Ready Your Infrastructure for the Cloud

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Executive Summary

We have all heard the incredible predictions for and forecasted adoption rates of cloud computing:

- IDC estimates the market for cloud products and services growing to $56B by 2014.

- Gartner more optimistically estimates the cloud market at $150B by 2013.

- AMI's research estimates that SMB cloud spending alone will reach $100B by 2014.

Is this hype or has the cloud arrived? Before we can answer that question, we will need to take a step back and explore just what this thing called "cloud" really is and what organizations hope to gain from it.

Companies today want to use cloud technology to make their businesses more efficient, hoping to deliver apps, storage, computing power and infrastructure on demand. Unfortunately, many organizations are letting the bright promise of cloud distract them from first ensuring that their existing infrastructures are up for the challenge. Before companies can make the cloud commitment, they need to assess their current processes and procedures.

In this paper, we will look into:

- What trends in the data center are driving a need for cloud computing?

- What has happened in technology to make this the perfect time for cloud?

- How prepared is my data center infrastructure to reap the benefits of the cloud?

We will also outline some trends and technologies that make the environment ripe for cloud as well as some tips for preparing your network for the cloud. This final question is key. Unfortunately, it is also the most often overlooked activity in cloud implementation. After reading this paper, you should have actionable steps you can take to ensure that your data center infrastructure is prepared for the unpredictable demands that any type of cloud initiative can place on it. You must be able to ensure that your service levels do not falter in your effort to provide greater computing power.

Ready Your Infrastructure for the Cloud

Data Center Trends

These last few years have been full of challenges brought about by a down and wildly fluctuating economy. As businesses struggle to protect and grow their revenues, a more back-to-basics, disciplined attitude and approach has begun to emerge. This revenue alignment approach will cause increased pressure in IT to provide products and services transparently while producing definable, measureable data. This is supported by a recent Gartner report where CIOs selected top priorities in 2011. This report demonstrated the changes from the top priority of "improving business processes" to the new top priority for 2011-2014 of "increasing enterprise growth" (McDonald & Aron, 2011).

What does this mean to you? Business units are razor focused on monitoring their operations and are requiring lightning fast capabilities to capitalize on opportunities today, not in six months or one year. This results in IT needing to operate in a more fluid but disciplined approach in order to become highly adaptable to the needs of the business; otherwise, they run the risk of becoming an obstacle to success. More than ever, the business has greater concern over the services delivered and consumed than by the technology behind it. Bottom line, IT needs to be in lock-step with the business objectives in order to assist with the enterprise growth without becoming the point of failure.

Rapidly Changing Environments

If the economic slow-down was not a challenge enough, there is now an almost desperate need for innovation and rapid time-to-market. In times such as these, strong enterprises will turn to the innovations brought about by IT to help them gain competitive advantage.

The easiest target is the data center's ability to handle operational shifts as a result of requests for rapid change. In most cases, leadership is questioning the viability of its current data center practices and is looking for alternatives for improvement.

Business Strategies	Ranking of business strategies CIOs selected as one of their top 3 in 2011 and projected for 2014				
Ranking	2011	2010	2009	2008	2014
Increasing enterprise growth	1	·	·	·	1
Attracting and retaining new customers	2	5	4	2	3
Reducing enterprise costs	3	2	2	5	6
Creating new products or services (innovation)	4	6	8	3	4
Improving business processes	5	1	1	1	13
Implementing and updating business applications	6	·	·	·	12
Improving the technical infrastructure	7	·	·	·	7
Improving enterprise efficiency	8	·	·	·	10
Improving operations	9	·	·	·	2
Improving business continuity, risk and security	10	·	·	·	23
Expanding into new markets and geographies	11	13	10	4	5
Attracting and retaining the workforce	12	4	3	6	8
Introducing and improving business channels	15	15	·	·	9

Figure 1. Gartner Executive Summary: Reimaging IT: The 2011 CIO Agenda

Keep in mind, rapid shifts in business practices impact more than just IT applications. Without the ability to know, control, manage and plan your critical infrastructure components, an enterprise's ability to swiftly introduce change and take advantage of new technology is greatly hindered. Available infrastructure and resources must be allocated more efficiently as needed to meet the changes in service requirements. This means that the underlying infrastructure must be adaptable along with the compute, services and applications.

Managing IT Value

IT is being driven by both internal (business objectives) and external (increased competition, slow economic recovery) factors that continue to disrupt the organization. Whether impacted directly or not, organizations will face change as the actions of their industry and competitors will require significant response to retain a foothold in their respective markets. The increasing importance of IT to the business will necessitate increased transparency in contribution, while becoming a more valued component of overall business health and success.

The ability of IT to increase transparency and set cost benchmarks will continue to be important in demonstrating IT's efficiency. However, IT's success will be measured by its ability to deliver the needed capabilities that the business is seeking, set forth by their criteria for success. Businesses' fanatical focus on time-to-market and cost is the top driver for the use of external IT infrastructure providers, as "buyers of IT functionality" try to generate as much revenue as possible to stimulate a return to growth. This trend shows a dangerous precedent if IT is not successful. These "buyers" may lose faith in their in-house IT's ability to deliver.

Today, IT is struggling to meet the demands for rapid deployment and agility due to the proliferation of customized and legacy environments. While consolidation for cost and utilization efficiencies has been ongoing for the past five years, many organizations are still weighed down by these environments and the applications that run on them. During this period, virtualization has enabled improved utilization, cost and time-to-market, but it comes with its own challenges. The initial cost savings for moving to a virtual environment are significant as the capital expense needed for physical hardware decreases drastically. However, the operating expenses for software and maintenance fees are no different in a virtual environment. Without a tie to direct value delivered, these savings will dwindle as virtualization of the enterprise increases. Businesses will be left wondering why their costs have not continued to fall. These costs need to be carefully scrutinized and installations managed to control "virtual server sprawl" in order for IT to continue to add value to the business.

The traditional views of success of on-time and on-budget delivery of technology are no longer in sync with the measures of the business criteria for success. IT organizations will need to move quickly toward contribution to business outcomes set forth by the project success criteria; otherwise, they will risk being deemed ineffective and replaced by outsourcing. Moving toward this differing view of value versus cost will help in determining the probability of delivering value when considering whether projects are kept alive. Investment decisions are then optimized around enabling innovation and managing appropriate cost and risk mitigation.

Improving Agility of Service Delivery Via the Cloud

Investment decisions are mainly based on their revenue generation. The focus on revenue growth is forcing the enterprise to break the traditional norms of IT-supported business practices. New models for service delivery, such as cloud computing, will be needed to support normal business practices, as well as those brought upon by ubiquitous computing. The impact of ubiquitous computing itself will have a large impact on infrastructure and management processes. Delivery of services, applications and data management across multiple devices (laptops, smart phones, tablet PC) and across multiple operating environments will necessitate the further use of web and cloud technologies for more than just convenience, but to help secure and manage the data on them.

When organizations introduce extreme change, supply and demand are at odds. Although buyers want agility and low-cost service solutions, utility offerings are a radical shift for the enterprise, and the adoption of new models has proved to be unpredictable at the enterprise level where "slow and steady" has been the norm due to security, regulatory and compliance concerns. Meanwhile, major enterprise buyers are looking to the market leaders to validate the new utility-style service models to meet their requirements for security, reliability, scale and compliance. However, providers are cautious due to the potential for new offerings to cannibalize their revenue from traditional offerings. Either way, the environment is ripe for cloud computing.

Cloud Defined

Let's take a step back and understand what is meant by cloud computing. According to National Institute of Standards and Technology (NIST), "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

> *More than half (56%) of enterprise IT organizations are building their own private cloud-based infrastructures. (Aberdeen Group)*

According to Forrester Research, successful cloud deployments typically are characterized by 1) high availability, 2) universal accessibility, 3) dynamic provisioning, 4) a self-sufficient user experience and, in many cases, 5) a pay-per-use pricing structure.

Essential Characteristics

NIST also describes five essential characteristics that define the cloud:

On-demand self-service - End users should be able to initiate and alter cloud services without interacting with administrative or management personnel.

Network access - Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, laptops and PDAs).

Resource pooling - Critical to the concept of a cloud environment is the idea that infrastructure services are consolidated to provide a seemingly endless supply of computing resources. Examples of resources include storage, processing, memory, network bandwidth and virtual machines.

Rapid elasticity through automation - Provisioning of cloud services should be nearly instantaneous. In fact, cloud implementations are able to provision services such as virtual desktops, storage and applications up to 240 times faster than more conventional methods.

Measured service - Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth and active user accounts). Resource usage can be monitored, controlled and reported, providing transparency for both the provider and consumer of the utilized service.

Within each cloud computing system architecture, cloud computing service offerings are divided into four additional categories:

- **Infrastructure as a Service (IaaS):** A comprehensive computer infrastructure (servers, storage, software and networks) made accessible to users via the Internet.

- **Security as a Service:** An outsourcing model for applying security management. Security as a service is best known for the utilization and application of security such as anti-virus software delivered via the web. However, this practice can refer to in-house security management provided by an external organization.

- **Storage as a Service:** At its most basic, the term "cloud storage" describes data storage that is made available as a service via a network. Cloud storage service attributes include the availability for massive scale; non-geographic barriers or limitations; commoditized components; billing on a usage basis (price per gigabyte); and are application agnostic.

- **Platform-as-a-Service (PaaS):** A full or partial development and deployment environment that supports online access and collaboration. This type of cloud enables developers to leverage a robust developing environment–via an IT infrastructure–without the necessary investment in hardware and additional management personnel.

- **Software-as-a-Service (SaaS):** Turnkey software applications–including complex customer relationship management (CRM) and enterprise resource management (ERM) programs–accessible via the Internet. These solutions are typically made available through the data center of a dedicated SaaS provider. However, PaaS and IaaS clouds can be used in place of a brick-and-mortar facility.

Cloud Architectures and Service Models

1. *Public Clouds:* Often characterized by the hosting of pay-per-use, virtualized servers by third-party cloud vendors and/or service providers.

2. *Private Clouds:* A highly virtualized, pooled resourced IT infrastructure that hosts services for employees and is managed by an organization's IT staff in its facility. In a private cloud, all data remains under the full control of the host organization, mitigating many potential risks intrinsic to public cloud deployments.

3. *Hybrid Clouds:* The concurrent or integrated use of an on-premises private cloud as well as public cloud offerings. The potential benefits of hybrid clouds will be realized when organizations are able to leverage resources from both internal and external cloud resources for the optimal delivery of services. Practices known as "cloud bursting" are already taking shape to reduce the need for additional data center build out to support peak growth periods, rather seamlessly shifting resources to the public cloud to increase capacity on either a permanent or temporary basis or to selectively host applications based on their risk profiles.

Getting Cloud Ready

Many private enterprise clouds currently exist in a prototypical state, with IT managers establishing private clouds as a proof-of-concept to assess the viability and path of future public or hybrid cloud ventures. Among the applications being explored by enterprises in these pilot clouds are commodity-based Web content; business intelligence and data analytics; email and collaborative workspace platforms; high-performance and batch computing; network testing and development; and enabling SaaS while maintaining core data center functionality.

Both internal and external cloud computing deployments will be able to help enterprises address changes in business needs and/or customer demand efficiently and effectively. But, how do you get started?

According to IDC, *"…senior executives are creating cloud computing mandates for their organizations with little understanding of how those initiatives might be implemented."*

Whether it's a private, public or a hybrid of the two, lack of basic preparation can be disastrous. So, how can you make your private infrastructure resources scalable and ready for the demands of cloud without compromising business efficiency?

Recognizing vulnerabilities in your existing data center before embarking on a cloud computing deployment offer an opportunity for potential cloud computing adopters to fortify critical systems. The most significant opportunities for data center readiness can be divided into three key areas:

Know What You Have and Where You Have It:

No matter where your current data center asset management is today–from scrambling to manage it all manually to overseeing multiple automated systems–there is always a better, improved level of efficiency to be reached. In order to more effectively manage the physical infrastructure, organizations need a fully integrated solution that (at a minimum) tracks the physical infrastructure configuration, manages projects and calculates current capacity.

- **Comprehensive Visualization –** You will need a central system that is dynamically updated as equipment is installed, decommissioned or moved within the infrastructure.

- **Know Your Inventory –** This single repository eliminates the need for personnel to conduct labor-intensive audits and update multiple spreadsheets, freeing up resources and improving management efficiency.

- **Know Your Capacity –** Once you have a repository of your assets, you will need to understand the capacity of each (space, power and network).

- **Maximize Your Data Center –** Plan and pool resource deployment and operation to optimize power and cooling usage.

The first step in effectively sizing your infrastructure is to know what you have in the first place.

> ### *Key Questions:*
> ✓ Do you know what assets you have in your data center?
> ✓ Do you know where those assets are?
> ✓ How are those assets interconnected?
> ✓ Is there a process today to efficiently commission or decommission assets?
> ✓ Can you determine if you have enough space/power for future IT projects?
> ✓ Are you effectively organizing assets to maximize power and cooling efficiencies?

Plan for Rapid Change:

The second step in infrastructure sizing is being able to plan for rapid change.

Only being able to fully visualize the effects of change on load, power and devices can you confidently react to the changes in reconfiguration and additions to your cloud initiatives.

- **Physical asset and resource management**
- **People and process management**
- **ITSM integration**
- **Performance optimization**

Organizations that take control of and optimize an increasingly complex physical infrastructure (including equipment, space, power, cooling, network and storage) begin the process of readying their infrastructure for the cloud.

Checklist to PLAN for Rapid Change:

✓ Do you have planning tools?

✓ Do you use actual data?

✓ Do you run rack capacity simulations?

✓ Do you look at power/space/network effects over time?

✓ Do you act on those results?

Checklist to COMMAND Your Remote Locations:

✓ Have you met your network availability SLAs?

✓ Can you manage your virtual and physical servers in the same manner?

✓ Do you have an acceptable MTTR?

✓ Do you get real-time alerts or alarms regarding the state of your assets?

✓ If you have a server off-line, do you have a process to get that server back into operation?

Command:

From the 2010 Emerson Data Center User's Group, more than half of those considering adoption of cloud were greatly concerned with it affecting availability and performance.

Without tight control and management over current assets, from corporate all the way to remote data centers, you will not be able to identify risk areas and right-size to create an optimized environment for cloud. This means point failures must be able to be quickly identified, isolated and corrected.

Remote access and management of all rack-level devices is critical to maintaining the fluid nature of cloud compute workloads. Downtime is not an option with the cloud.

Manage Power:

Cloud's virtualization technology facilitates a dynamic compute environment within a static foundation. Rapid changes in compute load translate into substantial increases in power consumption.

That means you must not only be able to maintain "headroom" to handle normal peaks in demand, but also the odd spikes from sudden and intense cloud utilization. Single points of failure must be identified and eliminated.

Checklist to MANAGE Your Power:
- ✓ Have you implemented virtualization in your data center?
- ✓ Can you measure/monitor the power implication of that implementation?
- ✓ Is that measured in real time?
- ✓ Is all your data center power data aggregated into a single location?
- ✓ Do you analyze that data for planning and costing?

Emerson Network Power Can Help

Bottom line? You may not know just how ready your data center is to handle the strenuous demands of a cloud initiative. Fortunately, that's where Emerson can help. We are not here to help you design or launch a cloud. We are here to help you prepare your data center for cloud.

Emerson has products and solutions ready to help you achieve the steps just mentioned, ensuring you have a healthy foundation from which to build your cloud. Emerson provides intelligent connectivity, capacity control and management of data center devices, power and remote location, plus intuitive planning tools needed to visualize the effects of change now and over the long term.

The Avocent® Data Center Planning Solution gives you complete insight. Insight into how your equipment is being utilized, where it's residing, how much power it's using and what would happen if you changed something. With that kind of power at your fingertips, you'll be able to reduce costs and manage rapid change with few resources, no matter how complex your infrastructure is.

Aperture™ Vista is a suite of applications that creates a unified view of physical resources across multiple data centers. The Aperture solution is comprised of monitoring and control, physical asset and resource management and people and process management–all built on a foundation of integrated information. Organizations can now take control of and optimize an increasingly complex physical infrastructure including equipment, space, power, cooling, network and storage.

The Avocent Control and Manageability Solution delivers secure, automated, real-time tracking and control of all your servers, embedded technologies, network equipment and power devices. This gives your IT staff what it needs to simply manage change from any location, at any time of day or night, without regard to hardware type, operating system or network status.

The Avocent Power Management Solution provides you with the tools you need to monitor energy consumption, costs and trends across all levels within the data center and remote locations.

Summary

While cloud computing offers a number of long-term benefits over traditional, distributed computing architectures, enterprises should not discount the significant risks. Understanding that business-critical applications and data have made network infrastructures more vital than ever, enterprises can take steps now to optimize their data center infrastructures before experimenting with cloud computing.

For enterprises that understand the risks as well as the best practices necessary to address them, a combined strategy employing both internal and external cloud approaches affords flexible capacity and maximum availability and ensures any new capital expenditures are allocated toward creating innovation, continuity and driving competitive advantage.

By enhancing the efficiency and elasticity of network infrastructure through the optimization of existing facilities, enterprises are well positioned to achieve performance optimization and agility without compromising the availability needed to support mission-critical applications.

About Emerson Network Power

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