Quantifying Data Center Efficiency: Achieving Value with Data Center Infrastructure Management

An ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) White Paper
Prepared for FieldView Solutions, Inc.
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Executive Summary

Data Center Infrastructure Management (DCIM) solutions, such as those offered by FieldView Solutions, facilitate substantial opportunities for improving IT reliability, performance and cost effectiveness. By evaluating the environment improvement results of actual FieldView customers, EMA has gauged the level of efficiency improvements that can be expected with the introduction of DCIM processes. Key findings from the research include:

• On average, with server consolidation initiatives every nine servers can be replaced with a single blade server, reducing energy consumption and related costs by 42%.
• Active thermal management will, on average, allow for the safe reduction of Power Usage Effectiveness (PUE) ratios by 16%, resulting in an annual cost saving of roughly $149,000 per 10,000 sq. ft. (929 sq. m.) of managed floor space.
• Continuous monitoring and alarming of environmental and IT component performance will reduce incidences of unnecessary hardware replacements by an average of $20,000 per year.
• Asset and inventory data collection automation minimized the need for ad-hoc audits and other time-consuming administrator activities, resulting in an average of 5,000 hours of FTE time reclaimed annually.
• All respondents indicated substantial improvement to data center reliability that has directly enhanced business productivity.

Improving IT Efficiency with Data Center Infrastructure Management (DCIM)

Data centers are expensive – really, ridiculously, stunningly expensive. The average annual cost of data center power consumption alone is calculated in the millions of dollars. Add to that the cost of hardware, maintenance, support staff and other ongoing operational expenses, and the total cost of data center ownership is clearly a staggering burden on even the most generous enterprise budgets. In the past, data center costs were just accepted as the price of doing business. After all, IT services and the facilities that support them are the cornerstone of any modern business operation and integral to driving both productivity and profitability. Efforts to curb data center expenditures were (and still often are) rebuffed due to concerns that they would impact production services. For IT managers, the situation has become even more challenging as data center complexity has greatly increased with the introduction of new requirements, such as to support virtualization, multi-tenant architectures and increased device densities.

The core of the problem for most organizations is principally that they lack visibility into their environments, or – if they are collecting infrastructure details – the information is too complex for them to rapidly and accurately analyze. A data center is really an ecosystem of technology components, where each element (e.g. a server, storage device, power distribution node, environmental control units) interacts in a variety of ways with every other element. Add a new device, for instance, and it will have a direct effect on the temperature, power draw, and network performance of every device in the vicinity, and all those neighboring devices will affect other

To reduce costs and increase overall IT efficiency, a holistic view of the infrastructure must be enabled that dynamically identifies the relationship of any single device to all the others.
components in a complex chain reaction that ripples across the data center. To reduce costs and increase overall IT efficiency, a holistic view of the infrastructure must be enabled that dynamically identifies the relationship of any single device to all the others. Data Center Infrastructure Management (DCIM) provides all the centralized monitoring and management processes necessary for enabling informed decision making on optimizing configurations, improving reliability and reducing cost.

**Quantifying DCIM Value**

Since DCIM has an effect on every aspect of a data center lifecycle, it manifests value in a very broad range of business-focused improvements. These principally fall into two distinct categories – direct value and indirect value. Direct value is the one most often discussed because it is quantifiable and includes direct cost reductions that can be measured and tracked over time to provide visible ROI on data center improvements. Energy costs associated with device power consumption and environment cooling are certainly the most visible evidence of improvements. In fact, some organizations need only look to their monthly electric bill to find proof of cost reduction. However, energy reduction is usually a little more complicated to calculate than that since most data centers are in a constant state of change, requiring continuous tracking of power consumption as it compares to active data processing. Similarly, the cost of hardware, maintenance and administrative staff to keep the data center fully functional also requires a multi-faceted view of what is happening in the data center to quantify accurately, but it is still possible to identify and track operational costs with detailed monitoring resources and analytical reporting.

Much more difficult to attribute to DCIM processes are indirect value areas. For instance, it is hard to quantify exactly how much money is saved in preventing data center failures, but it is clear there are substantial consequences that IT downtime causes to business reputation, productivity and profitability. Often, IT managers track IT availability as part of their SLA requirements, so even if they can’t attribute a dollar amount to reliability, they can often recognize improvements. Simplifying management process can additionally improve administrative staff efficiency, but this is also difficult to quantify because any saved time is typically redirected to address other business-related IT issues. Compliance achievement can actually fall into either direct or indirect value categories. There is a direct value if the organization is involved in energy certificate trading or a power provider energy reduction incentive program, and there would be indirect value if compliance goals were internally created to address social responsibilities such as reducing carbon footprint or other environmental impacts.

Since organizations achieve value from DCIM in different ways, it is not always clear how the adoption of these solutions will improve IT efficiencies in any particular IT implementation. Recognizing that the best indicators can be found in real-world use cases of DCIM practices, FieldView Solutions, a leading provider of data center management resources, sponsored EMA to perform research on organizations that have adopted its product set. Through a combination of live interviews and written surveys, FieldView Solutions’ customers have provided EMA with a detailed picture of key data center management challenges and the degree to which DCIM solutions have improved or eliminated them through direct and indirect value. Although FieldView sponsored the research, all the results were independently and objectively attained and analyzed by EMA.
**Introduction to FieldView**

All organizations interviewed in this evaluation have adopted and are actively utilizing the feature set offered in the FieldView Data Center Infrastructure Management Software. The platform has been purpose-built to gather, store and report on data center device and environment information in order to enable informed decision making for optimal infrastructure planning. Trending is performed on collected data and displayed in a consolidated dashboard view, providing reporting “at a glance” on a variety of statistics, such as site efficiency, power consumption, PUE and space utilization. FieldView includes heat mapping capabilities, which directly interpret data from environmental sensors to create a thermographic image of the data center. The FieldView architecture includes multi-tenant features designed to address the needs of both enterprises and service providers that support SaaS and Cloud infrastructures. In the recently released *EMA Radar for Data Center Infrastructure Management: Q4 2012*, FieldView was recognized as a Value Leader for delivering broad functionality while maintaining cost effectiveness.

![Figure 1: FieldView Data Center Modeling with Thermographic Imaging](image)

**Achieving Energy Efficiency**

The direct reduction of energy consumption on IT devices offers the most visible and most commonly identified opportunities for improving data center cost-effectiveness. Its popularity also stems from the fact that there are a number of methods for reducing the amount of power consumed by IT devices. Here are some of the most common:

- **Hardware Upgrades** – Hard disks, chip sets, power supplies and cooling systems are continually being redesigned to achieve greater standards in energy efficiency, so upgrading devices with more efficient alternatives can yield substantial efficiency improvements without introducing major changes to the environment. The challenge is in identifying the “power hogs” that would be advantaged by hardware upgrades or total replacement. Monitoring power consumption on each device and comparing the results against system utilization will help identify key candidates.
Quantifying Data Center Efficiency: Achieving Value with Data Center Infrastructure Management

- **Server Consolidation** – Even with efficient hardware, though, servers are rarely utilized to their full capacity. Common IT management practices reserve at least half of a server’s processing power to support unexpected spikes in demand. This often results in significant over-provisioning of devices with a larger portion of IT resources sitting idle the vast majority of the time. Server consolidation maximizes resources by combining them onto a single or smaller number of servers operating at greater capacity. A performance reserve is still maintained, but at a much smaller percentage since it can be shared by a greater number of workloads. Taking that concept a step further, a large number of systems can consolidate their processes onto especially large capacity servers, such as Blade Servers and Mainframes, which are designed to draw proportionally less power and operate with greater efficiency.

- **Virtualization** – The adoption of virtual servers expands on the concept of server consolidation by allowing a single physical system to host multiple services, allowing new workloads to be added to existing systems rather than adding more power-consuming devices.

- **Eliminate Unused Systems** – Monitoring and evaluating system utilization across the support stack can identify unused systems that can be shut down and retired along with their associated power consumption. Similarly, low-use systems can also be retired if their workloads are removed as part of a consolidation initiative or a simple workload migration.

- **Data Center Consolidation** – Through the use of server consolidation and an increase of rack densities, organizations with multiple data centers can migrate IT resources out of the least used facility, eliminating all the cost overhead associated with operating a separate infrastructure. Monitoring for system utilization and space availability provides key intelligence for targeting data centers for elimination and identifying data centers with the capacity to absorb additional resources.

- **Power Chain Management** – The infrastructure supporting power distribution can also cause power inefficiencies. Environment monitoring can identify under-utilized PDUs and UPSs so they can be reallocated to support more efficient zones or outright eliminated if they prove to be unnecessary. Additionally, any power chain elements that are determined to not be operating at peak efficiency should be repaired or replaced.

- **Power Capping** – Setting hard thresholds for individual servers, racks or data centers will prevent unexpected performance spikes from exceeding compliance requirements or equipment tolerances. Alarming when power consumption nears power cap limits provides IT administrators time to avert power capacity saturation.

- **Power State Management** – Schedules can be created to automatically shut down systems when they are not in use or place them in a state (such as “sleep” or “hibernation”) for fast recovery. Wake-on-LAN and other power-on capabilities allow systems to be activated prior to the start of a production day or to support backups and maintenance windows.

- **System Power Throttling** – During periods of low use, supported servers can reduce the power draw of the CPU, disk drives, display, or other peripherals while still being fully and immediately available to support critical workloads.

All of these methods require holistic monitoring of the data center environment over time and the ability to compare historical records of energy consumption against system use to indicate optimal data center configurations.
Evaluation Results

A number of the organizations interviewed reported utilizing FieldView to assist with identifying opportunities for energy consumption reduction. Most commonly, consolidation initiatives were identified as the most popularly adopted method, and organizations typically reported that traditional servers were transitioned onto blade servers, achieving a consolidation ratio of 9 to 1. An average traditional server consumes 500W of power versus approximately 2500W per blade server at an average workload (i.e. operating at full performance capacity 30% of the time). This indicates a 45% reduction in direct energy costs for the same amount of processing while increasing fault tolerance and performance through load balancing across processors. Further, when factoring in a typical Power Usage Effectiveness (PUE) of two (identifying the environmental cost of the data center as equal to the server power draw), costs associated with cooling and other infrastructure support are also roughly halved.

The chart below indicates expected efficiency improvements based on real-world reports of consolidation initiatives evidenced by FieldView customers transitioning from traditional servers to blade servers. Evaluation results fell between the minimum and maximum indicators and a 10% margin of error has been added to both ends to indicate a reasonable range for expected improvements that can be achieve in adopting consolidation initiatives:

<table>
<thead>
<tr>
<th>Metric</th>
<th>Minimum</th>
<th>Average</th>
<th>Maximum</th>
<th>Margin of Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server Consolidation Ratio</td>
<td>9:1</td>
<td>11:1</td>
<td>12:1</td>
<td></td>
</tr>
<tr>
<td>Percent Energy Consumption Reduction Per Blade Server</td>
<td>21%</td>
<td>42%</td>
<td>59%</td>
<td></td>
</tr>
<tr>
<td>Total Annual Cost Savings Per Blade Server (assuming a PUE of 2)</td>
<td>$3366</td>
<td>$4205</td>
<td>$7494</td>
<td></td>
</tr>
<tr>
<td>Annual Total Carbon Emission Reduction (in Tons) Per Blade server*</td>
<td>6.62</td>
<td>20.37</td>
<td>36.15</td>
<td></td>
</tr>
</tbody>
</table>

*Assuming energy source is from coal-fired base-load power plant

Figure 2: Server Consolidation Evaluation Results

Case Study #1: Server Consolidation Example

A prime example of improved efficiency through server consolidation was demonstrated by a media/information company that introduced FieldView specifically for the purpose of reducing energy costs. The organization had previously determined that roughly 80% of the servers spanning three data centers only utilize 10-15% of their CPU capacity. Assisted by infrastructure intelligence provided by FieldView, consolidation initiatives were adopted to more efficiently perform workload processing without reducing production reliability. To date, 1,243 servers have been consolidated into 137 Blade chassis, resulting in a 45% reduction in related energy costs and more than a half million dollars in annual energy cost savings. If drawing power from a coal-fired base-load power plant, the consolidation project has reduced total carbon emissions by 2,841 tons (2577 metric tons).
IT systems are not the only devices that draw power in the data center. Just as notable are the environmental units necessary to cool the environment. Servers generate heat – in fact, quite a lot of heat – and if they aren’t kept cool, they will fail. To prevent this from happening, data centers are often chilled to temperatures well below necessary tolerances. This is due to a number of reasons. For example, if excessively heat-generating systems are clustered in a particular area, they can create a “hot spot” and temperatures must be reduced for the entire data center to ensure proper cooling of that one specific location. Air flow is another factor as chilled air can pool up in one section of the data center if it does not have a clear path to circulate around the environment. Also, the cooling units themselves may not be placed in optimal locations where they can do the most good.

When data center managers lack the visibility into the thermal conditions of their environments, they tend to excessively lower ambient temperatures just to be on the safe side. Each degree of reduced temperature exponentially increases the cost of powering the cooling units. The most common method for identifying thermal efficiency is to calculate the data center’s PUE. This is accomplished by identifying the total data center facility power consumption and dividing that number by just the power consumed by IT equipment, the resulting PUE ratio indicates the proportion of energy consumed by the environment to that of the IT equipment it is supporting. Since the bulk of environmental power is consumed to support cooling, a PUE can provide a fairly good, easily determined indicator of thermal efficiencies. The average data center PUE is about 2.5, meaning one and a half times as much energy is consumed by the environmental and power distribution units than by the IT equipment they are supporting. The goal of achieving thermal efficiency is to attain as close as possible to a PUE of 1, and a realistically achievable goal would be a PUE of around 1.6.

A word of caution here, though – relying on PUE as a thermal efficiency indicator is really only reliable in environments that are static. If the data center is rapidly growing or consolidation initiatives are being performed, the PUE value may go up even though overall energy consumption costs have gone down in relation to the amount of computing activity being performed. This is simply because higher densities of equipment generate more heat and require more cooling. To accurately gauge improvements, you need to compare results from infrastructures that have not changed equipment densities, but have made adjustments to environmental conditions.

Identifying opportunities for reducing cooling requirements involves the recording of temperature readings from sensors and other live recording devices strategically distributed across the data center. When this temperature data is integrated into a DCIM visual modeling solution, the resulting thermographic imaging clearly displays hot spots and other thermal challenges, enabling IT administrators to make...
identified decisions on how to optimally reconfigure the environment to minimize heat impacts. After improvements have been introduced, regular monitoring of the thermal imaging provides IT support organizations with the assurance that heat tolerances are not being exceeded, so ambient temperatures can reliably be raised, substantially reducing costs associated with cooling.

**Evaluation Results**

FieldView was adopted by a number of the respondents in the evaluation specifically for the purpose of tracking and improving data center thermal conditions. By actively making adjustments to the infrastructure to eliminate hot spots and with continuous monitoring of the environment to ensure heat tolerances were not exceeded, these organizations were able to report increases in ambient temperature by roughly 9 degrees (on average). This resulted in the lowering of PUEs by as much as 18% and an average achieved PUE of 1.62 – which is perfectly aligned with typically established targets for improvement. Annual cooling-related energy consumption rates were reduced, on average, by 1.24 GWh for every 10,000 sq. ft. (929 sq. meter) of data center floor space.

The chart below indicates expected efficiency improvements based on real-world reports of thermal management initiatives evidenced by FieldView. To compare results, findings were proportioned to exemplify the equivalent of a 10,000 sq. ft. environment. Evaluation results fell between the minimum and maximum indicators and a 10% margin of error has been added to both ends to indicate a reasonable range for expected improvements that can be achieved from introducing thermal management practices:

![Figure 3: Thermal Management Evaluation Results](image)

**Case Study #2: Thermal Management Example**

One particular respondent that participated in the review represented an IT managed service provider supporting multiple customer tenants collocated in a single facility. To ensure reliability in supporting customer compute resources, data center temperatures were initially kept excessively low. Since related energy costs were charged back to the customers, the organization recognized the need to improve cooling efficiencies to improve customer satisfaction with operational costs. Following the introduction of FieldView, the organization was able to slowly increase chilled water supply by about a degree or so roughly once a week. In addition, it leveraged the ability to graphically display to its customers the thermal state of the infrastructure in comparison to established thresholds to provide the assurance
that the increased efficiencies had no impacts on the reliability of the production environment. In this way, over a period of 6 months, the temperature of the chilled water system was increased from 45 degrees to 55 degrees, resulting in a substantial decrease of related power consumption from .53 kW/ton to .32 kW/ton.

At the same time the efficiency improvements were being introduced, the organization also implemented a massive data center build-out – increasing floor size by 80% and load densities by 74%. Despite the fact that increased load densities will also increase PUE ratios, the fact that the organization was able to reliably increase environment temperatures actually resulted in a PUE decrease of 17%, reducing it from 1.7 to 1.45. Had the organization not been able to make this environmental improvement, overall energy consumption and their related costs would have been 15% higher than they are today.

Reducing the Cost of Operations

Although tracking energy cost reductions are undoubtedly the most visible methods for gauging value achieved from DCIM adoption, they are by no means the only efficiency improvement. Hardware-related operational costs can also be substantially reduced in environments that otherwise lack infrastructure visibility. For example, power spikes and hot spots can damage or reduce the performance of critical data center devices. Continuously monitoring the environment and alarming on potential problems can identify issues before they become impactful to the environment, and can actually extend the life of hardware components by providing assurances that they are functioning properly. That is, when organizations can confirm that IT components are operating optimally, they are unlikely to perform unnecessary replacements.

Consolidated infrastructure monitoring also provides many opportunities to reduce administrative support efforts. According to EMA research, an average data center incident takes roughly four hours to resolve, with fully half that time taken just to identify that the problem occurred. Simple graphical dashboards provide administrators with an immediate identification of issues and direction on the root cause of the problem, reducing both Mean Time To Detection (MTTD) and Mean Time To Resolution (MTTR), as well as preventing systemic infrastructure problems that cause IT operations to get stuck in the break/fix cycle of constant reactive “firefighting.” The less time IT administrators spend chasing down environment failures, the more time they have available to further improve the infrastructure and address business-focused IT projects. Similarly, automated data collection of a data center inventory drastically reduces the need for support staff to perform time-consuming audits.
Evaluation Results

Several of the evaluated organizations were able to directly attribute operational cost savings to the infrastructure monitoring capabilities provided by FieldView. Hardware components—excluding cooling units, branch circuits, UPSs, and even servers—were rescued from unnecessary replacement because the monitoring and alarming features delivered assurance of performance reliability. In addition, the asset tracking capabilities minimized or eliminated time-consuming activities, such as environment audits for the identification of available space and resources to support the addition of new servers. It should be noted that these organizations only recorded administrator time savings from larger projects and could not accurately account for what they estimated as substantial additional effort reductions collectively achieved in smaller day-to-day activities, such as in performing root cause analysis, executive report generation, and asset data reviews.

Figure 4 indicates the range of hardware and fulltime employee (FTE) cost savings that organizations were able to directly attribute to the adoption of FieldView. Results in this category varied greatly due to the significant differences in IT infrastructure sizes, complexity, and enterprise requirements. However, even the most modest environments were able to report substantial cost reductions in proportion to their operational scope. In this chart, FTE cost is calculated as the equivalent total compensation for the employees (including salary and benefits) at the current U.S. average IT administrator rate of $75 per hour. Due to the broad range of potential results, a 20% margin of error has been included to indicate the range of expected results:

<table>
<thead>
<tr>
<th></th>
<th>Margin of Error</th>
<th>Expected Improvement</th>
<th>Margin of Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Hardware Cost</td>
<td>$5,000</td>
<td>$10,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Savings</td>
<td></td>
<td></td>
<td>$30,000</td>
</tr>
<tr>
<td>$32,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Annual Support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff Time (in hours)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saved</td>
<td>340</td>
<td>480</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4,920</td>
<td>9,360</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11,232</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equivalent of Annual</td>
<td>$29K</td>
<td>$36K</td>
<td></td>
</tr>
<tr>
<td>Support Staff Cost</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Savings</td>
<td>$369K</td>
<td>$702K</td>
<td></td>
</tr>
<tr>
<td>$842K</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4: Operational Cost Reduction Evaluation Results

Case Study #3: Hardware Cost Reductions

Among the reviewed organizations that had indicated achievement of hardware cost reductions with the use of FieldView was a financial firm that had concerns about the reliability of the branch circuits supporting its IT infrastructure. Although the operations staff periodically took manual current measurements of the branch circuits, the process was very time-consuming and ultimately only provided a snapshot of the load status that would quickly become outdated. To avoid risk and ensure reliability, they blindly installed new branch circuits on a regular basis, not knowing whether they were fully utilized or not. The organization adopted FieldView specifically for its branch circuit monitoring capabilities to alleviate this problem and saw immediate returns. Manual measurement is no longer necessary and new branch circuits are only installed when the existing circuits are at capacity.
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Case Study #4: Minimizing Support Time and Effort
Reducing administration time was evident in all the interviewed FieldView customers, but one particular organization – a business intelligence provider – was especially adamant about the diminished administrative efforts they achieved. With limited support personnel, the organization was frustrated with needing to perform a time-consuming process for capacity management. To be specific, every time a new project was introduced, a manual audit of all the racks in the data center needed to be performed to identify available space and optimal configurations. This resulted in about a week’s worth of work that needed to be performed at least once per month by an administrator. With the help of FieldView’s built-in reports, the organization was able to reduce the evaluation process to only 20 or 30 minutes, freeing up administrative staff to more productively support the business. As reported by the responsible IT manager, “FieldView tells me how much I’m using now, so I can tell [a requester] how much I can support.”

Ensuring Reliability
Although the focus of this research is on quantifying data center efficiencies that can be directly attributed to the adoption DCIM practices, there are a number of indirect benefits as well – many of which can be attributed to an improvement of the reliability of the IT infrastructure. Anytime IT performance degrades or failures occur, business productivity is impacted and there is a potential for significant financial repercussions. For instance, project failures, missed deadlines and disappointed customers could all lead to direct revenue losses. Also, fines may be levied if the organization fails to meet compliance or SLA objectives. High availability and business continuity are both issues of primary importance to data center management, and maintaining them both requires visibility not only into the state of the IT devices and their workloads, but also into the power conditioning and failover chain that ensures they are fully functional and available if needed. During a crisis is the most inappropriate time to test a failover environment, and yet that is very often the case. Continuous monitoring of the failover infrastructure as well as the entire power chain provides organizations with the assurance of maintaining IT availability and business continuity.
Evaluation Results

All organizations reviewed in this evaluation indicated they had achieved significant improvements in the reliability of their support environment. One business acknowledged that where they used to typically experience roughly ten major environment failures a year, since the adoption of FieldView not a single failure incident has occurred. Responses from reviewed organizations indicated five key capabilities that directly led to improved infrastructure reliability:

- Prompt Problem Identification – dashboard and alarms immediately inform administrators of failures and potential problems so they can be immediately addressed.
- Power Availability Assurance – through monitoring of branch circuits and the entire power chain, key performance data is provided to help organizations ensure continuous power availability.
- Thermal Mapping – the easy identification of hot spots that exceed established threshold prevents temperature-related failures and hardware damage.
- Capacity Assurance – providing indicators when capacity thresholds are soon to be reached allows administrators time to expand the environment without impacting production performance, and the identification of available space and resources simplifies the process for introducing new infrastructure elements.
- Root Cause Analysis – simplifying the process for identifying the actual cause of a failure or performance degradation helps eliminate systemic problems.

The chart below identifies the percent of respondents that indicated significant reliability improvements associated with each capability:

![Figure 5: Percent of Respondents Identifying Capabilities That Have Improved IT Reliability](chart)

Case Study #5: Improving Data Center Reliability

Increased data center infrastructure reliability was a primary concern for a not-for-profit research organization that took part in the evaluation. FieldView was adopted specifically to ensure its IT environment was “predictable, reliable and sustainable.” The platform allowed the support team to be sure that they were not overloading circuits and that loads are distributed across the data center in an efficient manner. They also noted that the ability to look at power distribution records historically was essential to identifying trends and making critical adjustments, and they were able to be strategic in the deployment of new equipment thanks to the detailed capacity information the solution provides.
**Summary of Results from DCIM Adoption**

Every organization is unique, and each will have a different set of requirements for DCIM. As a result, each will experience results in different value categories and at varying degrees. The chart below provides a summary of the average level of direct, quantifiable value achieved by DCIM adoption in EMA’s evaluation. It should be noted that no single organization we reviewed achieved these results across every category, but instead typically focused on only one or two improvement areas. The amount of cost and resource savings was directly related to the amount of excess consumption that existed prior to the adoption of the DCIM solution. For example, environments that began with higher PUEs were typically chilled to a greater degree and therefore had greater opportunity to increase temperatures and achieve higher ROIs. EMA recommends each organization reviews its current infrastructure conditions and business requirements to determine which categories provide the greatest opportunities for improvement. The chart below is intended to indicate potential savings in each category – actual results (as they say) may vary:

<table>
<thead>
<tr>
<th>Category</th>
<th>Annual Power Consumption Reduction per 10,000 Sq. Ft.</th>
<th>Average Annual Carbon Emissions Reduction per 10,000 Sq. Ft.</th>
<th>Annual Hardware Cost Savings</th>
<th>Annual Staff Time Savings</th>
<th>Average Annual Cost Savings per 10,000 Sq. Ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server Consolidation (assuming 497 servers consolidated to blade servers at a ratio of 9:1 and a PUE of 2.00)</td>
<td>1,934,926 kWh/year</td>
<td>2272 tons</td>
<td>$232,191</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal Management</td>
<td>1,241,666 kWh/year</td>
<td>1444 tons</td>
<td></td>
<td></td>
<td>$149,000</td>
</tr>
<tr>
<td>Hardware Monitoring</td>
<td></td>
<td>$20,000</td>
<td>1,200 hrs.</td>
<td>$110,000</td>
<td></td>
</tr>
<tr>
<td>Simplify IT Operations</td>
<td></td>
<td></td>
<td>4,920 hrs.</td>
<td>$369,000</td>
<td></td>
</tr>
</tbody>
</table>

“FieldView’s focus on electrical resources leads to benefits in a number of areas. FieldView increases our ability to manage the floor in a reasonable manner and make decisions intelligently that leads to increased reliability.”
EMA Perspective

The core of DCIM is arming data center managers with the critical infrastructure intelligence to make informed decisions on optimal configuration for their environments that will lead to performance improvements, increased reliability and cost efficiencies. The evaluations evidenced in this research indicate significant opportunities for infrastructure improvements. However, it is important to note that in all the evaluated use cases results were only recorded where an organization actively introduced process improvements in each direct and indirect value category. Adopting a DCIM platform will not, by itself, yield efficiency improvements. A DCIM monitoring and management solution, such as FieldView, will provide the critical intelligence IT managers and administrators need to rapidly identify opportunities for improvement and optimal configurations, but a determination to introduce these efficiency enhancements must be in place for the initiative to be successful. DCIM is a process that is enhanced by automated tools. The better the monitoring and automation, the easier and quicker it is to introduce transformative processes.

Each of the evaluated organizations was able to achieve significant improvements by adopting FieldView to address specific infrastructure improvement goals – such as reducing power consumption, increasing power chain reliability, or reducing the cost of operations. By introducing changes targeted on those goals, the organizations were able to rapidly experience reductions in their most difficult infrastructure management challenges. With these resolved, they are leveraging the additional features of FieldView to systematically introduce improvements in other areas. For instance, once an organization has achieved its goals of improving reliability, it can focus on reducing energy consumption. Achieving all of the infrastructure improvements expressed in this research is certainly possible, but enterprises are cautioned not to try to accomplish them all at once. Instead, DCIM processes should be adopted to uniquely support each organization’s distinct requirements. In the performance of this research, EMA has reviewed substantial evidence that the adoption of FieldView has directly resulted in the achievement of organizational goals for IT infrastructure improvements and the attainment of greater efficiencies and cost reductions.
About FieldView Solutions

FieldView Solutions provides managers of today’s complex, mission-critical data centers and Colocation facilities with browser-based, scalable software tools that deliver a real-time view into all aspects of data center infrastructure management (DCIM). The company’s flagship product, FieldView, has helped data center IT and facilities operations professionals in many of the largest data centers including six of the top 10 banks, three of the five top technology providers, and 12 of the largest Co-Lo facilities in the U.S., Europe and Asia/Pacific since 2006 – managing 1.5 Gigawatts. The FieldView Solutions team is comprised of industry professionals with demonstrated experience in both the design and operation of data centers and the development of technology platforms that service them. FieldView Solutions meets the needs of a broad range of users, especially the largest-scale global corporate clients. For more information, visit www.fieldviewsolutions.com.

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About Enterprise Management Associates, Inc.

Founded in 1996, Enterprise Management Associates (EMA) is a leading industry analyst firm that provides deep insight across the full spectrum of IT and data management technologies. EMA analysts leverage a unique combination of practical experience, insight into industry best practices, and in-depth knowledge of current and planned vendor solutions to help its clients achieve their goals. Learn more about EMA research, analysis, and consulting services for enterprise line of business users, IT professionals and IT vendors at www.enterprisemanagement.com or blogs.enterprisemanagement.com. You can also follow EMA on Twitter or Facebook.

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