is also missing the following key cloud and operations management capabilities present in vRealize Suite:

- **Granular control of policies and capabilities by user and by group.** With vRealize Automation, various levels of authority and capability can be easily delegated to various groups and constituents. This turns provisioning of cloud services into a cooperative workflow between IT and its business constituents.

- **The ability to accurately measure the true cost of each cloud service across cloud service options (an internal implementation of vSphere, an implementation of vCloud Air, or an implementation of a service on Amazon or Microsoft Azure) is a key differentiating feature of vRealize Business, a component of vRealize Suite.**

- **Integrated Operations Management.** VRealize Suite includes vRealize Operations which provides for robust performance and capacity management based upon sophisticated self-learning analytics. This allows vRealize Operations to manage the performance and capacity of services deployed by vRealize Automation in a seamless manner.

- **Integrated Log Management.** VRealize Suite includes vRealize Log Insight, a robust and easy to use log analysis solution. Log Insight is also integrated with vRealize Operations allowing for insights from both log data and metric data to be shared across the two products.

**ServiceNow**

ServiceNow offers a set of SaaS delivered IT automation solutions. The most common usage of ServiceNow is of the Service Now Service Desk which allows IT organizations to automate an ITIL compliant process for managing requests and tickets.

ServiceNow has recently added Cloud Provisioning and Orchestration modules to its offering which allow IT organizations to automate the provisioning of infrastructure services on VMware vSphere and Amazon environments from a service catalog.

While the integration of basic provisioning tasks with the rest of IT’s ITIL process management is interesting, the provisioning and management capabilities of ServiceNow lag far behind those currently in the VMware vRealize Suite. The VMware vRealize Suite has the current and likely future advantages over the ServiceNow offering:

- VRealize Suite includes Operations Management capabilities which are not present in the ServiceNow offering.

- VRealize Suite includes the ability to deliver application platforms and applications themselves as a service which is not present in the ServiceNow offering.

- As VMware progresses in the delivery of the Software-Defined Data Center, vRealize Suite will be far ahead of ServiceNow in the ability to manage the SDDC and allow customers to realize the full benefits of the SDDC.

In summary, automating the management of the Service Desk and automating the management of an enterprise grade private and hybrid cloud which is heading in the direction of the Software-
Defined Data Center are two different things. Adding provisioning and orchestration features to a service desk management offering is not the right way to approach cloud management or the management of the SDDC. The VMware vRealize Suite is far better positioned to provide the needed capabilities than is ServiceNow.

### VIII. Cloud Management Solutions Comparison Table

The table below compares VMware vRealize Automation, a component of vRealize Suite, to the direct competitors of the vRealize Automation product. It should be noted that none of the direct competitors of vRealize Automation are available in a comprehensive cloud management suite like vRealize Suite from VMware.

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<th>Product</th>
<th>VMware vRealize Automation</th>
<th>BMC Cloud Lifecycle Manager</th>
<th>Cisco UCS Director &amp; CIAC</th>
<th>CSC Agile Platform</th>
<th>Dell Cloud Manager</th>
<th>Embotics Helion</th>
<th>IBM Cloud Manager with OpenStack</th>
<th>Red Hat CloudForms ManageEngine</th>
<th>RightScale</th>
<th>ServiceNow Orchestration</th>
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- ☐ The product fully implements the capability
IX. Comparison of Microsoft and VMware Management Suites

VMware and Microsoft are the only two major software vendors that offer both a virtualization platform and a management suite that spans operations management and cloud management. An enterprise with only one of either the VMware vSphere or the Microsoft Hyper-V virtualization platform has an easy decision to make about the vendor from which to get core operations management and cloud management capabilities.

The challenge for enterprise customers is how to effectively manage combinations of VMware vSphere and Microsoft Hyper-V, and in particular create operationally efficient clouds that span these two virtualization platforms. This is a particular challenge when customers have not only a substantial investment in both virtualization platforms, but have a substantial investment in VMware vSphere and the Windows operating system and the Windows applications running on those operating systems.

Microsoft Strengths

The System Center family of solutions (System Center Operations Manager (SCOM), Systems Center Configuration Manager (SCCM), and System Center Virtual Machine Manager (SCVMM) are solutions for managing the Windows operating system on physical and virtual platform, as well as for managing the workloads running on the Windows operating system. From a licensing perspective, Microsoft has retired its previous Enrollment for Core Infrastructure (ECI) and replaced it with the new Server and Cloud Enrollment offering. The new SCE offering is designed to make it easy for customers to migrate their workloads off of their on-premise data center and onto Microsoft Azure. The comparison of the old ECI and new SCE offerings is shown below.
The Microsoft SCM offering is strongest and most appealing to customers who have 100% Windows environments and who are using 100% Microsoft Hyper-V as the virtualization platform. Through the SCVMM component of System Center, Microsoft also has the ability to do basic administration of the vSphere platform. However as VMware brings its SDDC to market, Microsoft will have to go through an entire major release of the System Center suite in order to incorporate support for the incremental capabilities that VMware will add with the SDDC. Therefore even though it claims full support of the VMware environment, ECI will likely only be a best of class management offering for Microsoft focused environments.

**VMware Strengths**

VMware brings the following strengths to the Cloud Management market with respect to Microsoft:

- VMware vSphere is the market leading virtualization platform. While some customers have chosen to have more than one virtualization platform, they continue to rely upon VMware for the virtualization of their business critical and performance critical workloads.

- Through vCloud Air, VMware offers customers a hybrid cloud offering that is 100% compatible with the market leading on-premise vSphere platform. The migration of workloads from vSphere to Azure is a non-trivial undertaking.
• With the VMware vCenter Multi-Hypervisor Manager, customers can manage both VMware vSphere and Microsoft Hyper-V virtual machines from the vCenter console. SCOM has no ability to manage vSphere virtual machines without a management pack from Veeam.

• vRealize Operations (with the use of the Hyperic Agent) does a better job of providing operations management capabilities for Windows and Hyper-V environments than SCOM does in terms of monitoring the VMware environment. In fact, SCOM is unable to monitor a VMware environment without the assistance of a third party management pack from Veeam.

• VMware vRealize Operations includes state of the art self-learning performance analytics which eliminate the need to set manual thresholds, tune them and maintain them for hundreds of operations metrics. Microsoft has no similar capability in SCOM.

• With vRealize Log Insight, VMware has the ability to ingest and analyze real time event streams from the virtualization platform. The integration of vRealize Log Insight with vRealize Operations then gives the latter the ability to do real time infrastructure performance management of the virtualized environment for which Microsoft has no commensurate capability.

• VMware vRealize Automation has far greater customer traction as an automation and self-service platform than does Microsoft Systems Center Virtual Machine Manager (SCVMM). In particular, vRealize Automation has proven deployments of private and hybrid clouds that span VMware vSphere and Microsoft Hyper-V resource pools. SCVMM is an extremely rudimentary first generation product which only offers basic automation of infrastructure services (IaaS). vRealize Automation also has much broader support for different cloud platforms like Amazon and clouds running on other hypervisors.

• vRealize Automation includes the ability to encapsulate entire N-tier application systems into manageable containers, deploy them in various environments, and manage their lifecycles.

• Microsoft has no offering comparable to vRealize Suite which includes Operations Management, Self-Learning Analytics, Log Management, Configuration Management, Cloud Automation, Chargeback, and Cross-Cloud Costing.

Choosing a Cross-Platform Management Suite
Given the above relative strengths and weaknesses the following strategy is recommended for customers depending upon their situation:

• For customers with exclusively a Windows operating system and Hyper-V environment, and whose needs for scale and functionality will not drive their needs for current vSphere or future SDDC functionality, System Center is an appropriate management solution for Windows, Hyper-V and the Windows applications.

• For customers with exclusively a VMware vSphere virtualization platform, and a heavy investment in Windows operating systems and Windows applications, a hybrid approach is called for. SCOM is an appropriate choice to manage the Windows operating systems and applications (particularly the Microsoft provided Windows applications like Sharepoint, Exchange and SQL Server). However SCOM is weak when it comes to managing vSphere. For this reason, customers with a heavy investment in vSphere should use vRealize Suite for Operations Management, Cloud Management, and Cross-Cloud Costing.
For customers with both VMware vSphere and Microsoft Hyper-V platforms, again a hybrid approach is called for if the customer has a heavy investment in Windows operating systems and applications. SCOM is an appropriate choice to manage the Windows operating systems and Windows applications. But due to the fact that vRealize Suite does a better job of supporting Hyper-V, than SCOM does of supporting vSphere, vRealize Suite should be used as the cross virtualization platform operations management and cloud management solution.
X. Management Suite Comparison Table

The table below compares the management functionality of the Microsoft Enrollment for Core Infrastructure (Windows Server 2012 + System Center 2012 SP1 (SCOM, SCVMM, SCCSPP)) with the VMware vRealize Suite (vRealize Operations, vRealize Automation, vRealize Business).

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<th>Vendor</th>
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<td>vRealize Operations</td>
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<td>Virtual Windows Operating System Monitoring</td>
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In conclusion, vRealize Suite offers both considerable depth of functionality and support for a breadth of environments that are not matched by Microsoft’s offerings. Enterprises with substantial commitments to only vSphere or with commitments to vSphere, Hyper-V and Windows should standardize upon vRealize Suite to manage, vSphere, Hyper-V and Windows.

XI. About VMware

VMware is the leader in virtualization and cloud infrastructure solutions that enable businesses to thrive in the Cloud Era. Customers rely on VMware to help them transform the way they build, deliver and consume Information Technology resources in a manner that is evolutionary and based on their specific needs. With 2013 revenues of $5.21 billion, VMware has more than 500,000 customers and 75,000 partners. The company is headquartered in Silicon Valley with offices throughout the world and can be found online at www.vmware.com.

XII. About The Virtualization Practice

The Virtualization Practice is an industry analyst firm focusing upon data center virtualization and cloud computing. Bernd Harzog is TVP’s Analyst for Cloud Management focusing on the Operations, Applications, and Cloud Management layers of the Software-Defined Data. Bernd was formerly a Gartner Group® Research Director focusing on the Windows Server® operating system, CEO of RTO Software, and VP of Products at Netuitive®, and has been involved in vendor and IT strategy since 1980.