CLABBY ANALYTICS

Advisory

Maximizing Information Systems Efficiency: How to Build a Workload Optimized, Highly-Automated, Heterogeneous Hybrid Cloud

Executive Summary

At *Clabby Analytics* we have a fundamental belief when it comes to building highly optimized information systems environments: to achieve maximum efficiency, workloads should be placed on the processors/servers architecture best suited to execute them. Further, we believe that these resulting heterogeneous server environments should be linked together using cloud architecture — and that this architecture should be managed using tools and utilities that can monitor and control systems, storage, and networks across heterogeneous systems in a consistent manner in order to drive down management costs.

> ***What we see, however, in the global marketplace, is quite the opposite. We see way too many enterprises building homogeneous x86-based cloud environments that are being managed using siloed management tools. We would like to see these types of deployments curtailed because they waste information technology (IT) resources and information systems budgets — and because they create silos of resources and information that interfere with cross-enterprise program-to-program communications.***

In order to build hyper-efficient information systems environments, we suggest that IT executives:

1. Learn the differences between processors (such as x86 processors, POWER, z, Ultra-SPARC, and Itanium) because we believe that no single processor does all serial, parallel, and data-intensive jobs optimally. (Note: this position implies that efficient IT environments are made up of highly-tuned, optimized *heterogeneous* servers).
2. Adopt the cloud computing model to facilitate communications between information systems — and to take advantage of efficiencies delivered through resource virtualization and automated provisioning.
3. Invest heavily in automated systems-, storage-, and network-management tools in order to drive down human labor management costs. (Human labor costs can represent up to 50% of a typical IT budget — so automating manual management labor has the potential to very significantly reduce IT operational costs).

At *Clabby Analytics* we have written extensively on the importance of matching workloads to servers best suited to execute those workloads. In fact, we have dedicated an entire website to this theme (www.workloadoptimization.com). Further, many of our reports describe why cloud architecture provides an ideal basis for program-to-program communications between heterogeneous systems. In this *Advisory*, however, we take a closer look at point #3: the management of a heterogeneous cloud environment. What our research shows is that there is only one vendor — IBM — that is focused on building a set of common cloud management tools and utilities that can help IT buyers build hyper-efficient information systems environments using a hybrid cloud management approach. ***We believe that by using heterogeneous, cross-platform hybrid cloud management tools — as compared with siloed x86 management tools found in VMware and Hyper-V environments— enterprises will be better prepared to construct hyper-efficient cloud computing environments.***

The Cloud Management Marketplace: An Overview

First, it can be argued that cloud computing has been a part of the computing industry for over 40 years. IBM mainframes have offered virtualization facilities since the 1970s — and cloud architecture is based on resource virtualization. Today's System z mainframes offer advanced virtualization facilities (far superior to virtualization offerings found in the x86 world); as well as advanced automated provisioning (the build-up and tear-down of system images to allow system resources to be used to execute varying workloads); and advanced "integrated service management" (the ability to manage various elements of the mainframe by launching services as opposed to manually managing mainframe tasks). In this previously published report we explain in more detail what integrated service management is; and in this previously published report we describe why we believe a mainframe can be positioned as an advanced "cloud-in-a-box" solution.

Despite the fact that cloud services have been available on mainframe architecture for decades, most industry watchers and IT buyers consider the age of cloud architecture to have been launched in the mid-2000s. These early clouds (circa 2004) were mostly comprised of x86 servers unified using EMC's VMware virtualization software. Over time, VMware's software expanded and improved, moving beyond simple virtualization to more advanced infrastructure and management facilities. Microsoft followed VMware's lead and introduced its virtualization software (Hyper-V) later in the decade — and dozens of other companies brought their own virtualization solutions to market to compete with market-maker, market-leader VMware. Currently, the x86 virtualization market leaders include VMware, Microsoft, and Citrix — with Red Hat also gaining share with an open source implementation of a virtualization scheme known as KVM (KVM is part of the Linux kernel and is being enhanced by the open source community).

> ***Today, the cloud computing market is dominated by homogeneous x86 clouds running VMware or Microsoft Hyper-V for virtualization, virtual infrastructure, and virtual machine management. These installations are usually siloed (virtualization and infrastructure stacks that can only communicate with like homogeneous resources).***
>
> ***In recent years, however, we have seen the number of Power Systems/x86 heterogeneous clouds accelerate — and we've seen steady adoption of an IBM architecture known as zEnterprise (that can manage POWER- and x86-based blades under the auspices of an advanced System z [mainframe]). It appears to us that the number of enterprises that understand the importance of workload optimization, cloud architecture, and heterogeneous systems management is growing steadily.***

The Competitive Situation: Only One Heterogeneous Cloud Management Supplier?

As we look at the global IT marketplace, we see only one vendor that has a vested interest in building workload optimized systems and associated infrastructure/management products: IBM. And this is because, in our opinion, all of the other major systems makers are becoming x86-only suppliers.

Here's how we see the competitive situation in workload optimization. Oracle at present offers two types of systems: UltraSPARC- and x86-based system environments. However, Oracle's UltraSPARC is a troubled architecture — and we believe that it will be withdrawn from the market within the next five years (for more details on this perspective see this report). Likewise, we see Hewlett-Packard's (HP's) Itanium architecture as troubled — and believe that it too will be withdrawn (for more details, see this report). These circumstances make HP and Oracle essentially *x86-only* server makers (like Dell). And this means that HP/Oracle/Dell customers have, in effect, only one choice when it comes to workload optimization: siloed x86 architecture.

Now examine IBM's situation. IBM offers four distinct systems architectures: System z (mainframes); Power Systems (including PowerLinux); System x (x86-based servers); and the new PowerSystems (that include Pure Flex, PureApplication, and PureData systems). IBM designs its servers and processors to execute certain workloads optimally — so if a workload requires strong security and heavy input/output processing — and has a large volume of work to do — the system of choice should be a mainframe. For fast, lightly threaded applications, the system of choice should use x86 architecture. Power Systems are ideal for compute-intensive tasks. And the new PureSystems are designed to process very specific workloads (for instance, PureData servers have been designed specifically to execute transaction processing and specific analytics workloads).

The key point here is that IBM builds systems that can optimally execute specific workloads — whereas IBM's primary competitors are heading toward a single architecture (x86). As a result of this positioning IBM is the only vendor that is focused on cross platform integration and management — the remaining vendors are primarily focused on siloed management.

It is not possible to build hyper-optimized computing environments using only one processor/system architecture (again, because no single processor does all jobs optimally). So if the enterprise goal is to build optimized information systems environments, the only remaining choice for workload optimized systems — and for integrated, cross-platform management tools and utilities — is IBM.

IBM's Heterogeneous, Hybrid Cloud Management Offerings

Two years ago we wrote a report on an IBM cross-platform virtualization management offering product known as Systems Director VMControl (available here). Last year we participated in a Webinar where we discussed IBM's Tivoli Systems Automation product offering (a product set that provides a single point of control for managing systems resources across heterogeneous environments). But since then, we note that IBM has expanded the scope of its cross-platform management products — as well as the depth of its product offerings. IBM now positions its cross-platform management offerings as part of an effort to enable heterogeneous systems *to be managed in a hybrid cloud configuration.*

The VMControl product (described above) has been notably successful when deployed in environments where Power Systems and x86 servers work together. VMControl enables systems managers and administrators to manage Power Systems running the PowerVM hypervisor — as well as x86 servers running VMware, Hyper-V, and KVM — all using a common user interface to control virtual machine deployment and provisioning across these disparate environments. IBM recently announced that VMControl can now work with the zEnterprise (mainframe) zManager environment — providing Linux image management tools that allow VMControl to provision virtual resources, search for virtual resources, delete, and otherwise manage virtual machine images in mainframe Linux/z/VM environments.

As for IBM's Tivoli System Automation product offering, it is now being used in combination with a number of other IBM products (such as IBM's SmartCloud Foundation, and IBM's Cloud Ready for Linux on System z) to help IT managers and administrators automate and manage applications across a heterogeneous, virtualized, automatically provisioned, hybrid cloud environment. Further, it is being used to extend mainframe class Quality-of-Service (QoS — such as enhanced business resiliency or improved security) to underlying, homogeneous x86 cloud environments.

IBM's Tivoli System Automation — Thinking Outside the Box

As stated previously, we consider IBM's mainframe System z to be the industry's most advanced cloud environment — a self-sustaining cloud-in-a-box. But now it is time to think outside the box. *What would happen if mainframe class services could be extended to underlying homogeneous x86 clouds?* This is possible using a combination of IBM products including IBM SmartCloud

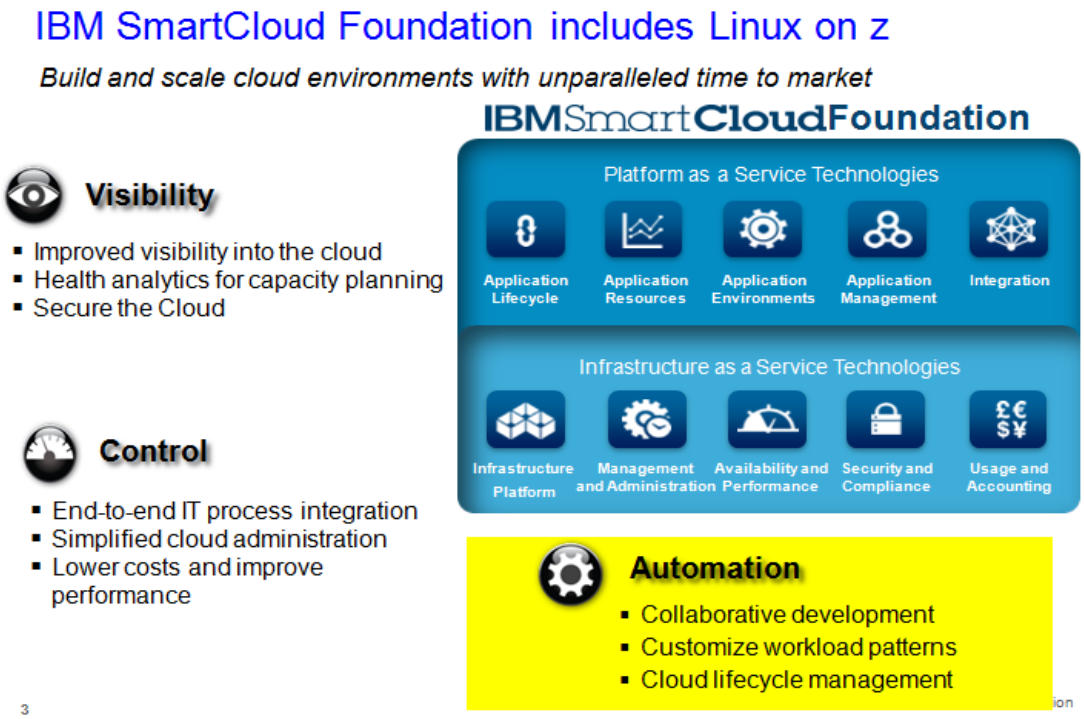
Foundation, IBM's "Cloud Ready for Linux on System z" solutions package, and various IBM Tivoli System Automation product offerings. ***By combining these three offerings it is possible to build a mainframe/x86 hybrid cloud environment that extends mainframe class services to underlying VMware/Hyper-V/KVM-based servers.*** The remainder of this section examines each of these product offerings in greater detail.

Start With a Cloud Foundation

Cloud architecture represents an ideal means to extend mainframe integrated service management to underlying, homogeneous VMware, Hyper-V, and KVM x86 environments. It enables enterprises to standardize cross-platform communications; it simplifies system deployment and scaling; and it enables applications to be managed in a common, consistent fashion.

To simplify cloud deployment — and to make clouds more manageable — IBM has built a cookie-cutter cloud deployment set of technologies known as IBM's SmartCloud Foundation that runs across all four of its platforms. This product provides systems managers and administrators with tools that provide improved visibility into the cloud, that provide health analytics for capacity planning — and that also help secure a cloud environment. These tools enable IT managers to structure end-to-end process flows, to simplify cloud administration, and to drive down management costs while improving overall cloud performance, to virtualize resources, to automate management, and to improve service delivery (see Figure 1).

Figure 1 — IBM's SmartCloud Foundation



Source: IBM Corporation — November, 2012

Deploy IBM's Cloud Ready for Linux on System z

IBM's Cloud Ready for Linux on System z is what IBM calls a "solution edition" — a pre-configured package that streamlines the deployment of an System z such that it can more quickly address certain workload requirements (there are over ten of these solution editions today — each designed to optimally serve different workloads). This particular solution edition enables IT managers and administrators to automatically provision Linux images that run on System z

platform by cloning pre-defined Linux virtual images. These images contain extensions that can be selected from a service catalog that allow for availability, performance, monitoring, backup and recovery extensions to be added to a virtual image — or custom extensions can be created.

Examine IBM's Tivoli System Automation Family
Using IBM's SmartCloud Foundation and IBM's Cloud Ready for Linux on System z, IT managers and administrators can quickly build and manage a cloud environment as well as provision applications and services very quickly (because users have the ability to construct and deconstruct Linux images within an IBM System z environment). But when these two solutions are combined with other IBM Tivoli products such as Tivoli System Automation, suddenly mainframe strengths in automation, security, billing, data management, analytics, and high-availability can be extended to x86 homogeneous environments.

IBM's Tivoli System Automation Family is a product suite that allows automation policies to be created (for instance, it allows deployed instances to be started and stopped in a coordinated fashion across different platforms). This policy driven focus simplifies the management of virtual resources across disparate platforms; it is easy and logical to use; and it is easy to launch — enabling resources to get up and running quickly. By comparison, other cross-platform management products are not policy driven but rather manually-oriented in nature.

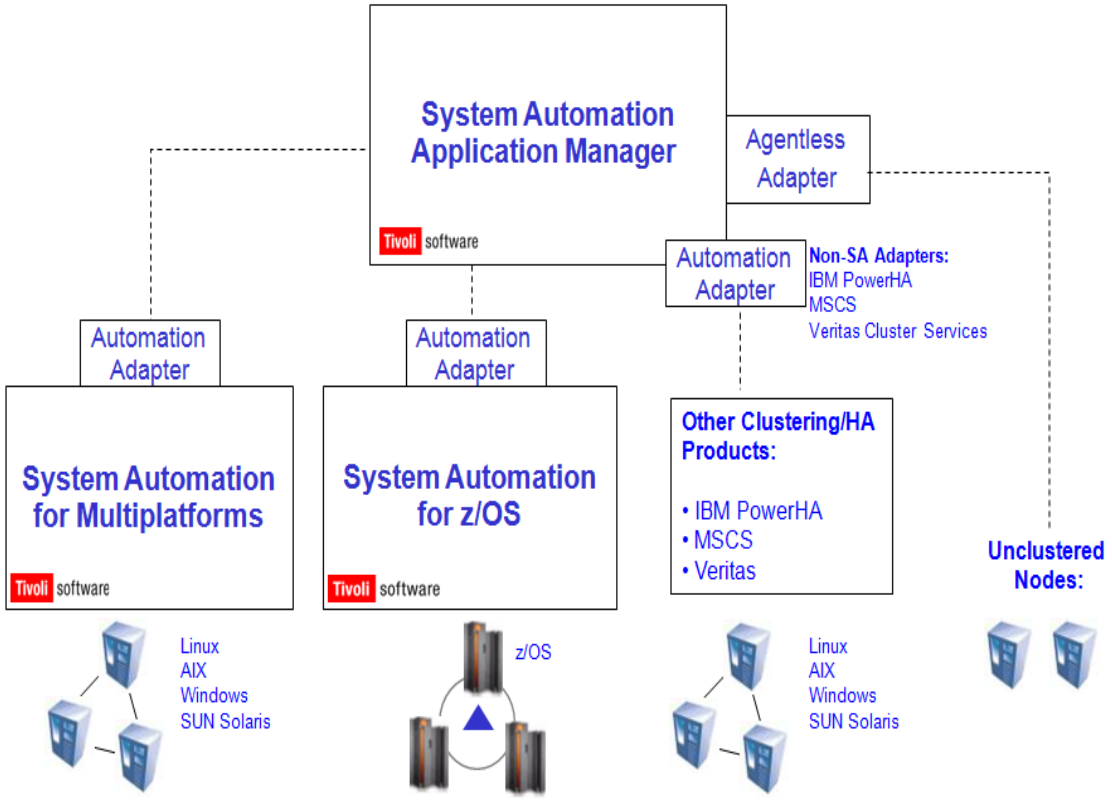
In addition to its policy focus, Tivoli System Automation Application Manager can be used to monitor application/virtual server instances — checking for exceptions and providing automated recovery/bypass/notification functions across mainframes as well as underlying x86 environments (this helps make virtualized resources more resilient by providing a single point of control across heterogeneous environments — and it helps minimize the need for unique skills to manage across various IT silos). Further, this product allows application level automation across complex environments using policy-based management (this eases configuration), and by allowing for pre-defined policies that can accelerate application deployment. Finally, this product allows for easy scaling, and it is highly flexible (in that it supports multiple different platforms).

> ***A closer look at how this product operates shows that it has a unique capability to support 3rd party cluster technologies (such as VMware or Hyper-V clusters) because it is built on IBM cluster technology that has been deployed in thousands of high-end Sysplex mainframe configurations as well as within distributed computing environments. What IBM has created with its System Automation product is the ability to leverage proven cluster technology to build a distributed automation engine from which many automated services can be launched.***

As mentioned above IBM's Tivoli System Automation Application Manager is actually part of a broader product set: the System Automation Family (illustrated in Figure 2 — next page). System Automation Application Manager aggregates availability information contributed by System Automation for Multiplatforms (for Windows, Unix clusters) and System Automation for z/OS (for z/OS clusters). Using this linkage, System z hardware and virtualized resources (including zManager controlled CPCs, LPARs, blades [both x86- and POWER-based], and virtual servers) can thus be linked with other cluster and high-availability products.

It is important to emphasize that the Systems Automation family of products can be driven by policies established by systems managers and administrators — greatly simplifying the control and management of virtual system resources across disparate platforms. It should further be noted that System Automation includes the notion of "workload awareness" in its policies — so IT managers and administrators can create high-availability policies at both the virtual resource as well as workload levels.

Figure 2 — Enterprise-wide Cloud Value — The Tivoli System Automation Family



Source: IBM Corporation — November, 2012

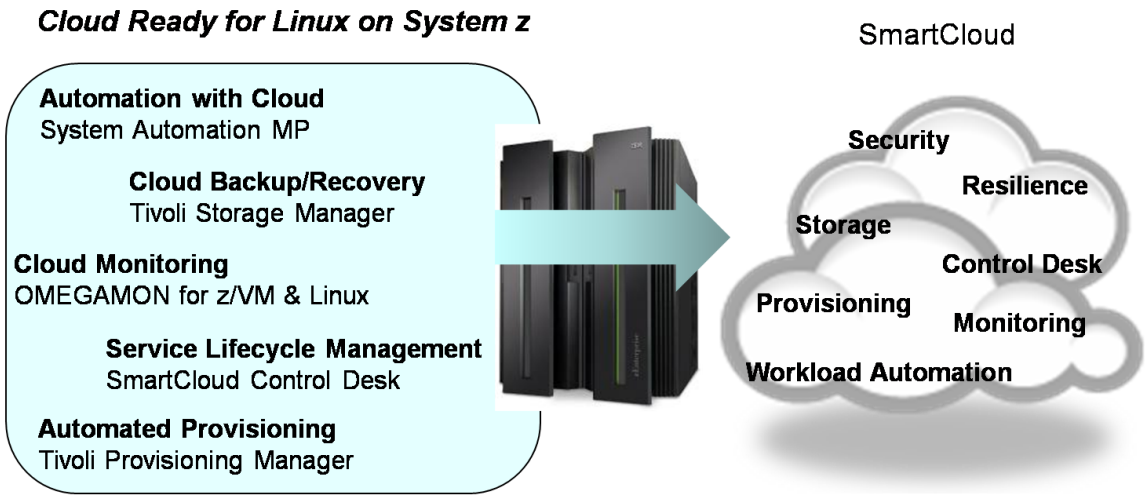
System Automation in a Private Cloud Configuration

Up until now, the configuration that we have been discussing has been a hybrid cloud environment where a mainframe is used to manage an underlying x86 homogeneous cluster. But IBM's Tivoli System Automation can also be used in conjunction with the mainframe's native zManager to create a single point of control that enables IT managers and administrators to manage heterogeneous systems across a private (locked-down private network) cloud. Using this configuration (known as zEnterprise — more information here), both System Automation for z/OS and System Automation Application Manager can be used to manage the hardware and virtual servers on the mainframe as well as on POWER- and x86-based blades that reside on a special IBM chassis/rack system known as a zBX.

Building an Even More Sophisticated Hybrid Cloud — Additional Product Offerings

The combination of SmartCloud, Cloud Ready for Linux on System z, and System Automation for Multiplatforms enables IT managers to create a cloud, manage that cloud, create images that can be deployed on virtual machines, build policy-based management facilities, monitor and control applications within the cloud at a granular level — and extend mainframe QoS to heterogeneous cloud-attached clusters. But other IBM products can also be used to bring in more advanced services to a hybrid System z/x86 clustered environment (see Figure 3). For instance, Tivoli Storage Manager can be used to provide cloud backup/recovery, or IBM's SmartCloud Control Desk (formerly Tivoli Service Request Manager) can be used to provide service lifecycle management, and so on…).

Figure 3 — Use Other Tivoli Tools to Build a More Sophisticated Hybrid Cloud



Source: IBM Corporation — November, 2012

Summary Observations

The goal of every Chief Information Officer should be to operate hyper-efficient information systems environment. Efficiency saves money — and the savings can potentially help an enterprise launch new initiatives to drive new business or to service customers better.

At *Clabby Analytics* we believe that *hyper-efficiency is achieved by deploying applications on systems that are best suited to execute those applications; by linking those heterogeneous systems together using cloud architecture to facilitate communications; and by automating the management of those systems as much as possible*. What our research shows is that only one company is aggressively pursuing all three of these actions: IBM. IBM is the only leading systems maker with four solid and viable systems architectures from which to choose. IBM has built a cloud foundation that makes it simple to deploy and manage clouds across these heterogeneous systems. And IBM is the only vendor with a major focus on cross-platform systems management.

IBM offers several different products that can extend mainframe-class manageability, resiliency, and security down to homogeneous x86 clusters running VMware and Hyper-V. These products make these homogeneous clusters part of the corporate whole. They help reduce the cost of management by highly-automating the provisioning and management of applications within the cloud. And, they eliminate silos — and the communications obstacles that silos create.

IT executives who are interested in making their computing environments hyper-efficient must consider the deployment of advanced hybrid cloud environments. These environments improve QoS by extending mainframe-class service levels to VMware and Hyper-V clusters. They break down cross platform communications barriers. They reduce the need for systems managers with specialized skills to manage homogeneous environments. They lower overall management costs through automation. And, most importantly, they lead to efficient operations — saving enterprises BIG MONEY that can be used elsewhere to drive profitability or to launch new initiatives.

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