DCD INTELLIGENCE

MANAGING THE UNPREDICTABLE:

HOW TO INCREASE DATA CENTER DENSITY AND CAPACITY WITHOUT INCREASING RISK

Server Technology
A brand of legrand

Nick Parfitt
Kevin Restivo

DCD Intelligence
June 2016

CONTENTS

FIGURE & TABLE INDEX

SUMMARY

As demands on data centers, like required increases in compute output and storage size grow, so too does the need to better plan for the unknown. However, adding capacity to meet future compute needs can be expensive, and enterprise workloads are not always predictable.

Yet data centers need to ensure there is sufficient capacity for potential expansion efforts as business grows more dependent on data centers for service provisioning.

Denser environments and capacity planning can help Data Center Managers prepare for the future with limited information. To achieve this, data center operators need a sharper understanding of their own resource requirements namely bandwidth, compute outputs and storage to properly assess, and adjust for hard-to-predict workloads such as traffic from the Internet of Things, the nascent network of Internet-connected devices able to collect and exchange data.

The alternatives to effective power management and capacity planning are to waste money on over-provisioning (be it servers or cloud time), to cut availability when faced with unexpected load peaks or to move to the back of a virtual queue to wait in line for shared resources.

This makes monitoring an important element of overall data center operations management for many reasons, including the ability to decrease the number and duration of unplanned outages, effective power management / distribution, loading and balancing in addition to improvement of maintenance activity effectiveness.

The challenge of remaining flexible to meet demand whether expected or not, is an important driver of new and emerging power management technologies and approaches for data center managers. This DCD Intelligence White Paper, sponsored by Server Technology Inc., addresses the key questions including:

- Why are denser data centers of increasing interest to data center operators?
- What are the key elements of a high-density data center?
- How can enterprises take advantage of high-density computing?
- What lessons can be learned from data centers with higher densities?
- What are the benefits of higher PDU outlet numbers and higher server operating temperatures?

INTRODUCTION: DCD INTELLIGENCE'S VIEW OF THE DATA CENTER LANDSCAPE

The balancing act between the requirement for flexibility and cost-effective data center management is increasingly precarious. Rising real estate costs make it difficult for enterprises to justify land acquisition solely as a means of capacity expansion. Concurrently, power is a top data center operational cost; on average, 27% of ongoing data center expenditures are on power, according to the DCD Intelligence Global Census in 2014. Combined, the aforementioned factors have driven proportionally higher server and power densities globally.

The need for an increasingly modular approach to data center management is also tied to other well-documented truisms such as:

- The growing importance of data centers which makes management more risk averse. Making the most of a data center's space can allow its managers to better handle future demand.
- As the server racks in data centers have become denser and generally more expensive to run, so their 'fit out' has become more technologically complex, and dependent on networks rather than just on servers. There is increased demand for more outlets in a smaller form factor as well.
- The IT load has become less predictable and the peaks of demand fuelled by external sources, such as mobile device traffic, have become or are expected to become more extreme. This means staying ahead of demand with necessary infrastructure but using it when the demand is omnipresent as opposed to when it presents itself.
- Data centers are more likely to be shared facilities with a competition for shared services, and a number of key architectures have emerged – virtualisation, software-defined, cloud – that abstract the physical properties of the data center and reconstitute them wholly or in part to an IT layer.

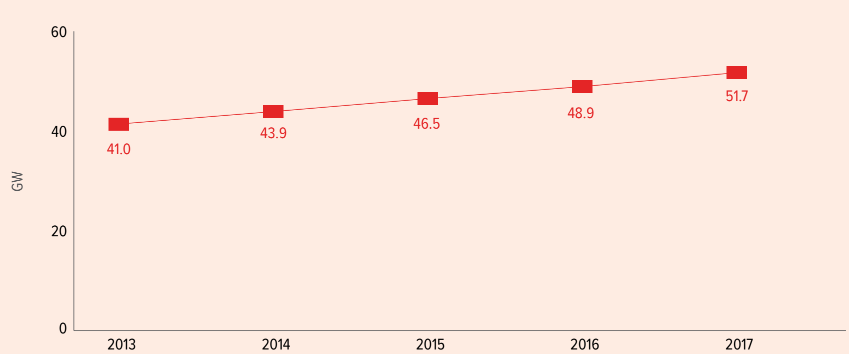
There are other reasons to operate denser data centers, such as public scrutiny. Governments and public opinion are pressuring data centers to be more energy efficient and to use greener technologies, but there is also a strong economic motivation for facilities to conserve power. Larger facilities have been proven to save hundreds of thousands of dollars of operating expenses by adopting more efficient power management and cooling strategies.

THE IMPACT ON DATA CENTERS OF INCREASED POWER DEMAND

With demands on data centers growing and real estate costs soaring, the industry is adapting to create higher rack densities as a means of planning ahead. To fully appreciate this point, it's helpful to understand power densities and capacity planning in the framework of global data center growth. Specifically, power consumption has grown steadily since 2013, especially in emerging markets. This is a pace that is expected to remain relatively consistent through 2017, according to DCD Intelligence. This rapid growth has put pressure on data center operators, managers, and customers to find more efficient ways to use space and power. Since these two factors are critical to data center design, experts are designing more modularity and flexibility into their data centers and equipment racks to prepare for a variety of workloads in future.

This is crucial as power requirement will only be expected to rise in accordance with the growing number of demands on data centers, even though recent research in the world's most advanced market - the United States - indicates that the rate of growth is slowing there. DCD Intelligence has tracked the development and rapid growth of the data center industry for a decade. As illustrated in Figure 1, estimated power consumption has grown steadily over the past with an estimated 45 GW or more of power drawn today by data centers globally,. It's important to note that this growth will come despite rapid adoption of virtualization, power optimization technologies, and improvements in per watt computing efficiency.

Figure 1: Projected Global Data Center Power Requirement (In GW)



Source: DCD Intelligence, 2016

HIGHER DENSITIES AS THE SOLUTION

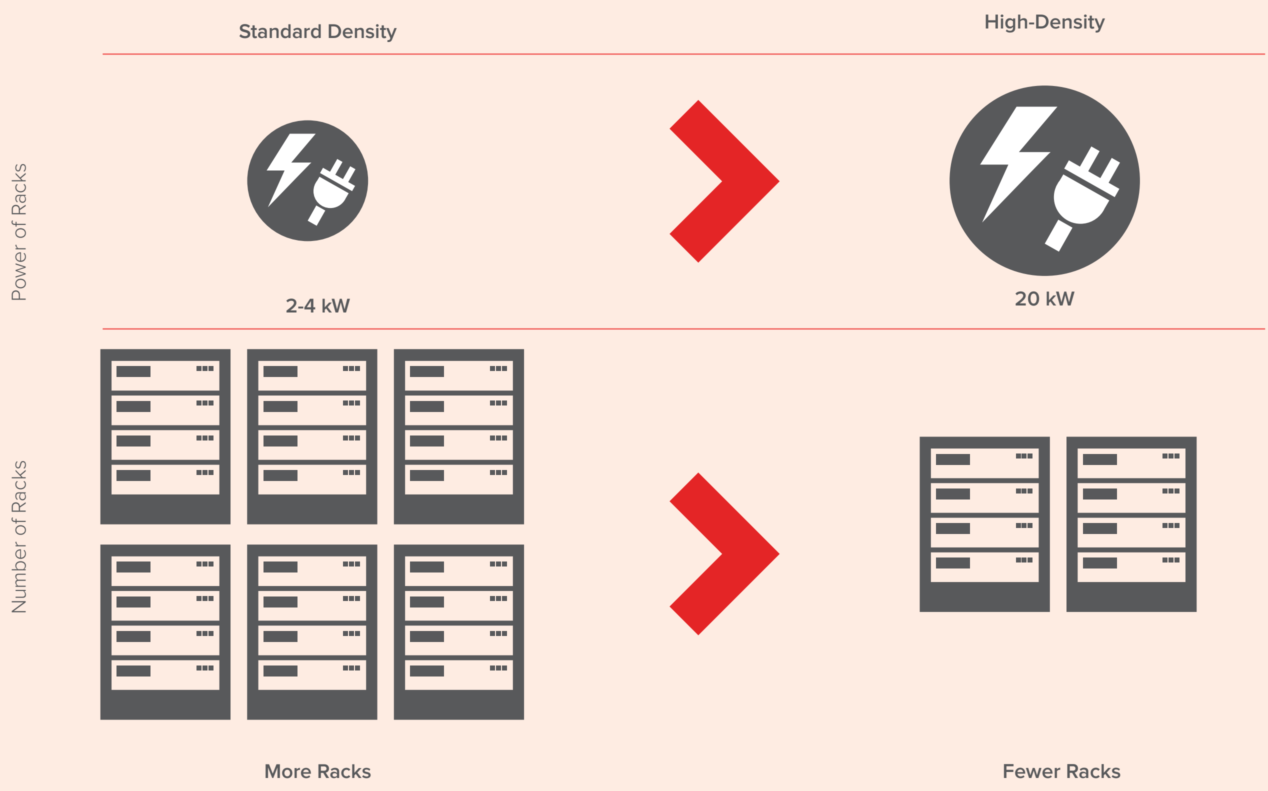
A key technological advance to address these problems and help manage increased demand has been the development of high-density computing, or the ability to increase computing capacity within the same rack space.

High-density computing can result in considerable savings, but also creates some challenges. Data centers must be able to provision additional power to high-density racks, space within the rack for PDUs can become very tight. Cooling requirements in these type of environments can also become extremely complex. However, with a well-engineered architecture, data center operators can use the space and efficiency benefits offered by high-density computing.

HIGH-DENSITY COMPUTING CAN RESULT IN CONSIDERABLE SAVINGS, BUT ALSO CREATES SOME CHALLENGES

DCD Intelligence defines high-density computing as the practice of packing greater computing capability into the same space and consequently requiring a higher power provision into that space. Typically, each rack in a data center was able to provide 2-4 kW of power, but today, technology advancements allow for 20-30 kW or more to be provided to each rack. Besides the increase in the total kW of power being delivered to racks, the proportion of racks that can be considered as high-density (ie greater than 10 kW/rack including both IT and non-IT requirement) are also growing globally. *See Figure 2 for details.* DCD Intelligence analysis of the global data center Census (the DCD Intelligence survey of data center decision makers) found that rack power density has grown steadily over the past five years and will continue to do so. *See Figure 4 for details.*

Figure 2: Primary Benefit of High-Density: More Computing In the Same Number of Racks



Source: DCD Intelligence, 2016

Higher-density racks / computing can be attained in multiple ways. First, by using new individual servers that can simply deliver more computing power within the same size largely due to improvements in processing power. Second, blade servers that are designed to be slotted in incrementally to add computing capacity; or high-density pods that have cooling and power outlets integrated into a self-contained modular design. Finally, taller racks support more gear and therefore higher power densities.

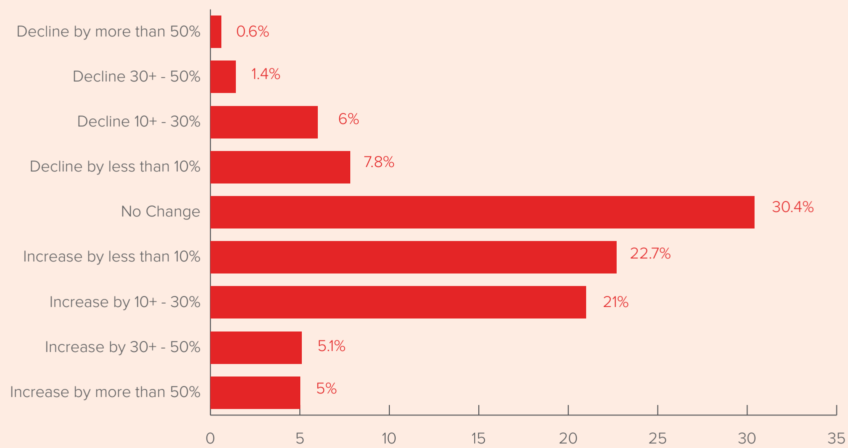
IMPROVED INFRASTRUCTURE MANAGEMENT:

High-density computing also results in reduced non-IT equipment per rack, which offers additional benefits for data center manageability. Data centers can have fewer racks and less cabling, which can result in higher reliability due to reduced complexity and fewer components. For example, data centers can have fewer but sometimes larger kW power drops to the cabinets, also known as branch circuits, and fewer fuses or breakers at the panel. This also applies if the user goes to 3-phase power over single phase.

DENSITY DRIVES POWER EFFICIENCY:

Despite the fact that high-density computing adds to the power draw on a per rack basis, it can significantly lower the overall power requirements of an end-user’s computing load. As illustrated in Figure 3, more than 40% of all data centers anticipated their power requirements would grow in 2015, with one in every five expecting substantial increases between 10%-30%. Consequently, the ability to reduce power wastage and improve computing efficiency are important concurrent goals.

Figure 3: **Change in Projected Global Data Center Annual Power Requirement 2014 to 2015**



Source: DCD Intelligence, 2016

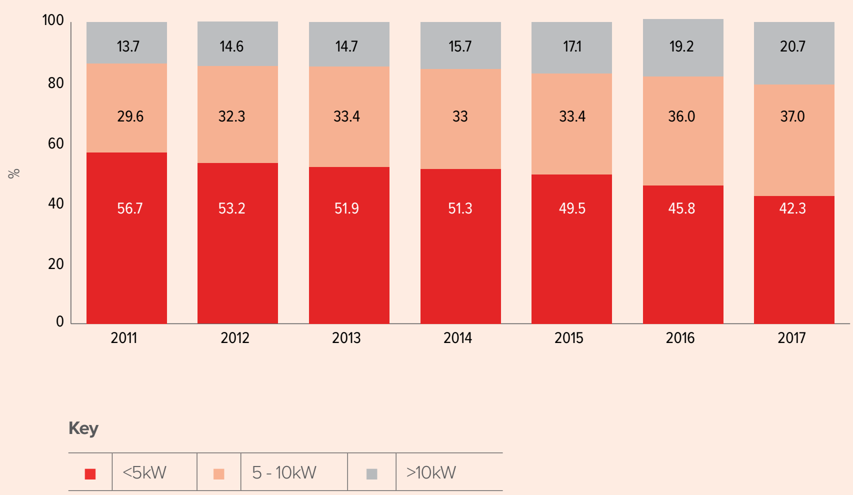
BETTER UNDERSTANDING HIGH-DENSITY COMPUTING

DCD Intelligence, like most of the industry, has defined the threshold for high-density at 10kW per rack. DCD Intelligence research reveals that awareness of high-density computing is still relatively low among IT decision makers within enterprises, with varying opinions on what exactly constitutes high-density, the costs and benefits of such an approach and its financial implications. Many enterprises are unaware that densities of 20kW and higher are even possible. Awareness of other innovations in data centers, such as improvements in cooling design, is also limited. DCD Intelligence found that enterprises often try to replicate what they have done in previous years without exploring the cost savings they can make with a more efficient data center design.

Despite the fact that awareness overall is low, the proportion of racks that can be considered higher-density is growing globally. DCD Intelligence's analysis of the Global Data Center Census found that rack power density has grown steadily over the past 5 years, as reported by respondents. See Figure 4 for details.

This data suggests that Data Center Managers and IT professionals are setting goals regarding adoption and interests are changing regarding going to increased density rack configurations.

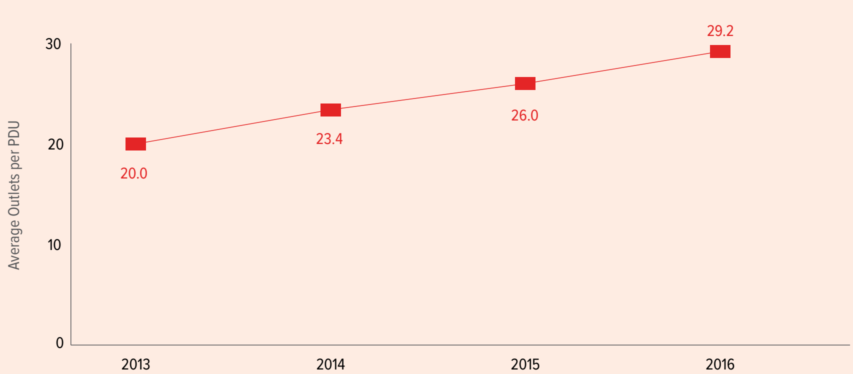
Figure 4: Global Proportions of Low, Medium and High-Density Racks



Source: DCD Intelligence, 2016

There has been a corresponding shift in products offered by suppliers such as Server Technology, a leading rack PDU manufacturer based in Reno, Nevada, to match the growing power and outlet requirements of data centers. In the period from 2013 to 2016, the vendor offered 46% more outlets per PDU sold; a reflection of customer demand for additional outlets and smaller PDU form factors, the company says. *(see Figure 5*).

Figure 5: Average Number of Outlets per PDU 2013 to 2016



Source: Server Technology Inc.

Those with the greatest need for power are often users of large computing resources in DCD Intelligence's opinion. As such, the benefits of high-density computing most immediately accrue to enterprises with large computing resources. Therefore, we anticipate cloud computing providers, digital media companies and telecom providers are the likeliest to operate higher-density computing environments.

OVERALL, HIGH-DENSITY COMPUTING IS GROWING PROPORTIONALLY DUE TO A GLOBAL DATA EXPLOSION THAT IS DRIVING EVER-GREATER STORAGE AND PROCESSING DEMANDS OF DATA CENTERS

Overall, high-density computing is growing proportionally due to a global data explosion that is driving ever-greater storage and processing demands of data centers. Internet of Things and cloud computing are just two major growth drivers, with storage and processing increasingly moving from local devices to remote data centers in the cloud.

According to Cisco's Global Cloud Index (2014-2019), data center traffic will grow 3X at a compound annual growth rate (CAGR) of 25%, reaching 10.4 zettabytes (1 zettabyte = 1,000 exabytes) per year by 2019.

Also, the data created by Internet of Everything (IoE) devices will reach 507.5 zettabytes per year by 2019, up from 134.5 zettabytes per year in 2014. By 2019, more than four-fifths (86 percent) of workloads will be processed by cloud data centers, according to the Global Cloud Index (2014-2019).

THE VOICE OF THE CUSTOMER

We interviewed two Server Technology customers to better illustrate how higher densities and capacity management efforts can improve operational efficiency. Here is what we found from each customer:

MITRE CORPORATION CASE STUDY

The MITRE Corporation is a private not-for-profit corporation that operates Federally Funded Research Development Centers (FFRDC's) that support the United States government with scientific research, analysis, systems engineering and integration. Over the past five years, MITRE has taken advantage of the operational capacities and economic efficiencies available through adopting higher-density blade and converged computing systems. But by 2013 their 15-year-old primary data center, which used a traditional raised floor design with computer room air-conditioning units, had reached its limits of power/cooing density of about 2.5 kW per cabinet.

To determine the best approach to support the higher performance computing and analytic services that could generate densities of 10-30 kW per cabinet, MITRE evaluated multiple approaches and technologies including; building a new on-premise data center, moving to an off-premise commercial data center, moving to cloud-based hosting services, or retrofitting the existing data center. MITRE conducted a detailed analysis to assess each option in terms of performance, capacity, efficiency, and initial- and long-term costs. Based on this analysis, MITRE performed an adaptive retrofit of the existing data center by implementing a refrigerant-based Rear Door Active Heat Extractor (RDAHX) cooling system. This dramatically increased the data center's capacity, density, and efficiency, as well as lowering operating costs.

MORE POWER

Achieving much higher cooling densities also requires delivering higher power densities, which can be challenging. One of the challenges MITRE addressed was in delivering enough power to each cabinet and higher counts of C13 and C19 outlets, to power equipment that occupied every rack unit in their taller 45U cabinets. MITRE found that continuing to use the traditional 208-volt standard would require at least four PDUs per cabinet to provide enough power and outlets, twice the number of breaker positions, power whips with larger copper cable diameters, and be more expensive and less efficient in meeting MITRE's needs.

Working with Server Technology, MITRE determined that a superior solution could be achieved by adopting a 415 volt, 3-phase power strategy, which is more frequently used in Europe. This approach was not only more efficient, but also had the benefit of requiring only two PDUs per cabinet, which due to their higher power capacity could support higher C13/C19 outlet counts. This approach delivered the higher power and outlet counts MITRE needed in each cabinet, and provided the flexibility to install diverse equipment into each refrigerant-cooled cabinet. It also provided the benefits of reduced breaker count, better power efficiency, smaller diameter copper power whips, and cost less than providing the same power levels and outlet counts using a traditional 208-volt solution.

THINK VERTICAL

The move to higher power and cooling density also enabled MITRE to shrink the horizontal footprint of the data center by a factor of about 3:1, and to maximize the "vertical real estate" in each cabinet. Today, MITRE can fill a single cabinet with

MITRE Case Study cont...

5 or 6 high powered 6U blade chassis that each draw up to 4 kW each, and be confident that they have the power and cooling required for today and can support even higher-density systems tomorrow. Additionally, implementing PDUs with higher outlet counts has made it easy for MITRE to deploy multiple HADOOP analytic clusters that fill cabinets from top to bottom with 1U and 2U servers and draw 12 to 16 kW, which was simply not possible before.

Perhaps the most important benefit of adopting a high-density data center strategy is that *"MITRE can now deploy higher performance computing platforms more economically, and more rapidly than was possible before"* according to Jim Treadway, MITRE's Chief Engineer for Infrastructure, and architect of their high-density data center strategy. *"Our modular design provides the right amounts of power and cooling to where it is needed, when it is needed, allowing us to respond quickly to our internal customer demand. All told, our retrofit was successful by applying progressive technologies to create a high performance compute center that also operates at less cost than traditional room or row based designs."*

EXPECT THE UNEXPECTED

In terms of advice, Treadway suggests the following:

- Avoid the "if you build it they will come" approach. Projecting capacity needs for 5 to 10 years out, and building to that projected capacity, is highly risky from both an operational and economic perspective. Alternatively, take a page from the "just in time delivery" playbook, and adopt designs that add capacity in smaller, incremental step functions. This helps keep capital expenditures comparatively low, and to stay just ahead of the demand curve.

- Pay attention to all of the technologies that are available, including disruptive or non-traditional technologies, to find the most advantageous way to support high-density computing for your environment. There are established and emergant power and cooling technologies available today that provide better efficiency, achieve much higher densities, provide greater flexibility, and cost less to acquire and operate.

PADDY POWER BETFAIR CASE STUDY

There has been a shift to denser environments by Betfair as it readies itself for a platform introduction designed to help it manage growing demand for its online betting services.

Betfair has long been working to establish a private cloud platform that will be able to handle its services. Betfair's coming platform, called i2, is based on Openstack and software-defined networking technology. It's designed to support additional continuous delivery of all Betfair applications in future.

'*The one big focus of Betfair is making room for i2,*' said Peter Giles, Paddy Power Betfair's Senior Data Centre Manager. '*We need the space to physically expand (to accommodate future growth expected or otherwise). The big thing in terms of capacity is the i2 platform; 80 to 85% of our needs internally is to support betfair.com. Everything … will sit on that platform.*'

Space, however, was an issue for Betfair as it readied itself for the service introductions, which meant the company had to better use the space and capacity at its disposal. Server utilization rose from 2010 to 2014 as the company increased densities in order to maximize space and newer equipment. In 2010, Betfair had 76 physical cabinets installed and 47 of them (61%) were utilized versus 86 physical cabinets installed and 67 of them utilized (78%) in 2014.

'*There was a big jump given the new solution (that resulted) in higher utilization of servers and cabinets,*' said Giles.

Crucial to Betfair's i2 preparation efforts was the server and power density of each cabinet as the company looks to maximize its space in preparation for expansion efforts, Giles noted. Betfair, which agreed to merge with fellow online betting operator Paddy Power earlier this year, now has 37 servers per cabinet in each production data center cabinet, which has resulted in a higher average density per cabinet of 6 to 7 kw, he added. This also meant an increased outlet count across their data center, in line with overall Server Technology figures *(see figure 5)*

'*What we wanted to do was to install PDUs that allow for as many servers as possible to be in each cabinet in as tight a space as possible,*' Giles noted. '*We wanted to get the biggest bang for our buck.*'

Server Technology's PDUs have helped Paddy Power Betfair operate higher-density environments and contributed to its data center operational cost reductions by virtue of more efficient power management, he added.

Giles says this is so because the 12-inch to 18-inch power leads used by Paddy Power Betfair means there are fewer cords blocking air flow at the back of the rack. As a result, the fans used to cool the servers are able to operate at a lower rate, reducing overall power consumption.

Flexibility is another benefit that is expected from Betfair's denser environment as it will give the ability to expand with Paddy Power Betfair more readily as demand increases.

A successful and complete rollout of the i2 platform at a yet-to-be determined date is expected to make data center workloads more manageable.

'*We need to be ready to capture demand that's coming. As people sporadically try this or that (within the organization) they may need resources. It ultimately should make (our lives) a bit easier.*'

POWER MANAGEMENT: SERVER TECHNOLOGY'S VIEW OF THE CURRENT ENVIRONMENT

Every kilowatt-hour of power consumed by a server produces an equivalent amount of heat. Without effective monitoring and management, this heat will accumulate within a data center. More importantly, it will affect server performance. The ability of a server to function at higher temperatures has improved in recent years, but so has computing density, i.e., the amount of computing power offered by each server. And as computing power increases, so does the heat generated. The growth of virtualized servers in data centers has also led to fewer idling computers in the average data center, again adding to heat generation.

Given that densities are on the rise (*see Figure 5*), it is imperative to properly manage power as the dependence by enterprises on data centers is on the rise. However, many power and cooling systems aren't able to efficiently accommodate the demands of today's data centers. For example, traditional perimeter-based CRAC units with a raised floor plenum were adequate when rack densities were comparatively low, at 2-4kW per rack. This is less so the case now. As computing power has increased in accordance with Moore's Law, so has the power drawn by servers making this a more problematic scenario for many a data center operator.

Besides greater risk of performance denigration or even downtime, this increased computing density creates two problems for data center power / heat management:

- More computing power directly translates into more heat being generated in the data center, which typically means more cooling infrastructure is required. New servers and switches could be generating as much as 10 times the heat per square foot as those made 10 years ago.
- High-density servers are often installed in the same data centers as previous generation systems. As a result, rack densities don't increase evenly across the data center, so some areas will be hotter than others. Also, equipment in the bottom of the rack may consume so much cold air that remaining quantities of cold air are not sufficient to cool equipment at the top of the rack. Thus cooling architectures need to allow for more targeting rather than simply keeping data center temperatures within ASHRAE guidelines.

DCD Intelligence spoke with Calvin Nicholson, the company's Senior Director of Software and Product Management, and Marc Cram, the Director of OEM and Global Accounts about intelligent power and heat management in addition to other issues.

The aforementioned pressures on data center infrastructure will only become more pronounced as mobile data traffic increases, connected devices like cars come online in meaningful ways and Wi-Fi access proliferates globally creating additional pathways to the internet thus placing additional demands on data centers, Cram noted.

ADDITIONAL REAL ESTATE ... IS HARDER FOR ENTERPRISES TO JUSTIFY ,,,, AS SUCH, MORE ENTERPRISES ARE EXAMINING HOW TO MAXIMIZE AVAILABLE RESOURCES.

Additional real estate, unless hyperscale public cloud providers such as Amazon, Google and Microsoft are taken into consideration, is harder for enterprises to justify given soaring costs in many locales, he added. As such, more enterprises are examining how to maximize available resources.

Accordingly, data center operators are reviewing rack power capacities to determine potential densities, he added.

Server Technology's Nicholson offers several density and data center operational points to keep in mind as enterprises make that journey. In particular:

- Importance of monitoring. This is important to do at the branch and in-feed levels for capacity planning purposes in an effort to achieve higher efficiency by looking for zombie servers and stranded capacity. *'You can't manage what you don't monitor,'* advises Nicholson. As such, monitoring tools can help companies track and report device-specific power consumption. This is important as the decision to provision a new server should be based on the power and cooling history of the rack over the past year not a single point in time. The most problematic scenarios Nicholson encounters are sites wherein data center operators didn't properly plan or assess the greatest possible uptime and reliability scenarios. As densities increase, the maintenance of servers and data centers should change. To that end, monitoring can help extend the 3 to 5-year lifecycle of servers if the equipment is run at warmer temperatures, said Nicholson. *'It's a huge opportunity (to save money),'* he noted. Also, increasing the inlet temperature to the cabinet is a great way to save money and the servers last just about as long running at the higher temperatures.
- Provisioning. This is a crucial tenet for data center operators to embrace and act upon correctly given the importance of reliability and uptime. Too often, companies can overprovision power to underused cabinets resulting in unnecessary operational expenditures. Given the rising cost of real estate, this type of scenario will be harder to justify in future, he believes. In addition, provisioning the wrong type of power can run counter to those tenets, which in turn negatively impacts data center operations. As such, Mr. Nicholson advises data center operators to provision at a higher power source (e.g. 415v) assuming the data center's cooling equipment can handle the accompanying demands.

SUMMARY AND CONCLUSIONS

The key data, research findings and recommendations are summarized below:

KEY DATA:

- Overall growth in data center capacity will drive demand for high-density computing. DCD Intelligence analysis predicts that white space worldwide will grow from 33.8-million square meters in 2013 to 41.3-million square meters in 2017, and data centers will draw 51.7 GW of power in 2017, up from 41.4 GW in 2013. The majority of this growth will occur in emerging markets and among colocation, telco, cloud and other IT service providers.

- Data center growth will be driven in part by the continuing data explosion, with Cisco expecting 3x growth at a 25% CAGR, to 10.4 zettabytes (1 zettabyte = 1,000 exabytes) per year by 2019.

- Space is fast becoming an issue for the data center industry, with one in six respondents from some hubs citing the lack of suitable data center locations as a significant concern in DCD Intelligence's most recent global Census survey. Anecdotally, even providers who were not particularly concerned about space in the past are now referencing it as a potential issue.

END-USER RECOMMENDATIONS

- Education and awareness levels for high-density computing are still low, with significant potential for confusion. Enterprises need to invest time and energy upfront to inform themselves about the advantages of high-density computing and approaches to denser environments in order to determine whether it is the right approach.

- Enterprises should plan to have flexible solutions that allow growth without the need for changing out equipment or expanding a facility. Enterprises should also keep in mind the modular benefits of high-density, particularly in scenarios where data centers may have limited rack space available but may be able to provision more power. This potentially allows enterprises to increase computing capacity without the need for an additional facility. A tactical solution may be to implement a rack PDU with the ability to support more outlets in the same form factor that has flexibility to support many different server counts and configurations.

- High-density is not synonymous with one particular technology like blade servers. While blade servers potentially offer one part of a high-density solution, enterprises should be aware that monitoring and management of power is more important if not more so than simply packing blade servers into racks. It is a broader effort.

POWER TO HIGHER-DENSITY RACKS NEEDS TO BE CAREFULLY PLANNED, MONITORED AND MANAGED .... AN INTELLIGENT AND INTEGRATED PDU SYSTEM IS A MAJOR FACTOR IN ACHIEVING THIS.

- Global providers of cloud computing and digital media providers are the likeliest adopters of high-density computing for starters. These companies would be well-served evaluating the potential benefits of higher power and server densities in addition to higher outlet counts for their respective businesses.

- Enterprises are advised to invest in detailed planning prior to investments in high-density. A granular understanding of requirements – both current and future – is critical to leverage potential efficiencies.

Enterprises can benefit from greater growth modularity, improvements in space and power efficiency, and potentially higher reliability, with denser environments. Large-scale users of computing resources, such as cloud computing providers, are particularly well-suited to plan, but a variety of enterprises can likely take advantage of denser environments assuming organizations have taken the necessary steps.

We recommend enterprises of all types evaluate the equipment, approaches, and opportunities offered by higher-density data centers, and we hope this report helps provide some high-level insight into the key issues involved and the benefits that can be realized.

The trend towards higher-density servers in both enterprise and multi-tenant data centers is well-established as one of the key responses to the ever-increasing demands made on data centers. Yet with higher densities comes increased risks associated with failure, increased resource and support requirements, and therefore an increased premium on operational efficiency. Power to higher-density racks needs to be carefully planned, monitored and managed in a logical and systemic manner that can adapt to changing and increasing needs. An intelligent and integrated PDU system is a major factor in achieving this.

ABOUT SERVER TECHNOLOGY INC.

Server Technology's power strategy experts have provided power solutions for labs, data centers, branch offices and telecommunications operations for 30 years. Over 60,000 customers around the world rely on our cabinet power distribution units and award winning power management solutions to reduce downtime, facilitate capacity planning, improve energy utilization, and drive efficiency. With the best quality, best technical support and most patents, Server Technology products provide uncompromising reliability, innovation, and value for the data center.

Stay Powered. Be Supported. Get Ahead.

www.servertech.com

DCD INTELLIGENCE

FOR MORE INFORMATION:

+44 (0)20 7426 4813
info@dcd-intelligence.com
www.dcd-intelligence.com