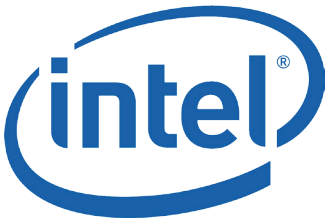
CITO Research

Advancing the craft of technology leadership



Intel Blog Acceleration

Blog Acceleration

Contents

Blog Acceleration

Introduction

The modern data center is moving from a "yield" system—whose primary resource-management methodology is to simply load a data center to capacity before building another one—to a more sophisticated and highly managed environment. Vendors are helping CIOs deploy and make better use of applications in their data center landscapes to a degree of precision never before imagined.

One of the most interesting companies using the *Intel Data Center Manager (DCM)* technology is *CiRBA*, whose Data Center Intelligence (DCI) platform can analyze, assign, and move workloads with maximum efficiency. This article reviews how CiRBA is working to change the way data centers are managed and the role that Intel DCM—embedded in DCI—plays in providing an unprecedented amount of information about energy usage.

CiRBA Data Center Intelligence

CiRBA, a Toronto-based software company, offers an advanced analytics software package called DCI, which enables organizations to run their computing landscapes at a high level of efficiency without taking on undue risk by conducting intelligent workload placement.

CiRBA's approach is like the game Tetris. Computing workloads are like Tetris pieces. They all have personalities and attributes that fit together in certain ways, controlled by limiting factors, such as capacity of hardware, configuration, and business policy. Playing Tetris poorly in the data center can result in stranded capacity—with machines just sitting there, consuming power without doing much computing.

CiRBA DCI gathers data from the array of assets supporting workloads, incorporates business and regulatory policy, and creates placement plans for workloads across in-house hardware, local clouds, and the public cloud. This allows CiRBA's customers to transform legacy infrastructure into virtual infrastructure for their customers. DCI takes into account all of the implications of moving a workload, from applications' relationship to databases, accelerators, hardware capacity, load balancing, and bandwidth, and with the help of Intel DCM, to actual hardware power consumption. This level of sophisticated analytics means that data center managers can now transfer workloads from physical servers to the cloud (P2C) and from mid-level Unix hardware to Intel x86 architecture (P2P) at the same time, boosting efficiency in the process.

Additionally, DCI can manage cloud assets, watching over the various environments, notifying users when opportunities arise to optimize more virtual and physical resources, based on both technical and nontechnical attributes, such as business rules.

Historically, workload management has been handled using a combination of spreadsheets and the trial-and-error recombination of logical and physical clusters. The result of this has been like that Tetris screen with a big gap in the middle—stranded capacity. Many organizations that have

virtualized resources have as much as double the capacity they actually need in their data centers, according to CiRBA's head of operations and product management, Chuck Tatham.

"Because they are paralyzed by the complexity of [managing workloads] empirically, they just throw capacity at the problem," Tatham says.

The Role of Intel DCM

In today's power-constrained environment, buying more gear is not a sustainable solution to the workload problem. Some number-crunching financial institutions are already at the point where their host municipalities can no longer supply them with as much power as they need for their data centers, Tatham says. CiRBA's technology includes the ability to benchmark the likely power-consumption impact of moving workloads across equipment. But the information input for power consumption was typically what the manufacturer "plated" as the top wattage rating for the unit, or the predicted CPU utilization. Use of this value typically leads to overestimation, because machines are rarely used at full power, full-time.

Intel DCM allows CiRBA's platform to communicate directly with a server and take in real-time power consumption data, associating a real power curve with server behavior. This allows CiRBA to optimize infrastructure around "compacting, de-fragmenting, or de-balancing" infrastructure, Tatham says. For example, workloads can be moved during off-peak hours, when machines are not as busy, to a much smaller group of servers, powering down the machines that are not being used. CiRBA DCI can also predict which workloads will behave in a certain way, providing reliable advice about when machines can be sent into a low-power state.

Intel DCM also enables CiRBA DCI customers to charge back infrastructure with richer data than before. For example, the power consumption of an individual virtual machine on a server can be determined so that the owner of that virtual machine can be charged by IT with fine granularity, empowering the owner to make more informed decisions about how to balance workloads.

Intel DCM is able to do this because it draws power consumption and thermal data from the server itself. Through a web service interface, this data is fed into CiRBA's analytics engine.

The two companies discovered each other when Intel became involved in helping strategic customers move from mid-range Unix-based systems such as Sun SPARC to Intel x86 machines. Intel wanted to make the workload analytics provided by CiRBA available to its customers, and CiRBA saw that it could benefit from adding real-time data on power to its analytics portfolio.

Benefits of Embedding Intel DCM

Now that *Intel DCM* is embedded in the offering, customers of CiRBA DCI can factor power into their analyses to further green IT agendas and spend less on power and cooling as they virtualize their workloads. The partnership is not only useful for reorganizing or placing workloads in the cloud; customers can also avoid designing infrastructure that is too dense from a power-consumption perspective or too hot from a thermal dynamics perspective.

"If you're a CIO and you're sitting on a data center that is absolutely tapped, the city won't give you any more power, and you're faced with building a $25 or $30 million data center in order to get more capacity, there's a pretty strong argument to avoid building a new data center by getting smarter with power," Tatham says.

Intel DCM is helping partner applications such as CiRBA to become an important decision-making tool for datacenter managers with daunting power management issues—an audience that previously was only guessing at the scale of those issues.

This blog was written by CITO Research and sponsored by Intel.

Introduction

Whether the goal is to provide highly complex, compute-intensive calculations or to support a distributed application on a cluster of servers, data center managers are hitting a wall when it comes to the amount of electrical power available to them.

SGI is a high-performance computing (HPC) hardware manufacturer based in Hayward, California, the result of the 2009 acquisition of the original Silicon Graphics, Inc. by Rackable Systems. For several years, the company has had an asset-management platform called SGI Management Center. Now, for select products, Management Center embeds *Intel Data Center Manager (DCM)* technology, opening up a range of new capabilities that makes the SGI offer more compelling.

SGI's Data Center Innovations

SGI products are used in some of the most advanced calculations taking place on Earth. Astronomers at NASA and biologists working on modeling genes at the Technical University of Denmark are among SGI's customers. In addition to traditional HPC products, the company also offers an innovative set of rack-mounted servers and storage for large data center clients.

Energy management has always been a top concern for SGI. One of the innovations of the legacy Rackable Systems side of the business was the development of "half-depth" servers, which make efficient use of rack space by consolidating cooling air and heat release through a central chimney, rather than isolate the "cool" and "hot" sides of the units, as many other vendors do, according to David Sundstrom, director of product marketing at SGI.

Traditionally, both groups of customers had energy concerns, although the HPC customers were more interested in "breaking the laws of physics"—trying to get as much power and performance out of the machines as possible. But power has become more expensive, particularly in Europe, and computing demands have begun to outstrip the capacity of the power supply for buildings and the capabilities of utilities that support them. About two years ago, SGI began to see a convergence in demand for power management between its enterprise data center and HPC customers. In both cases, "the systems now have the ability to draw power in excess of the building power envelope," Sundstrom says. "Power is now the dominant operational cost of very large systems."

Many customers, particularly those in the HPC market, dealt with the issue by running higher-powered computations at night and throttling back on consumption during the day, when power is more expensive. The SGI Management Center (MC) administration platform provides real-time analysis of more than 120 metrics for each server and provides a common interface across multiple architectures in the SGI family. Users can also manage tens of thousands of server nodes from a single point of control, including powering the servers up or down, in what Sundstrom calls "coarse-grained power management." In other words, servers, or entire clusters of servers, can be turned on or off quickly and with a contextual, consolidated level of understanding.

The disadvantage of this approach was the time it took to reboot servers. This could take several minutes—assuming that no issues during reboot—and thus was not ideal for highly variable environments, which sometimes require workloads to be shifted in seconds.

This changed in fall 2010, when SGI MC began to embed *Intel DCM.*

The Role of Intel DCM

Intel DCM offers partners such as SGI the ability to assist with power capacity planning by measuring energy consumption and usage by device. *Intel DCM* also enables partners to measure the inlet temperature of devices, by improving the thermal profile of the data center and allowing partner solutions to proactively identify and rectify potential failures.

In addition, *Intel DCM* allows dynamic control of machines through real-time connections. By incorporating *Intel DCM*, SGI now offers "fine-grained, dynamic power management" in the SGI MC for a number of its Intel–based servers, Sundstrom says. Data center customers can now apply policies to throttle servers, which will reduce clock cycles and thus power demand, rather than switching them completely on or off. This provides many more options for apportioning tasks to machines or groups of machines, based on power and computing demand constraints. Combined with SMC's capability to dynamically manage logical and physical machine clusters, users now have a much more complete and agile level of control over their data center landscapes.

"It's a key breakthrough that really gives us a completely different option for managing power that we didn't have before," Sundstrom says.

Benefits of Embedding Intel DCM

Using SMC with *Intel DCM*, data center managers can aggregate and control servers in ways that are unique to their specific environments.

For managing physical clusters, data center managers might want to compare the power consumption of one rack versus another, or individual machines against each other, or troubleshoot hotspots in the data center.

For logical clusters, managers can also slice and dice their understanding and control across a group of servers organized to support a calculation or a particular application, or compare the relative consumption of storage, administration, or calculation nodes.

One SGI customer running Hadoop was in danger of exceeding its power envelope in the data center. Using SMC with *Intel DCM*, the customer is now able to scale the power states of each server and distribute the workload proportionately, providing a consistent level of throughput while staying well clear of the power ceiling.

Because it was able to leverage Intel's substantial research and development efforts, instead of trying to develop a similar capability on its own, SGI is now able to compete more effectively against much larger vendors that have power-management solutions as part of their offers.

"Between our hardware, including our servers with Intel motherboards and power-management enabled chipsets, and our joint software set—SMC incorporating Intel DCM—we are able to drive a much more cost-effective solution for power management," Sundstrom says. "Now there's another game in town."

As part of partner applications such as SGI Management Center, *Intel DCM* adds significant value, both for data center managers looking to get a handle on the energy profile of their data centers and for hardware vendors looking to increase the value of their offerings.

This blog was written by CITO Research and sponsored by Intel.

Introduction

CIOs and facilities managers are suffering from a crisis of wasted energy across the enterprise. Most enterprises are almost completely unaware of how much power their data centers consume, and have no way to segment the data they do have. Even on sophisticated devices such as enterprise-class servers, there's no information on energy consumption or its relationship to computing power utilization.

Atlanta-based *JouleX* has risen to the challenge of providing energy intelligence on the full range of instrumented IT, covering everything from data center servers and HVAC equipment to office PCs, edge routers, and other networking devices. The company's roots in network security set it apart from other energy management solutions because of its capability to listen to a much wider range of devices. The software, called JouleX Energy Management (JEM), uses network security protocols, interfaces with device management systems, and power management software such as *Intel Data Center Manager (DCM)*, providing an unprecedented level of visibility into the relationship between energy consumption and device utilization and significantly reducing the overall energy costs of its customers.

JouleX: Tackling the "Massive Amounts of Micro-Waste"

JouleX's approach to energy management is predicated on the idea that what CEO Thomas Noonan calls "massive amounts of micro-waste" are accumulating on virtually every device that is part of the IT landscape, from servers all the way down to screen savers on PCs, HVAC equipment, and VoIP telephones.

"Today, we live in a world that is all about optimization," Noonan says. "We don't live in a world that is 'on' or 'off' anymore. If a device is operating at 20 or 30 percent utilization, there is no reason that it needs to be consuming full power. We can easily and automatically reduce a device's energy consumption by 30 to 35 percent and not affect the performance, saving a lot of money and reducing a corporation's carbon footprint. Our field customer data shows that we're saving as much as 50 percent in some applications, with no impact to productivity." One customer is saving more than €600,000 annually due to steps taken based on JouleX Energy Manager's (JEM) intelligence.

JouleX, whose founders come from the information security world, takes the patterns of information capture and analysis from network security and applies them to the problem of energy management. Rather than try to replace existing management and control platforms, JEM complements and enhances management and control functions by adding a layer of information about

the energy profile of all the equipment in the data center (and often beyond). Through an "agentless," network-based implementation, JEM interfaces with devices in three primary ways:

- Through the device's native interface
- Through the device's management system. This is usually the ideal approach because the management system also provides critical device information about firmware updates, CPU utilization, and the allocation of resources against applications
- Natively through network protocols such as SNMP (Simple Network Management Protocol), SSH (Secure Shell), and others

"The ideology of 'always on' simply can't exist in the future, because we are wasting an enormous amount of power," says Noonan. "We're out there helping people make the IT infrastructure be 'always available, but energy-optimized.'" Micro-waste is rampant in energy-intensive data centers, where as much as 30 percent of the servers are "dead"—defined as using less than 15 percent of computing capacity but consuming 70 percent or more or their rated energy capacity, Noonan says.

But micro-waste also lurks in corners far below the threshold of perception for most facilities or IT managers, says Noonan, citing evidence such as one client's $118,000 in annual power bills, attributed solely to screen savers running at night. Another client's virus scan software was waking up machines to do system checks and neglecting to put them to sleep—$78,000 per year. Noonan says there is no way either client would have discovered this waste without JEM.

The Role and Benefits of Intel DCM

Intel DCM adds another level of granular information about and management control over the equipment JEM monitors in the data center. Using *Intel DCM*'s dynamic control capabilities, JEM customers observe the real-time power profiles of individual nodes, machines, or groups of servers and can vary the core voltage of processors anywhere along the power scale from 0 to 100 percent, dramatically improving energy efficiency. This can be done across tens of thousands of servers, in multiple locations worldwide, from a single "pane of glass" or management console. For servers with power capping technologies, JEM customers use *Intel DCM* to dynamically implement automated policies that are time-, location-, or event-based, allowing holistic monitoring, management, and control across a range of devices, optimizing energy and computing performance across time zones, device types, and application profiles.

Since 60 percent or more of the energy consumption of a server is in the processor, any solution made to monitor and control energy in the data center would require a high degree of visibility into the thermal, power consumption, and utilization conditions of processors. Well before the company launched in 2010, JouleX's founding engineers started a dialogue with Intel, knowing

that any solution that offered visibility into the performance of Intel hardware would be critical to the success of JouleX's overall offering, Noonan says. Recognizing the demands that would be made for a high level of instrumentation on chips, Intel engaged with JouleX in development discussions around *Intel DCM*.

Participation in development discussions for *Intel DCM* "gave us a granular control plane to both extract accurate energy consumption data, and at the same time deliver variable levels of control, Noonan says. In the data center, the last thing anyone wants to hear is that someone is going to "turn something off"…energy optimization in the data center requires acute visibility into power consumption and utilization at a very granular level and demands sophisticated control to reduce energy consumption without impacting performance."

Intel DCM helps partners such as JouleX help their customers measure energy usage by device, plan for future power capacity needs, proactively identify failure situations and inefficient power consumption, and dynamically control the power draw of any number of devices, from one to tens of thousands, through a single console. With *Intel DCM* embedded in JEM, JouleX is able to offer one of the most comprehensive and sophisticated energy intelligence platforms available in a simple, easy to use network-based software application.

Related Articles

Check out other CITO Research articles on energy management:

- *High Performance Computing Vendors Gain Energy Advantage*
- *Power Management at the Data Center: From Capacity to Control*

This blog was written by CITO Research and sponsored by Intel.

Introduction

Managing a contemporary data center is becoming increasingly complex because it spans the responsibilities of IT and facilities staff as well as having implications for business-level decisions. As more devices become instrumented, additional knowledge can be gathered to drive intelligent and economically sound decisions—if the data can be easily consolidated, presented, and acted upon.

Visual Data Center (VDC) is the primary software product and trade name of Optimum Path Systems of Tampa, Florida. The company produces 3D visualization Data Center Infrastructure Management (DCIM) software, which provides a complete picture of data center operations. *Intel Data Center Manager (DCM)* plays an integral role in augmenting VDC's data center picture with power consumption and temperature information.

About Visual Data Center

Optimum Path Systems was founded in 1999 by Jim Yuan. The company mainly created custom software for large telecom carriers, performing functions such as billing, provisioning and messaging. According to Steven Webel, COO, in 2007, a client asked Optimum Path for a floor plan of its data center.

"They wanted to point and click on a device and see documentation and a couple of data points of monitored data," Webel says. "So we finished that project and we thought, 'there some more things we could do with this.'" The company began exploring the facilities and IT monitoring markets and saw many gaps. VDC was created and released and has now become the company's primary product and trade name.

The VDC approach is simple but effective. Using existing data protocols, such as IPMI (Intelligent Platform Management Interface) and SNMP (Secure Network Management Protocol), VDC collects information from the water towers and air conditioners on top of the building all the way down to the chip level, Webel says.

"All of these devices in the middle primarily support a few common languages, so we can very quickly get from 90 to 95 percent coverage of the devices," Webel explains. "Because we're software people, we built VDC modularly, with an open architecture, so it's easy for us to add a plug-in to talk to something we don't natively talk to."

The result is a hardware-agnostic solution that shows a single view of both static equipment status (warranty information, location, service history, etc.) and activity (CPU utilization, power consumption, temperature, etc.) in 3D, and, more recently, delivered on mobile devices as well. Although it was always possible to obtain energy information from devices, either through instrumented power strips, uninterruptible power supplies (UPS), or through IPMI, VDC had to do a considerable

amount of footwork to incorporate this data from numerous sources. Additionally, many devices communicate average power consumption and temperature readings at the rack or power-strip level rather than by individual server air inlets or AC plugs.

To close the gap, VDC began working with *Intel DCM* middleware to collect critical, granular server information, greatly increasing the time-to-effectiveness of the VDC solution.

The Role of Intel DCM

Intel DCM has several unique capabilities that are integral to the offerings of companies such as VDC. Critical among these are the ability to provide accurate real-time temperature and power consumption data on individual devices, and to read virtually any kind of data output from any device, and provide that in a consolidated and programmatic way for consumption by DCIM tools.

By incorporating Intel DCM middleware, VDC can now offer fine-grain energy management information from each device, essentially at the "push of a button," Webel says.

"It's very important to get data directly from the server, versus getting that data from a UPS device two rooms away," says Webel. "The more granular your data collection, the more valuable and correct it is." With *Intel DCM* embedded, VDC can now enhance its 3D data center picture with temperature recordings directly from the inlets (air intakes) of individual servers and show actual power consumption for each device, rather than aggregates or estimates.

Additionally, *Intel DCM* speeds the identification of usable protocols for data collection across a range of devices using Intel chips. Before *Intel DCM* became a part of its offering, VDC routinely encountered devices from manufacturers that did not have an IPMI output written into their systems' operating protocols, necessitating custom plug-in work.

"The *Intel DCM* software will look for IPMI and say, 'OK, that's not there—here's a WMI (Windows Management Instrumentation) or interact interface," Webel says. "It can just jump around and find all kinds of different ways to pull data. For us, that means we have a single place to go for all the server data now. I don't have to configure 3,000 servers with monitoring. I just go to *Intel DCM* and they're already collecting it—I just show it. That makes the implementation much easier on our end."

Benefits of Embedding Intel DCM

Embedding *Intel DCM* middleware into its 3D visualization software has helped VDC accelerate its deployment time and added granularity to its thermal imaging maps and power consumption data. As a software-only company, VDC can develop solutions more quickly than hardware companies many times its size, which have long development cycles and closely tie their hardware to their monitoring solutions. With *Intel DCM* embedded, VDC can offer a hardware-agnostic, single-

window DCIM solution that can be rapidly configured and altered to each client's needs. Webel estimates that *Intel DCM* covers approximately 80 percent of all devices in his data center engagements. And the coverage is increasing.

"If you have six different windows open and you're trying to see how these things are interacting, it's up to you to connect the dots rather than your system providing a coherent interface to all the aspects of the technology," Webel says. The combined capabilities of data-point consolidation, protocol reconciliation, and granularity provided by *Intel DCM* at the device level are analogous to VDC's offering at the level of the data center and help VDC achieve its goal of providing an end-to-end picture, an increasingly essential capability for facilities and IT managers alike.

Related Articles:

- *Eliminating Massive Amounts of Micro-Waste*
- *High Performance Computing Vendors Gain Energy Advantage*
- *Power Management at the Data Center: From Capacity to Control*

This blog was written by CITO Research and sponsored by Intel.

Introduction

Data center infrastructure management (DCIM) technology has made great strides in recent years, providing ever-more granular views into the use of electric power and computing capacity in data centers. With the rising cost of energy and the complexity of managing the explosion of new data sources and mobile applications, data center operators are under pressure to improve efficiency, agility, and dependability. Each iteration of DCIM provides another angle from which to understand the relationship between energy consumption and computing power. Moreover, business leaders want to understand an even more elusive relationship—the relationship between power consumption and business value.

A particularly ambitious DCIM provider, *iTRACS* already has a 360-degree view of DCIM—literally. iTRACS offers interactive 3D visualization, a navigable point-and-click 3D environment that lets users see, manage, and gain complete "command and control" over physical infrastructure in the data center, from the transformer outside of the building down to every device on every rack.

Now, by integrating *Intel Data Center Manager* (DCM) software with its Converged Physical Infrastructure Management™ (CPIM™) software portfolio, iTRACS is able to extend its DCIM capabilities even further, along two lines:

- iTRACS can now measure the power consumption and environmental conditions of each asset in the data center, right down to the device level.
- iTRACS is working to develop a new "business value" efficiency metric that would augment PUE by calculating the efficiency with which IT assets—the compute side of the data center—deliver business value to the organization. Essentially, the more business value delivered by IT per unit of energy consumed, the more efficient the data center becomes.

About iTRACS

iTRACS, based in Oak Brook, Illinois, has been developing physical infrastructure management solutions for 20 years, beginning with building cabling infrastructure in data centers. The company moved from asset-management documentation in the late 1980s, to embedded resource-discovery tools in the early 2000s, to automated Move/Add/Change platforms in the middle of the decade. The CPIM™ software portfolio with interactive 3D visualization was launched in 2009, providing users with a real-time, navigable 3D environment for managing all data center assets and the complex web of interrelationships that exist between them.

iTRACS has built an energy efficiency strategy around its CPIM™ software portfolio called iTRACS PowerEye™, which consists of four main energy management capabilities: Visualize, Analyze, Manage, and Optimize. By "flying" around a 3D model of a data center, an operator sees a real-time picture of the entire environment, clicking on assets to reveal which applications are

running where, what each network cable is connecting, and which assets are underutilized or wasting power. This level of point-and-click navigability offers true command and control over the physical infrastructure.

"If the boardroom tells you that you need to cut energy consumption by 20% by consolidating servers—while at the same time increasing the number of virtual machines on the floor to optimize your virtualized environment—how would you figure that out?" asks Willie Bloomstein, Marketing Strategist, iTRACS. "Previously, you would send out a team with clipboards to walk the floor, trying to figure out which servers were connected to what and where space is available to replace older devices with new energy-efficient ones. Now you can sit at a console showing you a single-pane view of the entire data center, examine your environment, explore 'what if' scenarios, and come up with a strategy that mitigates the risk associated with change. It's not just real-time event management or reducing energy consumption. It's also the ability to strategically optimize physical infrastructure over the long term to deliver continuous business value to the organization."

iTRACS estimates that its iTRACS PowerEye™ strategy can help companies, depending on their current power usage, reduce their energy costs by up to 30 to 40 percent.

Role and Benefits of Intel DCM

Intel Data Center Manager (DCM) completes a vital link in the iTRACS campaign to provide a total picture of the business value generated by IT-related energy consumption. With the integration of "*Intel Data Center Manager (DCM)* into the CPIM™ platform, iTRACS extends its capabilities deeper into the data center, with the ability to collect, manage, and analyze power and temperature readings at the individual device level. Leveraging this granular information, data center managers can improve capacity planning, identify and decommission energy-wasting assets, strategize new equipment outlays using predictions based on actual energy usage, and prevent outages from occurring by identifying and resolving sources of overload, hot spots, and cooling issues before they become problems.

On the Road to a New Efficiency Metric

In addition to improving energy efficiency, the iTRACS and Intel partnership is bringing the DCIM world one step closer to a new paradigm in the measurement of efficiency. This new approach, which iTRACS calls DCIM Business Output™, is designed to augment the popular PUE metric with a series of new measurements that calculate the efficiency with which IT assets—the "compute" side of the data center—deliver business value to the organization.

Explains Bloomstein, "PUE is an excellent guide for measuring the percentage of energy going to facilities assets (like cooling) vs. the amount of energy going to IT assets (such as servers). But PUE is facilities-centric, telling you little about the efficiency with which IT assets are driving business

value for the organization. We are suggesting that the industry supplement PUE with an additional IT-centric approach, which would measure the positive business outcomes delivered by the IT assets, and how much power is required to achieve those outcomes."

Asset Efficiency

This proposed metric would compare CPU utilization vs. power usage at the individual device level, creating an opportunity to compare one IT asset against another to see which provides the most value at the highest efficiency.

Comparing Server A with Server B might look like this:

Server A

- Capacity: 100 business operations per minute
- Is currently running at 87 operations per minute—operating at 87% capacity
- Consumes 100 units of electricity—running 0.87 operations per unit of energy

Server B

- Bigger capacity: 150 business operations per minute
- Currently running at only 75 operations per minute—operating at 50% capacity
- Also consumes 100 units of electricity, so it's running 0.75 operations per unit of energy

So server B, which has the potential to deliver higher business output to the organization, is actually running less efficiently. Both the business and the planet suffer.

IT Efficiency

Bloomstein calls this second metric the "PUE of IT" because it would help determine how much energy is going into IT assets that work directly for the business (servers, etc.) versus IT assets that do not work for the business, but are in a supportive role (storage, switches, etc.). The goal is to minimize the amount of energy consumed by assets that aren't working directly for the business so that owners can put more energy into assets that are doing work for the business.

Bloomstein says the "business value" or "business output" in these metrics would be whatever each individual data center operator wants them to be, depending on the organization's business model and mission. It could be as simple as CPU cycles or as targeted as customer transactions. An ecommerce company might measure "business output" as transactions or revenue. A social media company may look at advertising dollars or social transactions. A cloud provider might look at services or compute power charged to customers.

iTRACS believes a new family of IT-centric metrics could be helpful for businesses that increasingly run in the cloud, allowing providers to apportion computing resources, in real time, based not only on customer demand, but on climatic conditions and energy costs at data centers at certain points in the day. A services provider with a global portfolio of data centers could essentially move the cloud to different locations on the planet at any given point in time, depending on where the greatest energy efficiency is available. The business would expend the least possible energy while reaching its most ambitious goals.

Conclusion

Like the famous Charles and Ray Eames film The Power of Ten, the vision of iTRACS evokes a similarly giddy level of experiential engagement with the DCIM landscape, moving from a grain of sand (a device) to a view of the whole planet (global businesses running in the cloud) in an instant. The level of detail provided by *Intel Data Center Manager (DCM)* means that one will eventually be able to jump from the grain of sand into the cloud and clearly see power usage and other key metrics at any scale.

All of this has a lofty goal—a more energy-efficient, optimized business environment that will have a truly granular yet global understanding of the impact of its decisions on its bottom line and on the planet.

This blog was written by CITO Research and sponsored by Intel.

Rackwise: "Real-Time Granularity Brings PUE into the C-Suite"

Introduction

A data center is both one of an enterprise's primary assets, as well as one of its primary cost centers. With the increasing cost of energy, coupled with the huge demand placed on computing resources, operations, IT, and the executive team all have a stake in a deeper and clearer understanding of total cost of ownership to run an application. The Green IT movement provides additional impetus for maximizing efficiency. Throw in the complexity added by co-location, managed hosting, virtualization, and the cloud, and the demand for insight-driven efficiency is even stronger. Vendors in the data center management space are springing forward to address this demand.

Rackwise, a comprehensive data center information management (DCIM) company, has moved the needle forward, providing a higher level of granularity for real-time reporting on data-center assets, forging a new partnership with Intel Corp., in which Rackwise will embed *Intel Data Center Manager (DCM)* into its software.

About Rackwise

San Francisco-based Rackwise addresses multiple dimensions of the data center, including visualization, documentation, modeling, analysis, and management. Over time, the company has built models of 30,000 pieces of equipment, and its customer base includes such companies as FedEx, Chase, and Home Depot, according to Doug MacRae, Executive Vice President, Technology Development Group. Rackwise's product line covers four key areas: Data Center Essentials, Data Center Optimization, Data Center Intelligence, and Data Center Business.

Data Center Essentials is Rackwise's product foundation. It includes basic design and modeling functionality, and support for virtualization, cabling, asset management, and capacity planning.

Data Center Optimization locates servers with low CPU utilization, recognizes highly consumptive devices, and correlates those devices with the applications they support, providing grounds for determining ROI on equipment and decisions about whether to decommission that equipment.

Data Center Intelligence performs fault impact analysis, capacity planning, and historical reporting, as well as executive-level reports on power expenditures, operational, and capital costs.

Data Center Business performs cost and savings analysis, and allows enterprises to run chargeback programs on any user-defined metric, including space, power, and CPU utilization. Through graphics and dashboards, this feature also allows executives to assess the true costs of running business services in a given geography, or for particular hardware-software configurations, which means they can design business services to run optimally based on accurate information about their IT stack.

Rackwise continually enhances its offering through integration with other software such as Microsoft Visio, which allows customers to color-code heat rates, server loads, device types and locations, and visualizations of server racks from the enclosure level, down to the module level, MacRae says. Other partnerships include BMC Remedy and Atrium CMDB for change management and trouble ticketing, and, most recently, *Intel DCM*.

The Role of Intel DCM

Rackwise previously offered real-time monitoring of equipment using Simple Network Management Protocol (SNMP). But this first-generation capability still required a good deal of manual setup and verification, says MacRae. Rackwise turned to Intel to provide more automated provisioning and to take readings at the device level of each rack.

"What we've gained by plugging in the *Intel DCM* solution is a finer level of detail, more accurate, real-time information, and the ability to provision this interface in a much more robust fashion than we had before," MacRae says. "It's also much faster."

Using *Intel DCM*'s auto-detect feature, Rackwise can accelerate onboarding of new devices as they are added to racks at its clients' data centers, significantly reducing the amount of manual verification its clients will need to perform.

Intel DCM provides real-time indications of power consumption and temperature data—aggregated at the levels of rack, row, and room—as well as in user-defined logical groups, which Rackwise is incorporating into its Essentials offering, allowing operations managers to make off-the-cuff allocation decisions, says MacRae.

Rackwise can now deliver metrics such as Power Usage Effectiveness (PUE) at practically any level of granularity, from device to rack to geographic region, which is something Rackwise's clients demand. PUE is expressed as the amount of total facility power divided by the power consumed by the IT equipment. One aspect of this is closer monitoring of non-IT devices, which some clients have started to explore. The other is more fine-grained analysis of exactly how and where IT devices are wasting power, which is where *Intel DCM* comes in. While some vendors offer only PUE estimates based on the "plated" or manufacturer-estimated figures of a device, because it has embedded *Intel DCM*, Rackwise can offer actual real-time measurements of temperature at the inlets of individual devices.

"Over the last year, PUE has gone from casual interest at the executive level to a serious part of our discussions," MacRae says.

Increasingly, enterprises are turning to managed hosting, co-location, and the cloud for running their applications, but they still want to know about the efficiency of their applications across the board. In the near future, Rackwise, which itself uses a software-as-a-service model, is looking to take this fine-grained functionality into multitenant environments, and to begin providing report cards on hosted as well as in-house environments, MacRae says.

Even now, he estimates that the pre-Intel Rackwise installations save most customers 10 to 20 percent.

"With *Intel DCM*, we're expecting a pretty significant jump on that, which will translate into operational savings and the ability to get a more accurate level of ongoing reporting for the data centers," MacRae says.

Conclusion

As the complexity and importance of data center operations increases in the eyes of those holding the financial strings at a company, there is tremendous opportunity for vendors to intervene and provide new levels of data-center visibility, control, and flexibility. Communicating technology decisions, in both broad-based and laser-sharp financial terms, is dependent on gathering accurate, real-time data on computing hardware, as close to the device level as possible. Through partnerships such as *Intel DCM* and Rackwise, the C-suite's conversations are increasingly extending from capital and operating expenses to more specific metrics, such as PUE. With a more immediate grasp of data center operations and their true costs in hand; the relationship between power and technology metrics and financial metrics is becoming much clearer, helping enterprises run more efficiently.

This blog was written by CITO Research and sponsored by Intel.