



## Advisory

# Beyond Virtualization: Building a Long Term Information Systems Strategic Plan

### *Introduction*

Considering that the amount of information that an enterprise collects doubles every three years — and considering the millions of new devices that must be supported every year (including mobile devices as well as new peripherals) — resource “virtualization” has become a “must do now” in the data center. Virtualization (the logical pooling of physical resources) creates pools of computing power, storage and networking — giving enterprises the capacity and bandwidth that they need to handle the information explosion while supporting a myriad of new devices and new business services. Further, by virtualizing computing resources, enterprises can increase overall systems utilization (thus realizing a better return on investment) — and enterprises can lower management costs and power usage (resulting in lower operating expenses [OPEX]). In other words, by virtualizing resources, enterprises can operate smarter (a theme IBM calls “smarter planet”).

Based upon informal interviews conducted around the world in places like Thailand, the United Arab Emirates, Brazil, Western Europe, Eastern Europe, Russia, India and the United States, *Clabby Analytics* estimates, only about 15-20% of the world’s information systems have been virtualized. This means that 80-85% of the world’s enterprises must get “smarter” about how they utilize resources. For these enterprises, this *Research Report* describes the steps that need to be taken to build a virtualized, automatically provisioned, workload balanced, service managed, highly efficient “smart” information infrastructure.

***Failure to virtualize resources not only affects return-on-investment and total-cost-of-ownership, it also affects a company’s ability to respond in an agile manner to changing market conditions or new business opportunities. Without the savings delivered through virtualization, enterprises may not be able to find the resources needed to launch new projects or applications — resulting in an inability to respond to competitive pressure or to satisfy customer demands. And, for all of these reasons, virtualization has become a “must do”. Accordingly, to compete in the long-term, YOUR ENTERPRISE must build a comprehensive virtualization/provisioning/workload management/service management strategy.***

### *Executive Summary*

When it comes to information systems, the big picture goal of an enterprise should be to flow business processes as efficiently as possible. By doing this, organizations can greatly reduce sales, general and administrative costs — and the resulting cost savings can be passed directly to the enterprise bottom line where they contribute directly to overall profitability. Further, enterprises can improve customer service (resulting in more business); and enterprises can streamline supply chain process flows (resulting in cost savings due to process flow improvements when dealing with business partners).

To flow processes smoothly, enterprises need to build information systems environments that are highly efficient and flexible (using consolidation/virtualization/automated

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workflow techniques); easily managed (using service management software); and highly interoperable (using a service-oriented architecture such that programs can easily interact with one another; and such that data can be readily shared).

To build these highly efficient information systems environments, your organization needs to:

1. *Consolidate* information systems (move from many distributed systems and storage devices to fewer). Servers, storage, and network resources are all candidates for consolidation. Consolidation helps lower management costs, reduce energy usage, save on floor space, and bring software license/maintenance costs under control;
2. *Virtualize* (logically pool unused resources such that they can be used by applications that need them), resulting in improved utilization and lower management costs, as well as improved high-availability;
3. *Manage workloads* — often called workload balancing and/or provisioning (this involves building-up and/or tearing-down systems images or storage allotments to allow new images to be quickly deployed and/or new virtualized storage resources to be made available). Workload management helps improve systems/storage utilization; and,
4. *Optimize service delivery* — allowing IT users to easily gain access to computing resources to fulfill their computing needs — whenever they need them from wherever they are.

***When building highly-efficient information systems environments, vendor selection should, therefore, be based on a given vendor's ability to provide a virtualization environment that can automatically manage workloads, automate processes, and provide related service management tools. (This environment can be provided by the vendor itself — or can be constructed using various virtualization/provisioning/workload management products available in the open market).***

### *Big Picture Strategic Planning*

From *Clabby Analytics*' perspective, many enterprises are failing to plan ahead using the above mentioned big picture view. If the ultimate purpose of information systems is to efficiently serve business process flows, then IT strategic planners need to develop a roadmap that shows how their enterprise will ultimately reach business process flow nirvana. And this means that IT strategic planners need to:

1. Standardize on fewer information systems (standardize on x86 multi-cores, and/or POWER, and/or z);
2. Build a common virtualization/provisioning/workload management environment (sometimes called a cloud environment);
3. Invest in business process flow management software to manage and streamline process flows; and,
4. Invest in service management software to reduce management costs and improve service levels.

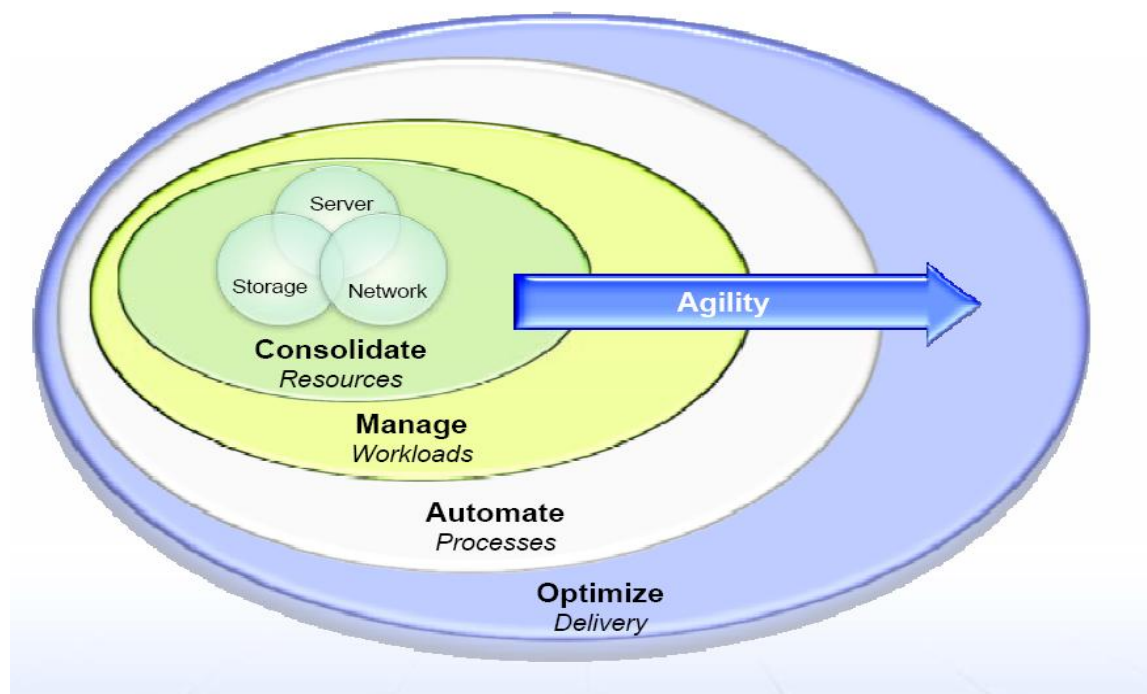
***Instead of taking a comprehensive view — and building a long term cloud/process flow strategy, we see many enterprises taking a step-by-step approach, buying virtualization infrastructure and management***

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software from one vendor, and then buying provisioning software from another; and then struggling to integrate, automate and manage the two. In many cases we see IT organizations building virtualization islands — islands of x86 servers that are virtualized and managed using homogeneous tools and utilities, while their other information systems are virtualized and managed using other tools and utilities. We even see Microsoft Windows environments being managed differently than Linux environments on the same servers.

What we are advocating is that IT strategic planners take a more comprehensive, longer-term view of their goals and objectives — and that they map out a long-term roadmap of the products and services their enterprise is likely to need to achieve business agility (see Figure 1) — and then build consolidation/virtualization/provisioning/workload automation/process flow management/service management plans accordingly.

***Figure 1: A “Big Picture” View of Information Systems Design***



Source: IBM Corporation — April, 2010

How can enterprises build highly-efficient information infrastructures? Let's take a closer look at standardization, consolidation, virtualization, workload management, process automation, and service management in order to understand not only how enterprises are using these approaches to build more efficient information systems — but also the business benefits that they are seeing by doing so.

### ***Standardization***

This is not a discussion about formal standards. It is instead a discussion about standardizing on specific systems architectures. Over the next three years, *Clabby Analytics* expect to see the following developments in the midrange/high-end server and virtualization markets:

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- The server market will gravitate toward three microprocessor architectures: multi-core x86, POWER, and z.
  - New multi-core, Intel-based Xeon processors will be capable of handling many of the same workloads that currently run on 64-bit Itanium processors. This overlap will stifle Itanium sales.
  - Mass migration away from Sun SPARC architecture (due to Oracle's pending takeover) is already underway. SPARC will not recover.

For more information describing this server market consolidation/standardization on three architectures — and the causes of this trend — see our market analysis report at:

<http://www.clabbyanalytics.com/uploads/ServerMarketViewMarch2010UPDATE.pdf>

### *Consolidation*

Consolidation involves taking many to fewer. So, for instance, hundreds of distributed x86 Linux servers can be consolidated into a single mainframe.

The business benefits of consolidation are:

- The management of servers/storage and network devices can be greatly simplified (because IT managers and administrators need to manage fewer devices);
- Energy costs can be reduced (for instance, larger, better utilized consolidated servers frequently do significantly more work than underutilized distributed servers — meaning more computing is being done while burning less power than the amount of power consumed by underutilized distributed server farms);
- License fees/maintenance costs can be brought under control — when enterprises consolidate, they frequently take inventory of the applications, databases, and operating environments that they are running and find that they can up-rev and consolidate their software licenses (one organization that we talked to found that by consolidating their systems environment, they were able to save millions of dollars in software license and maintenance costs).
- Data center space is expensive. Another organization that we talked to (Finanz Informatik — a case study can be found at [http://www.clabbyanalytics.com/uploads/Finanz\\_Informatik\\_Final.pdf](http://www.clabbyanalytics.com/uploads/Finanz_Informatik_Final.pdf)) found that they could actually reduce the number of data centers that they operated through consolidation efforts.

*Consolidation results in reduced software and equipment costs, improved productivity, and lower operating costs. As for new trends, the server industry has been undergoing consolidation since the mid 1990s. Enterprises are now becoming more aggressive in storage consolidation.*

### *Virtualization*

Virtualization is the logical pooling of unused resources (for instance, unused computer processing power can be pooled such that applications that need access to computing resources can access and exploit that computing capacity).

The key benefits of virtualization are improved utilization, higher availability, simplified management, and lower software testing/software quality assurance costs.

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- From a utilization perspective, x86 server users who use VMware, Citrix, Novell, Microsoft, and/or open source KVM (or other virtualization products) are now able to raise the utilization rates of their server from 10-15% utilization to 40-60% utilization. This means that a single virtualized server can do the work of three or four non-virtualized servers. — meaning that enterprises can do more work with fewer servers. (Note: we have talked to several mainframe users who run their mainframes at 100% utilization — recognizing a tremendous return on investment thanks to virtualization.
- From a simplified management perspective — it has proven easier to manage a single, centrally-controlled server environment as opposed to managing multiple, distributed servers. Accordingly, fewer people are needed to manage centrally-controlled servers — resulting in lower operational expenses (OPEX) and improved staff productivity.
- Virtualization also helps lower costs related to high-availability. In days gone by, IT managers often purchased back-up servers and storage devices for fail-over should a problem occur with a production server. Virtualization makes it possible to fail-over to a resource pool — eliminating the need for physical server fail-over.
- Testing/quality assurance costs can also be reduced thanks to virtualization practices. Virtual partitions can be set-up on production servers — and new software can be tested on the server on which it may someday actually be deployed. This eliminates the need to build and provision (copy systems images) onto separate test servers — saving enterprises the need to invest in additional hardware, software, and in labor for set-up.

### ***Managing Workloads and Automating Processes***

A lot of the work that is being done to create cloud computing environments has to do with managing workloads and process flows. Today, much of this work is done manually — which means that expensive systems/storage/network human resources need to be used to do what could be done automatically. In the future, efficient information systems will flow processes over consolidated, virtualized, automatically provisioned, workload-optimized underlying IT infrastructure.

The way that automated provisioning and workload automation works is through the creation of scripts or programs that can programmatically react to conditions that occur. For instance, a high-priority application asks for computing resources — and a script or program recognizes that program's request. It checks to see if the resources are available — and if so, provides that application with access to those resources by building up the systems image to serve that application (this is called “automatic provisioning”). If the resources needed to run that application are not available, the application's priority may supersede (bump) lower priority applications that are currently running. In each case, a decision is being made programmatically as opposed to being made by a human — freeing up systems administrators and managers to perform other tasks.

The primary benefit of automated provisioning and workload management is that it reduces manual labor (while potentially eliminating possible human errors that may occur). By

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taking human labor out of the picture, enterprises can save thousands of dollars in labor costs while also (potentially) improving application service levels.

From *Clabby Analytics* perspective, there are two approaches to managing workloads and automating processes: 1) an integrated approach; and 2) a point product approach.

- Vendors that build integrated virtualization/provisioning/workload management/automated process flow environments include companies such as IBM, Microsoft, Novell, Oracle, and CA — as well as many cloud suppliers. (It can be argued that VMware also provides such an environment — but we don't see VMware as being strong in process flow management).
- Vendors that build point product solutions for provisioning/workload management/auto-mated process flow environments include: VMware, Hewlett-Packard (Opsware), and Oracle (BEA) — and dozens of others (search provisioning, workload balancing, etc. on the Internet).

*For strategic planning purposes, the most important consideration in workload management and automated process management is to consider how much time and money your enterprise is willing to spend integrating these types of software products with underling, consolidated, virtualized systems architectures.*

### *Service Management and Service Delivery*

IT service management is exactly as its name implies: a way to manage a collection of IT services. A more formal definition can be found at [www.itil.org](http://www.itil.org):

*"IT service management is the framework which plans, monitors and controls the quality of the delivered services. The correcting variables are derived from the business targets and customer orientation as well as cost optimization". To align with these "business targets", service management focuses on services that IT delivers to the business such as e-mail or accounts payable/accounts receivable/general ledger or corporate intranet — as opposed to focusing on physical systems management or database administration or other IT activities.*

IT service management software automates redundant, repetitive IT tasks, integrates those tasks into a single group of common services (such as availability services, or storage services, or security services, etc.) — and then provides a dashboard view of how those integrated tasks are performing. From these dashboards, services can be monitored and controlled — and corrective action can be taken if need be.

From a business benefit perspective, service management does two things: 1) it reduces the amount of labor an IT manager/administrator must perform to manage information systems environments; and, 2) it improves business agility and business effectiveness by allowing business users to self provision resources as required. By using service management software, businesses are able to leverage a virtualized, provisioned infrastructure as a new business and delivery model where a 'virtual enterprise' is unconstrained by physical barriers and location.

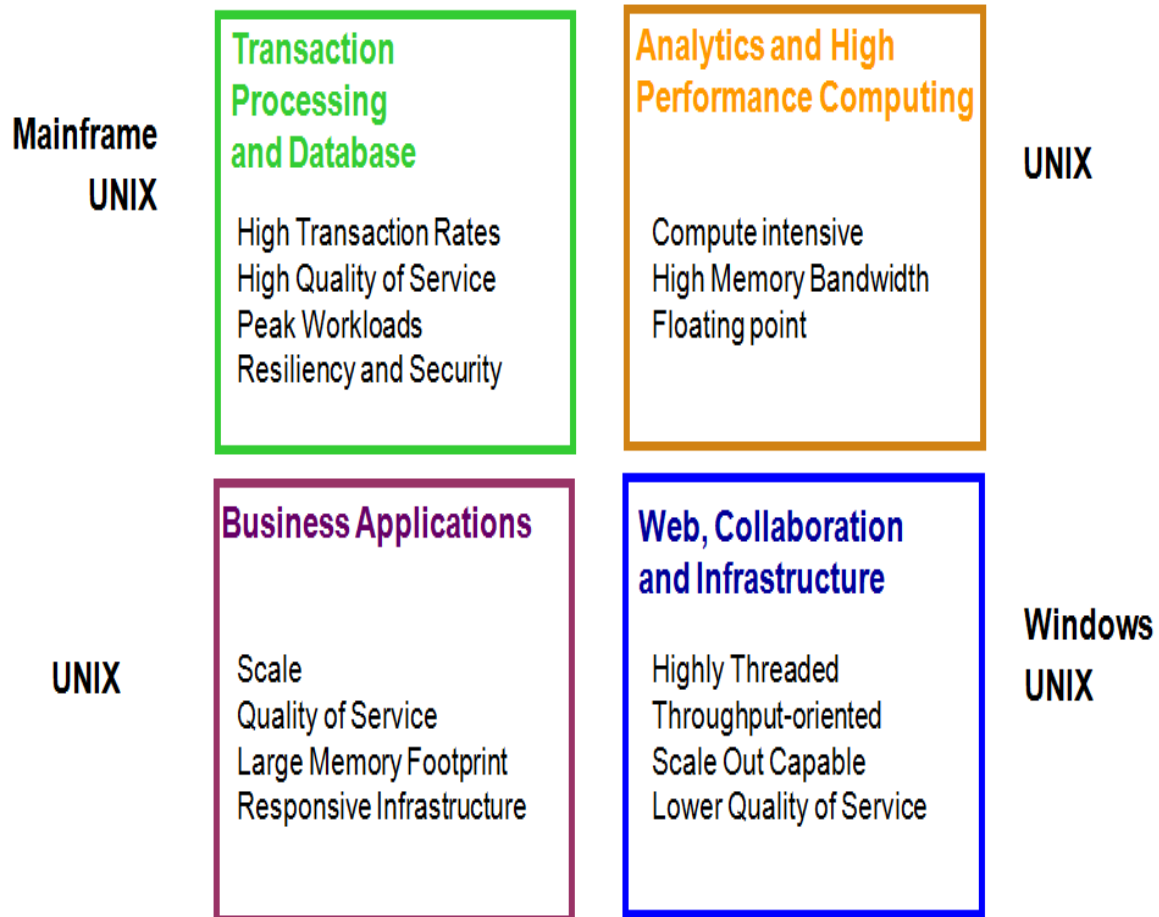
### *Finally, Consider Virtualization "Maturity When Implementing Your Smarter Planet Strategy*

When standardizing an information systems environment, consider that x86 servers, Power Systems, and mainframes each perform different tasks well. For instance, mainframes are

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extremely well suited to process very high numbers of transactions while delivering high levels of service and extremely strong resiliency and security (some Unix configurations also have these characteristics). Unix servers are good at compute-intensive tasks, floating point calculations and for handling business analytics and business applications. x86 servers are particularly well suited for handling high thread counts — and are throughput oriented (see Figure 2 for a comparison of these three systems types).

***Figure 2 — Comparison of Mainframes, Unix Servers, and x86 Servers***



*Source: IBM Corporation — April, 2010*

Also consider that the maturity of virtualization infrastructure and management differs significantly between each platform (x86) is the least mature, mainframes are the most mature. Weigh workload characteristics (Figure 2) and virtualization maturity (Figure 3). very carefully when choosing your information systems environments. Making the right platform/virtualization choice has the potential to save your enterprise from having to make substantial investments when it comes to integrating virtualization, provisioning, and workload balancing components as your organization builds its smarter planet strategy.



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**Figure 3 — Level of Maturity Comparison — VMware vs. POWER vs. Mainframe**

Attribute	VMware ESX 4.0	PowerVM	z/VM V6.1
<b>Scalability and Performance</b>			
Real CPU sharing	Up to 20 VMs per CPU (workload dependent)	Micro-partitioning allows dynamic adjustments of 1/100 <sup>th</sup> of a CPU between running VMs	Architecturally limitless; more than 60 VMs per CPU (workload dependent)
Architected maximum number of VMs	320 per copy of VMware	1000 per physical server using PowerVM	Thousands per copy of z/VM
Practical maximum number of VMs	Tens per copy of VMware	Hundreds per server using PowerVM	Hundreds per copy of z/VM
Real CPU and memory capacity on demand	No	Yes, non-disruptively	Yes, non-disruptively
In-memory support	Shared virtual memory pages (detected via background operation)	Active memory sharing dynamically flows memory between running VMs	Minidisk cache; Virtual Disks in Storage; DCSS (shared program executables)
Virtual Machine (VM) scalability	Up to 8 CPUs, 255 GB of memory, modest I/O bandwidth	Up to 256 CPUs, 8TB of memory, extensive I/O bandwidth	Up to 64 CPUs, 1 TB of memory, extensive I/O bandwidth
Run multiple copies of hypervisor on single server	No	No	Yes; share CPU, I/O, and networking resources with up to 60 copies of z/VM on one mainframe
<b>Flexible Operations</b>			
Command and control, monitoring, automation infrastructure	Modest, yet easy to use	Extensive, robust	Pervasive, robust, time-tested
System co-residency with z/OS	No	No	Yes; LPAR technology lets users run z/VM side-by-side z/OS inside the same machine
Hypervisor-on-hypervisor support	No	No	Yes; run multiple copies of z/VM as guests of z/VM (even new release levels on old releases)
Resource over-commitment support (memory, CPU, network, I/O)	Modest	Extensive	Extensive
Virtual Machine mobility support	Yes; essential for workload mgmt across multiple copies of VMware	Yes, live partition migration supported across (and between) POWER6 and POWER7 servers and blades	Planned future support; dynamic scalability of z/VM lessens need to relocate guest images
<b>Infrastructure Economics</b>			
Cost-efficient disaster recovery	No; typically requires a duplication of hardware and software license fees	Yes, including PowerHA and VMControl system pools	Yes; Capacity Backup on Demand CPUs offer inexpensive multi-system failover options
Cost-efficient technology refresh	No; typically requires re-purchasing new hardware and application verification	Yes, including live migration of VMs from POWER6 to POWER7 servers	Yes; mainframe upgrades offer investment protection and application compatibility

*Source: IBM — April, 2010*

### Summary Observation

Strategic planners need to understand virtualization is not the end game when it comes to improving information systems efficiency. The end game is to streamline process flows over underlying, highly-efficient information systems.

*As for parting advice: before choosing a strategic virtualization partner, a comprehensive, a big-picture IT optimization plan that includes consolidation, virtualization, workload management, automated process flow and optimized service delivery needs to be articulated. After this has been accomplished, select vendors who can best integrate these various components in order to ensure streamlined operations, and in order to reduce integration costs.*

**Clabby Analytics**  
<http://www.clabbyanalytics.com>  
 Telephone: 001 (207) 846-6662

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