

The Need for a More Integrated Approach to DCIM

A ManageEngine White Paper

By Suvish Viswanathan, ManageEngine

Executive Summary

The data center is the nerve center of the enterprise, but for too many years it has been managed inefficiently. The IT organization, for example, has developed and deployed a sophisticated infrastructure for managing the data center's information technology assets (the servers, the networks, the storage and peripheral devices). At the same time, the data center management organization has developed and deployed a parallel infrastructure for managing the data center's infrastructure assets (the heating, ventilation and air conditioning [HVAC] systems; the electrical systems; fire suppression systems; data center security systems and more).

These two infrastructures are completely complementary in terms of their role in delivering service to the enterprise and its customers, yet they operate in near complete isolation from one another.

While there have been legitimate technical reasons for this separation in the past, the ability of today's technology to overcome those historical differences calls into question whether it remains in an organization's best interest to continue to manage these in such an inefficient manner. The simple answer to that question is "no, it is not." It is costly from a human resources perspective, from an operational perspective, from an environmental perspective—indeed, from nearly every perspective one might consider.

This paper outlines a rationale for consolidating the management of these disparate infrastructures through a single, comprehensive, integrated management solution. Such a solution would bring together IT and data center management in such a way that all data center assets could be monitored and managed through a single integrated data center infrastructure management (DCIM) console. It would help lower costs and reduce the environmental impact of the data center while simultaneously improving performance and optimizing service delivery.

The Evolution of Infrastructure Management

Over the years, the challenges associated with data center management have grown at an exponential rate. Once we might have looked out and imagined that the challenge was primarily one of scale: How do you fit all the computing and storage assets into the fixed footprint of the data center itself? Some data center veterans will remember seemingly endless rows of VAX systems and Winchester disks stretching out like the crates in the warehouse at the end of Raiders of the Lost Ark. But then those big crates were flattened into pizza box-sized things, and we started growing upwards. Suddenly, there were individual cabinets with voluminous racks of servers—and, for a while, it seemed that the ability to scale would remain unchecked.

But that was just one perspective. The sheer number of computing assets we could now accommodate in the physical data center, including network devices, applications, servers and storage devices, put more pressure on the day-to-day management practicalities. Once you could slip a disc into a machine, tap a couple of keys and patch a software issue or update an entire application. Disc in, disc out, done. But what soon followed in the amazing, expanding data center sent chills up the spines of IT managers: disc in, disc out, done. Repeat.

And repeat *again*.

Soon it was clear that we had to come up with whole new ways to manage these highly interdependent assets in the data center. Either it took too long for one person to patch all the machines or it took too many people to do it all in the [arbitrarily defined] amount of time it used to take.

Enter the Age of Managing Management

The List of Things To Be Managed just goes on, evolving in sync with the demand for data and computing resources—firewalls, load balancers, network devices and more. In fact, by this time we've realized that the task of managing the IT assets of the data center is so complex that we need tools to help us manage the management tasks themselves. We need change management tools that can help us keep track of what has to be done, who did what, when it was done and more. We need tools that can enable us to roll back quickly to a prior state if we find something went awry. We need tools that can model the impact of changes and that can monitor the state of this complex environment so that the heartbeat of the data center remains steady and strong.

Note, too, that so far we've said nothing about managing non-routine maintenance and update issues. This is just day-to-day complexity. Factor in the *unexpected* failure of a computer or storage device and that can reprioritize every management task we've just mentioned.

Moving into the Virtual World

So, fast forward to today. In some ways, today's data may seem simpler than its predecessors. The sheer number of physical servers may be lower than it was a decade ago. But each of the servers remaining on the data center floor may be playing host to tens or hundreds of *virtual* servers, which stretches the management complexity of this environment into whole new realms. Which virtual machine (VM) is running where? Is it at capacity? Overloaded? Underutilized?

Even the nature of the data center itself has evolved. The data center may no longer belong to a single company. An independent service provider may own the data center and provide outsourced services to companies from all over the world. Who defines the policies and practices and service level agreements that apply to the assets under management? How are those policies and practices managed—at the machine level, at the VM level, within various private cloud environments that the data center may be hosting?

Finally, to add just a little more complexity to the mix (because, clearly, we can never get enough complexity), we now have to spend more and more time thinking about how the assets in a data center are performing relative to other assets and applications over which we have virtually no control. Mobile and social media can place huge and unpredictable demands on IT resources. Hyperconverged applications pose similar problems, yet more and more they become the norm.

Rising to the Challenge

Thankfully, companies such as ManageEngine have created IT management tools that are capable of providing the comprehensive support that today's complex IT environments require. A tool such as ManageEngine IT360 can facilitate management of the physical, virtual and cloud-based IT infrastructures. It can manage the seemingly innumerable configuration changes in each of these environments. It even includes in-depth analytical tools that can identify root causes and troubleshoot them automatically—and that can alert the right IT resource when encountering an issue that cannot be fixed programmatically.

The only problem is, that's *still* not enough.

A Parallel Evolution in Data Center Facilities Management

IT management is only *half* the challenge confronting managers in the modern data center. The other half of the challenge lies in the management of the data center infrastructure itself. All these IT assets require an enormously sophisticated physical infrastructure, with power considerations, security considerations, cabling considerations and more. Successful delivery of the IT services to the end customers who need it depends entirely on the successful management of the data center infrastructure itself. Traditionally, that's been handled by another team entirely, using an entirely different set of tools and an entirely different set of management and performance criteria.

That's a problem. It's a problem we've been trying to overcome for some time through awkward alliances between IT management and data center management organizations. We've seen the equivalent of celebrity marriages formed between high-profile IT and data center management firms, each promising to work together to solve a client's data center challenges. But those marriages last as long as most celebrity marriages last, and when the marriage breaks up, it is the client that has depended on that partnership that suffers most. Their data center is left unsupported by one or the other party.

Different Worlds, Identical Missions

The physical data center itself—the brick and mortar building that surrounds all those physical and virtual machines—consists of electrical supply systems, backup power systems, power distribution units (PDU), HVAC systems, fire detection and suppression systems, biometric security and surveillance systems, water systems and more. Data center managers pay as much attention to monitoring, managing and maintaining these systems as IT managers do to their IT assets. And just as IT management has evolved to deal with the increasing complexity of the IT environment itself, so too has data center facilities management evolved to deal with the complexities involved in that world.

Today's data center managers have tools and technologies for monitoring each of the systems and services just mentioned. Some of these tools may be brilliantly integrated for security purposes—access control systems, for example, that can collect and validate input from biometric devices and then unlock the doors only to specific data center areas, even to specific data center cabinet enclosures. If the visitor attempts to access an unauthorized area or rack enclosure, the access control system can detect the attempt and automatically retrain the security cameras while alerting data center security. If the unauthorized access attempt persists, the system can automatically alert local law enforcement officials.

Other systems have been developed to optimize data center operations for cost savings. Computer room air conditioning (CRAC) systems, for example, may monitor the temperature from hundreds, even thousands, of locations around the data center and make micro-adjustments to hundreds of air flow and cooling units to distribute heat more effectively through the complex. This can both optimize energy use where cooling is required (which can lower operating costs) and maintain an optimal operating environment for the IT assets whose performance is temperature sensitive. At the same time, the fact that these systems make use of sophisticated automation to monitor and manage the complex features of this environment also means that the data center can keep its personnel costs in check. There is much to be managed and maintained, but if the systems can do the bulk of the work without the need for physical intervention on the part of an administrator, then the data center can operate in a lean and efficient manner.

The reality is, though, that all these efforts to enable greater efficiencies—in both the IT and data center management worlds—have only partially succeeded. Each world may operate more efficiently, but they remain two parallel worlds. IT and data center managers might quickly agree that they have a common purpose—to enable the optimal delivery of a service to customers—but the levers they pull and the buttons they push are very different.

The Need for a Truly Integrated Approach to Service Delivery Management

The IT and data center worlds should not need to operate in parallel, though. What they need is to operate as one, in a truly integrated manner. That's what DCIM—data center infrastructure management—*should* be all about. What if the CRAC system monitoring temperatures throughout the data center could do more than just make micro adjustments to fans and airflow systems? What if it were integrated with a virtual machine management system so that a more broadly defined data center management solution could move virtual machines from a hot server in one part of the data center to a cooler machine in another part of the data center—proactively and automatically—as part of a broader management strategy?

This more fully integrated universe of *service* delivery management, one that consolidates IT management and data center facilities management, is where the next breakthroughs need to come. The assets under facilities management and the assets under IT management need to be integrated into the same asset management tool so the entire service delivery infrastructure can be tracked and managed throughout its lifecycle.

That requires an evolution within both worlds:

- An asset management system supporting both worlds needs to be able to capture data from infrastructure components using not just protocols such as SNMP but also protocols such as MODBUS, BACnet and others.
- Similarly, all the management tools must themselves interact with greater communications interoperability—whether that's building/space management (BMS), security and fire suppression units or any other. With greater communications flexibility, no one will have to rip and replace tools as quickly in the future, and organizations won't get locked down to a single vendor.
- Finally, service managers relying on these tools will need an analytics engine that can make sense of the information collected within this system. Only with strong analytical tools will decision-makers be able to make truly well-informed decisions.

Data center management will never be performed efficiently if the IT infrastructure and facilities infrastructure are managed separately. Can you imagine your blade servers running in a room cooled to only 90°F? Should you really feel comfortable about the ongoing availability of your business critical applications if you don't know that the diesel tank fueling your back-up generator is only 10% full? Is it really possible to ensure the security of your

infrastructure and the critical data it processes without a proper sensing mechanism in place?

When viewed through the lens of service delivery, all the assets in your data center are connected, and your ability to monitor and manage them needs to be equally as interconnected.

The Shape of a Truly Integrated DCIM solution

That is the shape of DCIM as we see it at ManageEngine, and it's important to pause on that point for a moment. DCIM has, unfortunately, become one of those marketplace buzzwords that lacks a common, shared definition. One recent industry article mentioned that more than 80 companies offer DCIM solutions. The problem with that statement is that most of those companies don't. Those companies may offer an IT or facilities management product that facilitates the management of *one part* of the data center infrastructure, but that's a far cry from the kind of integrated DCIM solution that today's fast-paced businesses can rely upon.

A true DCIM must be able to do the following:

Collect data: The data center is full of data collection nodes: IT systems collecting performance data in real time from servers, switches, data storage systems and more—as well as facilities infrastructure systems collecting data about rack temperatures, power consumption, backup generator fuel tank levels and more. These systems rely less and less frequently on an agent-based approach to reporting, so a DCIM solution must be able to collect data using a wide range of common communications protocols—from SNMP, WMI, SSH and the like for IT assets to MODBUS, BACnet, LonMark and others for the facilities infrastructure assets.

The data capture features of DCIM need to support more than real-time infrastructure monitoring, too. The DCIM system must be able to reach deep into the broader infrastructure to pull granular data from individual pieces of equipment for planning and forecasting purposes.

Provide analytical support: Ultimately, the point of collecting data is to subject it to analysis and correlation, so a DCIM system needs a powerful analytical component. From a data center management standpoint, the analytical engine can facilitate decisions. These can be programmatic decisions, such as when an alert might prompt the automated transfer of virtual machines from one server to another or automatically increase the airflow within a certain set of racks because of a sudden spike in CPU temperatures. Or, they can be strategic decisions taken by a committee, such as when planners view DCIM data for environmental trends, application performance patterns or the broader user experience.

Accommodate the operator: A DCIM solution that can monitor and manage a wide range of assets—but only if those assets have been built by the same vendor that built the DCIM solution—is a non-starter. The days of a monolithic, single-vendor infrastructure are long past. In fact, just the opposite is true: The whole notion of the “data center” itself is becoming more and more fluid. If the data center is where an organization runs its mission critical applications and manages the delivery of the user experience, then parts of that data center may be in the cloud. Parts of that data center may reside in physically non-contiguous locations. And decisions about future data center elements may be governed as much by time to service delivery as physical location.

An integrated DCIM solution must accommodate a wide range of systems, tools, protocols and standards. It needs to be able to pick up alerts from different assets in the data center and send them to the appropriate authority (via email, SMS or whatever mechanism is preferred by the enterprise). All the elements in the infrastructure need to expose their APIs so that the management tools can understand and interact with them. This would give data center managers the flexibility they need to expand in the ways that will be best for their business (which a vendor lock-in never does).

Control and automate: Today’s data centers are enormously complex. Some management issues need human oversight; others do not. A truly integrated DCIM solution can help you manage your resources so that issues that do require human intervention are flagged and escalated accordingly. The solution needs to be able to contact the person with the right skills, the right authority and the right access. It needs to be able to alert that person in a manner that is in keeping both with the severity of the issue and the policies and procedures of the organization itself.

For issues that do not require human intervention, the DCIM must be able to handle them programmatically through various workflow automations. This enables you to focus your (highly intelligent, creative and skilled) human resources on the strategic management tasks that can enhance business productivity, the end-user experience or some other area that matters more to the enterprise.

Manage inventory centrally: Asset management is a major pain point in the data center, but a truly integrated DCIM solution can eliminate this pain through an automated asset discovery engine. Such an engine would provide capabilities to crawl the data center infrastructure and discover all the devices and services involved and then feed those discoveries into a centralized repository such as a configuration management database (CMDB). Such a database would not be a mere manifest of detected devices, systems and services, though; for this database to be truly useful, it must enable data center managers to understand the relationships between the devices, systems and services. Thus, if a data

center manager were planning a project to swap out a row of batteries, for example, the CMDB could let the manager know precisely which servers this row of batteries is backing up as well as precisely which mission-critical applications and services are running on those servers. The practical impact of any asset change could be readily seen if this kind of DCIM were in place. It's a hyperconnected world in the data center, which is why we need a truly integrated DCIM tool to handle it!

Sidebar: The Utility of Metrics

You'll note that we have not mentioned any of the metrics usually mentioned when talking about data center management. Historically, many people have talked about data center management in terms of Total Cost of Ownership (TCO), Power Usage Effectiveness (PUE), Data Center Infrastructure Efficiency (DCIE) and other metrics. These *are* important metrics, particularly within the context of a green IT initiative. Failure to monitor activities with an eye toward the data center's carbon footprint will have a significantly negative impact on both the company's tax bill and public image.

However, these metrics provide only a fragmented view of overall data center performance.

Data center infrastructure management needs to transcend that fragmented view. The data center is the nerve center of business today, and it needs to be managed with the organization's service delivery goals in mind. There are human, resource and environmental components that we need to balance and manage effectively. Only by taking an approach that unifies, integrates and consolidates all these elements can we manage the entire data center in a manner consistent with our broader service delivery goals.

ManageEngine IT360 and DCIM

The latest release of ManageEngine IT360 offers a truly integrated approach to IT and data center infrastructure management. By plugging in the Facilities Infrastructure Management Module (FIMM), data center managers can use IT360 to manage both the IT *and* the data center infrastructure assets through a single, integrated tool—with a unified management console—to ensure optimal delivery of services to the customers who rely on the data center.

The Hyperconnected Infrastructure

Instead of viewing IT and DCM as though they were distinct and unrelated worlds, IT360 enables a data center management team to view the facility as a hyperconnected infrastructure. All the IT assets—the servers, the applications, storage and so on—are viewed as assets on par with the security systems, the HVAC, CRAC, fire suppression systems and so on. The IT assets continue to be managed using SNMP and an army of remote daemons and agents that report up to probe servers (located locally in individual data center facilities), which in turn regularly roll up their reports to a centralized implementation of IT360.

For those data center assets that do not respond to a traditional ping, such as an electromechanical door lock or a fire sensor, IT360 uses the FIMM to connect

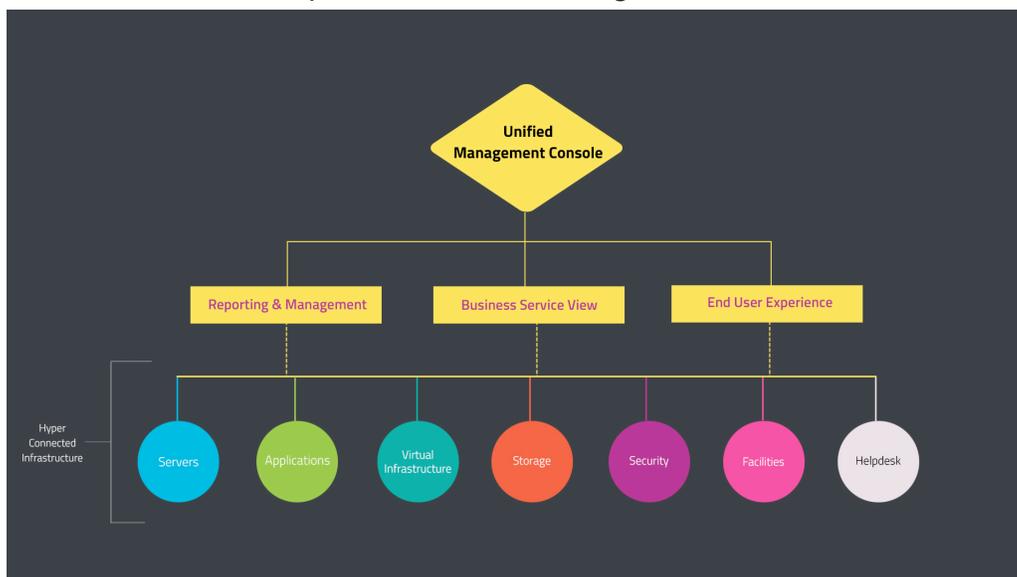
to a network of remote telemetry units (RTUs) that can capture and convey information from an ever expanding number of non-IT data center assets.

Just as the local probe servers capture the health and performance characteristics of the IT assets, the RTUs capture and convey information from the sensors operating throughout the data center. A mid-sized data center might deploy two or more RTUs, each of which can capture data from a large number of serially connected devices.

IT360 provides full support for role-based interactions and engagement limitations. An enterprise could provide administrators at the corporate network operations center (NOC) a full view of all the information coming into IT360 from all the probe servers and FIMMs in all the different data centers operated by the enterprise—and all on a single console. At the same time, it could limit the view of administrators within individual data centers to the activities occurring within their own data center.

This constraint is important, because while administrators at the headquarters level will always want to know the state of the overall infrastructure, it will fall on the shoulders of the local administrators and managers to take care of any situations that arise. Application performance flags, temperature sensor alerts and more can be presented to the local administrators on a single unified console, enabling managers to make connections that they might never have made before. An application performance flag that arrives coincidentally with a temperature sensor alert might not be a coincidence at all. An operator can respond to both conditions in an appropriate manner and see the effect that his or her action has on both.

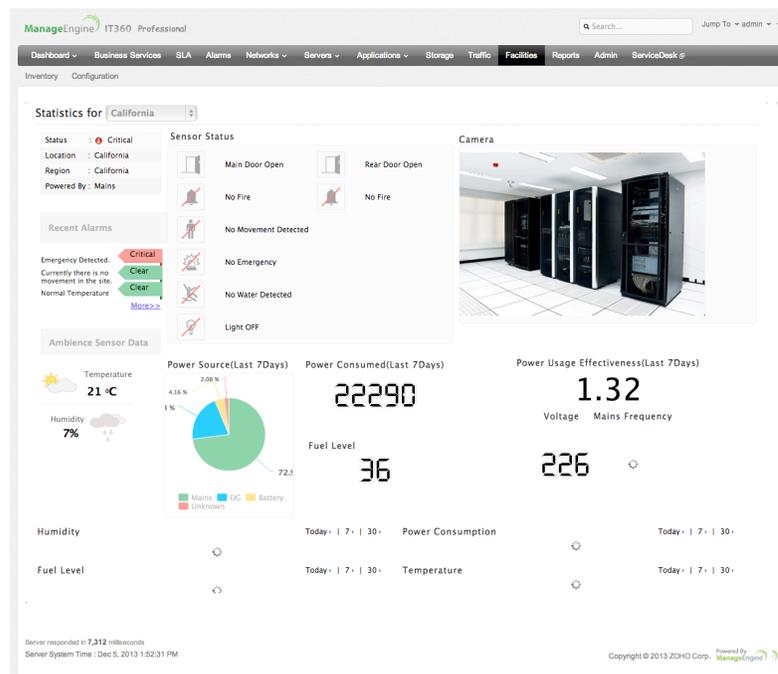
IT360 is evolving a full complement of automation tools that administrators can apply to automate the response to a wide range of environmental conditions—



Hyperconnected DC Environment

from automatically restarting IT assets to changing fan patterns in response to temperature shifts. It might send an alert to an operator if the batteries in a set of Uninterrupted Power Supplies (UPS) need to be changed, and it might also tell that same operator which IT and data center assets are connected to that battery bay and need to be reconnected to another bay when those batteries are swapped out. Before that reconnection takes place, IT360 would orchestrate the migration of mission-critical VMs from any assets that will be reconfigured and can then manage the orderly shutdown of those assets. These are still the early days of such a comprehensive solution, but this is the direction in which we see a DCIM solution based on IT360 evolving.

Some management tasks, of course, will always require human intervention, and for those tasks, we envision IT360 connecting directly into your service management system. IT360 has long been able to share information and status updates with an organization's IT help desk, and the ability to connect non-IT assets into the trouble-ticketing and management system is in the works for a future release update. This will streamline asset management throughout the data center. If we consider again the example of the server performance hit occurring at the same time that the temperature spike was noted, the ability to manage the tickets associated with both assets will help an enterprise orchestrate and prioritize its trouble ticket management with greater understanding of the overall impact and repercussions of an event.



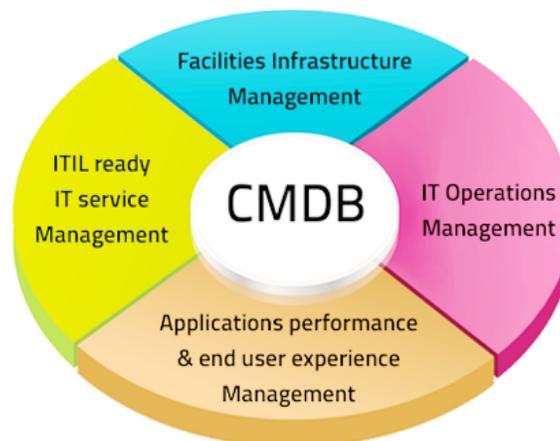
Analyzing a Broader and Deeper Data Pool

One of the advantages that results from this consolidated approach to data center management is the ability to perform broader and deeper analysis of the data arising from the overall environment. Operators can see connections that were not previously apparent when looking at application performance, for example. Perhaps a change in the network infrastructure here can be seen to account for the performance change that occurred simultaneously.

The reverse of this is true also. With a consolidated view of the interrelationships of the IT and data center assets, it becomes possible to use predictive analytics to forecast what might happen if you altered different elements within the broader infrastructure. You might actually find new ways to reduce a data center's carbon footprint, for example, or reduce costs, energy consumption, or personnel because of the insights that arise from this integrated approach.

A Full 360-Degree View of Operations

Ultimately, the ability to gain this much insight into the events and activities that are taking place in your data centers—not just from day-to-day but in real time—puts you in a powerful position to refine those data center operations rapidly and in very meaningful ways. You can gain a much greater awareness of the dynamics between the IT infrastructure and the data center infrastructure itself. Relationships that might not have been obvious before can become glaringly obvious when both infrastructures are managed together.



With IT360, the interconnectedness of your enterprise becomes both more apparent and

The functionality we've described in this paper also represents only the earliest implementations of what we view as a truly comprehensive DCIM solution. With each release of IT360 (and ManageEngine releases updates three to four times each year), these capabilities will expand. More automation features are in the pipeline, as are more tools for managing all your data center assets (IT as well as infrastructure) in a CMDB repository. Within CMDB, an organization would not only be able to keep tabs on all its physical and virtual assets, but it would be able to map the relationships between them. A system administrator would be able to see not only which servers are engaged to support a critical business transaction (as well as the granular details about those servers, including model number, build date, manufacturer's contact information and more) but even which data center infrastructure assets support those servers (such as which

electrical circuit and UPS subsystems support them, which backup generators stand behind them and more).

For more information about how IT360 can provide comprehensive support for your DCIM needs, contact ManageEngine today. A trial version of IT360 can be downloaded from the ManageEngine website as can a trial version of the FIMM. Connecting the FIMM to RTUs within a data center requires professional support, and ManageEngine can help you find a local resource that can facilitate this configuration. Visit us at www.manageengine.com/dcim/ for more information.

###

Suvish Viswanathan is the product marketing manager, [Unified Solutions](#), at [ManageEngine](#), a division of [Zoho Corp](#). You can reach him on [LinkedIn](#) or follow his tweets at [@suvishv](#).

