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New world data center environment

Today's data centers are embarking down a path in which "old world" business, technology, and facility metrics are being pushed aside in order to provide unparalleled service delivery capabilities, processes and methodologies. The expectations derived from today's high-density technology deployments are driving service delivery models to extremes with very high service delivery capabilities adopted as baseline requirements within today's stringent business models. Part of the "revolution" that is driving today's data center modeling to unprecedented high performance and efficiency levels is the fact that computer processing advances with regard to high-performance and smaller footprints have truly countered each other. Processing performance has continued to grow exponentially, with size and footprint continuing to diminish to levels that are now causing huge issues within the areas of facility environmental infrastructures. Today's high-density deployments are pushing the environmental envelope to astounding levels so as to require engineers to perform baseline infrastructure calculations based upon watts per rack/cabinet, rather than watts per square foot as in the past.

In order to achieve today's high-density technology deployments that involve packing large quantities of processing power into smaller white space areas requires deliberate and careful analysis, planning, design, and deployment methodologies in order to prevent environmental melt-downs that can occur because of these high-density technology deployments. Most data center operators are struggling with exactly how to deal with today's high-density server technology systems, such as 1U/2U rack-mount servers and/or blade server systems. Since IT hardware manufacturers are trending towards the high-density blade server hardware technologies, practically everyone is struggling to figure out how to fit these technologies into their data centers and operations. To further complicate this paradigm, application consolidation and virtualization efforts are also driving processing utilization levels to unprecedented levels which are simultaneously impacting MEP (Mechanical, Electrical & Plumbing) architectures to astounding levels. The struggle is not to understand the technical intricacies of virtualization, but how to control the environmental nightmares with regard to cooling and power caused by such high-density, high-utilization IT deployments. It is certainly widely understood that being able to install more technologies into smaller data center spaces is conceptually a "good thing", but the impact to other data center facility operations and infrastructure systems can be catastrophic if all of the facility and technology infrastructure elements are not considered "holistically", which drives you to ask yourself the question…Do I really want to do that?

The days of designing data centers based on the facility alone are over with today's high-density data center designs and deployments being completely based around business and technology metrics and models. Those requirements are dictating leaner operational budgets that are in turn causing careful consideration in the areas of hugely expensive data center real-estate. The trend has always been to operate within the company's technology and/or data center means, with the trend always being to reduce the number of data centers and/or overall raised floor space with strict cost containment controls in place. Today's high-density technology deployments are allowing organizations to finally see the light so to speak, with regard to expensive raised floor deployments, but are paying the price for not properly planning their high-density deployments in the areas of power and cooling costs and/or catastrophic environmental issues with the data center itself.

Another key piece to today's data center puzzle is the fact that virtualization and consolidation technologies are enabling processing utilizations to finally come up to full capabilities, which compounds the power and cooling issues even further. Most data center operators are taking advantage of deploying today's consolidation and virtualization technologies at some level, but add the application virtualization factor into the overall environmental mix and you have a real recipe for huge environmental nightmares within the data center if technology and facility infrastructures have not been planned as a completely integrated and holistic solution. In order to further understand the overall impact of today's high density technology deployments with respect specific to power and cooling dynamics, a typical 42U rack configured with six IBM blade server chassis and fully populated with 14 servers for each chassis yields 84 servers per rack. If application virtualization is also deployed at typical stacking ratios (i.e. 8

to 1), the potential application yield per rack is approximately 672 applications. With this, the typical processing utilization of 10-15% per server now spikes to over 90% causing power and cooling requirements to now be at what is termed "nameplate", or at the maximum manufacturer environmental output ratings.

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With today's technology and data center designs being so focused within these very high processing environments, the industry is being driven to view the data center as "the computer". The days of carving data center white space into specific technology chunks with specific technological and environmental requirements, as well as processing systems being deployed within physical high-density deployments in which one-off application deployments are the norm, are quickly diminishing. With energy efficiency being one of today's huge issues, more specifically with regard to power operational costs, overall operational efficiency within the data center is fast becoming a very hot topic. Today's data center issues regarding high-density hardware deployments, systems/applications consolidations and virtualizations, and facility environmental performance and efficiency, represent the core reasons for a tremendous paradigm shift with today's data center facilities and technology designs/deployments. With these shifts, it is now absolutely imperative that all elements of business, technology and facilities be carefully and absolutely integrated in order to ensure the highest levels of overall performance, service delivery, resiliency, and efficiency in today's high density environments.

Regarding today's server technologies, it is important to understand that many computing manufacturers are continuing to develop even greater high-density and processing platforms that will require even tighter space and environmental conditioning requirements. The fact that we are dealing with high-density issues at this current state only means that they will only get much worse. The ability to operate your data center and technology environments within today's "New World" of the high-density data center environments depend on your company's ability to gain the knowledge and understanding of how to balance these shifts in technology paradigms so as to continue to meet stringent business model demands while delivering the highest levels of service delivery, availability, and continuance. With this, it is imperative for enterprises to carefully evaluate their existing IT deployments and make plans for the high-density environment now, since it is obvious that these types of systems are not going away and represent the future for all or most IT deployments for the near future. Like it or not, these types of systems and deployments are here to stay.

One of the most critical first steps in determining if/how/when to shift your existing data center and technology operations into this "New World" data center paradigm is to completely understand the IT environment in which you currently operate and if/how you can best utilize what is already in place. For today's high density environments, the possibility of utilizing existing IT systems and applications depends mostly on the specific hardware platforms and their abilities to be a participant within the high-density data center environment. If the IT systems were purchased and/or deployed within the last two years, it is entirely possible that they may be capable of participating within the consolidated and/or virtualized IT model. However, careful evaluations and analysis are always required in order to make those determinations on a case-by-case basis.

There are two methods of achieving the high-density data center environment that are reliant on the ability of the IT organization to properly plan, design and deploy the overall solution. It is also important to point out that this usually cannot be a solution that is a "one-off" deployment where the enterprise adopts consolidation/virtualization practices for one data center, but not others. Consolidation and/or Virtualization efforts must be adopted on an enterprise basis in order to fully utilize the capabilities and processes within the high-density data center environment. The level of competition within today's business environment demands enhancements as to how customers build and manage their technology infrastructures and a huge strategic advantage can be gained by making adjustments in utilization current platforms, operating systems and storage systems while extracting the highest performances from each asset.

Consolidation vs. Virtualization

Many IT departments have already uncovered that there are distinct overlaps between consolidation and virtualization. The key issue is how to reconcile these two techniques within today's data center environments. Today's virtualization tools such as partitions, virtual machines, and resource management software, enable multiple workloads to co-exist and run in parallel on larger servers, which is also key aspect of consolidation. However, it must be understood that virtualization also offers far-reaching capabilities for enterprises to fundamentally transform their IT operations within their own data center environments. The tactical use of virtualization tools for consolidation purposes must be carefully balanced with long-term business, technology and facility goals in order to achieve the ideal architecture for today's virtualized data centers.

Server consolidation implies combining workloads from separate machines or applications into a smaller number of systems and/or applications. There are multiple forms of consolidation that deal with heterogeneous workloads from multiple servers being moved to single larger servers; multiple workloads being combined under a single operating system, thus reducing the number of operating system images.

Server virtualization involves decoupling a workload and its data from the functional operations of the physical platform of which it is being hosted. This increases the flexibility with which the workloads can be matched with physical resources in an effort to enable the development of business-driven policies for delivering resources that are relevant given the specific time, costs, and service delivery and/or service level requirements. Compared to consolidation by itself, virtualization allows IT operations to be performed with far better economies of scale allowing system/applications architectures to be efficiently managed, regardless of rates of growth, while maximizing the utilization of all processing resources within the data center space.

It is easily understood that there are similarities between consolidation and virtualization terms and policies, but there exist distinct and fundamental differences between the two approaches. Consolidation is generally most effective with homogeneous workloads and the ideal consolidation approach deals with hosting multiple workloads within the realm of a single operating system. This also requires some type of management tool that provides the required resource management functionality and/or capabilities. Consolidation typically lowers overall operational costs by reducing the number of operating environments deployed within the data center, which in turn reduces the quantity of operating environments that IT departments are required to manage. Consolidation also possesses distinct advantages by eliminating excess application deployments, which reduced overall licensing costs and administrative requirements to maintain those applications.

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In closing, it should be apparent that there are definite and distinct struggles going on within today's enterprises that are impacting both short and long-term business, technology and data center facility decisions. Decisions made today will have huge impacts on overall data center facilities and technology reliability, performance and scalability for many years to come. Data Center operational and modeling decisions made today will have huge impacts on business models and drivers tomorrow, so careful consideration must be engineered into the overall data center architecture and environment in order to ensure the highest levels of service delivery and efficiency. One thing that is clearly understood is that today's data centers are shifting into a "New World" paradigm in which high-density technology deployments cannot be exclusively focused around hardware/application deployments, but must be engineered to take into consideration all elements of business, technology, and facilities in order to integrate the entire process and operations as a cohesive unit. Data centers are facilities and operations that are easily retrofitted and not very often. Therefore, it only makes sense to do your homework up front in order to prevent catastrophic issues and nightmares going forward.

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