Facility and IT management solutions
White paper

Tivoli® software

Integrate IT management and building automation to help optimize performance.

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Overview

Although facility management and IT systems depend on each other, they often operate in separate worlds:

- The facility manager responsible for electric bills has a limited ability to monitor or control how efficiently energy is used in the data center — even though a data center may use 10 to 30 times more energy per square foot than a typical office building.
- The data center manager may get little or no warning when an air conditioner fails and a room's temperature drifts outside specifications — even though these conditions may rob server rooms of the power and cooling they need, and thus put critical functions at risk.

When facility and IT management are not integrated, energy efficiency, IT performance, server availability, customer service and a company's reputation can all suffer.

Despite these challenges, there are strong reasons for facility and IT management teams to retain control over their own domains. A solution that forces one or both of these teams to manage their resources with unfamiliar tools – or that gives either team authority that exceeds its expertise – is no solution at all.

Now, an integrated approach to monitoring and control is changing the landscape in facility and IT system management. This white paper describes how an interoperable system can give both facility and IT personnel full visibility into their own and each other's critical management parameters – without forcing either team to give up its world view or authority.

When a business uses a combined technology solution, both facility and IT teams can use proactive, predictive processes to help:

- Improve data center operations.
- Reduce business risk.
- Increase energy efficiency.
- Support sound decisions about server room operations, upgrades, expansions and reconfigurations.

Highlights

Throughout this white paper, short scenarios provide representative examples of how facilities and IT integration enable sound decision making. The paper also offers a more detailed integration example, using a solution that combines IBM Tivoli® platforms and the Metasys® building automation system from Johnson Controls®, Inc. The uses of integration can vary greatly from one company to another, but these examples help you envision how you might take advantage of these capabilities in your business.

Isolated approaches to facilities and data center management stand in the way of addressing energy efficiency

Several trends are pushing organizations to pay more attention to data center performance and efficiency. The sheer need for computing resources is stretching the limits of space and power. Electricity use associated with servers doubled from 2000 to 2005.[1] Electricity costs are rising both in absolute terms and relative to total IT operating costs. Furthermore, companies face growing pressure to minimize carbon emissions.

Because customers' expectations about service quality – speed, reliability and accuracy – continue to rise, organizations that want to address energy efficiency need to coordinate data center and facility management. It would be risky to think of either in isolation because the two functions share responsibility for service commitments to the business. For example, taking drastic steps to save energy in the data center would be unacceptable if it led to poor response times and compromised service level agreements (SLAs).

Organizations that want to address energy efficiency need to coordinate data center and facility management

When facilities and IT management work in isolation, their people and processes lack common goals and objectives, and the organization lacks financial accountability for IT energy use. They have no visibility into total data center energy use, true life-cycle cost or return on investment in IT assets. The facility manager cannot make changes to optimize IT assets because there is no way to assess the risk those changes may pose to reliability and availability.

Scenario: prompt responses to brownout
A brownout alert from an electric utility requires a power reduction. With an integrated approach to facilities and IT systems management, the facilities department could start backup power and shed nonessential loads. The IT department could receive an alert, then leverage visibility into the facilities information to respond appropriately, such as by decreasing application performance, signaling servers to reduce clockspeed, making nonessential applications dormant or redistributing workload to other data centers.

Integrate monitoring information to help both teams make intelligent, prompt decisions

Controlling data center costs – facilities typically represent the majority of data center costs – is just one reason for facilities and data center management to merge. An integrated facility and IT management system helps both functions advance the organization's goals.

As data centers and facilities become more complex and independent, the data center increasingly impacts facilities planning construction and maintenance. Understanding the impact of data center consolidation, growth and disaster recovery helps facilities managers with immediate decisions and long-term planning.

For example, the facility manager is equally responsible for the climate in people's offices and for the "comfort" of servers in the data center. Although monitoring the temperature at the center of a space is sufficient for offices, the data center needs finer control. Temperature variations across the server room and from the bottoms to the tops of racks can make a major difference. The cooling system must provide enough airflow to keep all servers within their prescribed temperature ranges.

Facility managers who lack the ability to monitor and understand IT operations and workload often resort to overcapacity: keeping the server room cold, which is highly inefficient. But if given access to detailed information about server performance, a facility manager could:

- Install strategically placed monitoring devices.
- Leverage the environmental monitoring capabilities that already exist within newer IT equipment.
- Automate control of the space to optimize energy use.

Scenario: coordinated approach to cooling issues

An HVAC damper failure indicates potential cooling issues that would affect two server racks. With integrated facilities and data center management, facilities managers could learn about the issue and dispatch a repair technician. Meanwhile, a message could be sent automatically to IT personnel, who could determine which servers will be affected, identify the applications running on those servers and review the SLAs associated with them. Then the IT staff could decide whether to do nothing (because the affected IT service is not essential), move IT workload until the situation is resolved or reduce service levels to minimize cooling needs until the repairs are complete.

Data center and IT managers can also use integrated information to make sound operating decisions and respond appropriately to changing conditions. For example, IT could understand the impact of changing workload during the day and use that insight to optimize execution and scheduling.

Additionally, IT could place servers and manage data center change *proactively*. Staff could weigh server additions or reconfigurations against the impacts on power and cooling requirements. To further manage capacity proactively, facilities managers could even be included as approvers on such projects.

When information about the facility is available to IT staff, they can manage operations and automate policies to reduce peak load charges and initiate failure responses, such as a cooling system failure, before the application servers are impacted – and thereby reduce risk to services. IT can also use information about the energy efficiency of server and storage implementations to:

- Identify the largest consumers of energy and cooling.
- Determine whether the utilization of resources justifies continued expenses.
- Justify expenditures for improved implementations.
- Support an enterprise virtualization strategy that helps maximize the operating efficiencies of both the cooling infrastructure and the virtual resource allocation.

Joint solution from IBM and Johnson Controls
Drawing on their strengths in IT system and facilities management, IBM and Johnson Controls have developed an integrated solution to help optimize performance. The basic components are:

IBM Tivoli Monitoring for Energy Management, which links the domains of energy management and service management to help users reduce energy use while maintaining IT service levels. The system monitors key energy metrics in the data center, gives alerts about critical energy situations and helps managers take corrective actions. It effectively ties together IT assets, data center infrastructure and building automation systems to enable a more effective and comprehensive energy management strategy.

The Metasys building management system from Johnson Controls, which integrates monitoring and control of multiple building functions from a single interface. Its open system architecture seamlessly integrates with industry-standard protocols and communicates with hundreds of individual devices. Metasys Systems Integration Platform from Johnson Controls provides a single-seat building management system that can seamlessly integrate with equipment and control systems from multiple manufacturers. Systems made by Honeywell, Siemens, Trane, TAC and others can operate in a single-seat environment and integrate with Tivoli software using the Metasys building automation system.

IBM Tivoli Business Service Manager, which supports the creation of executive dashboards to monitor energy infrastructure and critical situations that might threaten business services. Both operations and business audiences can enjoy visibility into service performance, then leverage the information to help control costs and accelerate problem resolution.

IBM Maximo® Asset Management for Energy Optimization, which helps optimize the energy efficiency of assets with detailed information and visualization of thermal profiles. It provides a graphical view of data center IT and facilities components and leverages energy and asset data to produce a thermal visualization solution to address issues related to heat and power management in the data center.

IBM Tivoli Asset Management for IT, which tracks financial information such as server depreciation, maintenance history and standard power consumption. It helps users understand, for example, when a legacy server should be replaced with a new, more energy-efficient unit.

Highlights

Users can view all the information they need to manage their data centers through a "single pane of glass" — one portal with one login

Leverage a consolidated view to help optimize decision making

Users of the integrated IT system and facilities management solution from IBM and Johnson Controls can view all the information they need to manage their data centers through a "single pane of glass" – one portal with one login. Facilities and IT managers each view dashboards that show the status of the critical parameters that matter most to their group.

At a glance, managers can gain insights to help answer critical questions. For example, IT staff can determine: How much power am I using? How much money can I save by reducing power? Which services are costing the most in power consumption? Which assets are efficient or inefficient? Can I change and still meet my SLAs?

Facilities managers gain insight into the changes and behaviors of the data center. Have new servers created hot spots in the data center? Are there major variances between cooling requirements during a day? Can I raise the data center temperature and still meet the cooling needs of the servers? How can my facilities systems proactively meet the needs of IT workloads?

Integrated information is even more valuable as a basis for sound planning and data center optimization. It supports effective reactions to internal and external events that affect IT systems. Examples include:

- **Thermal visualization** provides a graphical view of data center IT and facilities components, overlaid with metrics on energy use, heat and humidity. This helps identify "hot spots" in server rooms and can guide relocation of servers to areas where more cooling is available. It also can help prioritize replacement of "hot" devices with more efficient equipment. In addition, it can identify issues that relate to facilities (cabling faults or other infrastructure problems) rather than to IT equipment.
- **An energy dashboard** gives managers one view of the data center's energy use and its ongoing impact on cost. Energy and carbon footprint information can be listed by resource as well as rolled up and reported by application or business service.

Scenario: proactive response to potential failure

Predictive monitoring of a computer room air conditioner shows an operating signature that indicates potential failure. If IT system and facilities management are integrated, facilities staff will know to schedule an investigation. IT staff would also be alerted and could act appropriately before an alarm occurs.

- **Energy management tools** let users adjust workloads in the enterprise based on the current cost of energy and SLAs, in alignment with business priorities. The cost per kilowatt-hour is obtained in real time and compared against a preset cost threshold. When that threshold is exceeded, the IT and facilities environments are adjusted to reduce consumption. For example, an organization might trade off lighting for data center requirements at times of peak demand. Other measures can include raising office temperatures, deferring IT workloads or relocating IT workloads to locations where the power cost is lower.
- **Workload allocation functions** let users apportion workloads in the most efficient way based on energy-specific metrics, while also accounting for SLAs related to availability and response time. Automated or manual decisions on allocation take into account the workloads' historical energy use, the current energy available, cooling metrics and energy cost. Rapid failover decisions can help maintain uninterrupted performance of critical IT services.
- **Resource management tools** help users manage resource use and energy consumption in accordance with the current cost of energy, resource energy efficiency, available power and SLAs. In response to even sudden increases in load against building cooling capacity, the system supports or automates decisions on reducing CPU and power utilization on resources, moving or consolidating running workloads in accordance with response-time SLAs, reducing power on resources with low utilization and turning off noncritical resources.

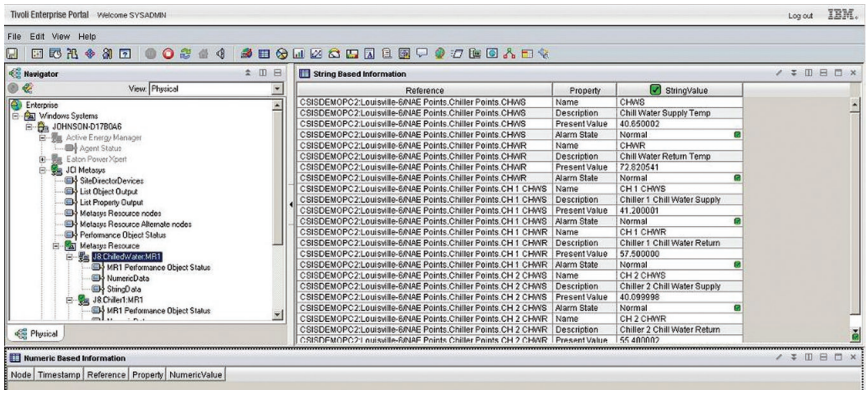
Chilled water scenario provides one example of implementation

To illustrate the advantages of combining the management capabilities of Metasys and Tivoli Monitoring, an early version of the solution was deployed to validate the technology and scenarios.

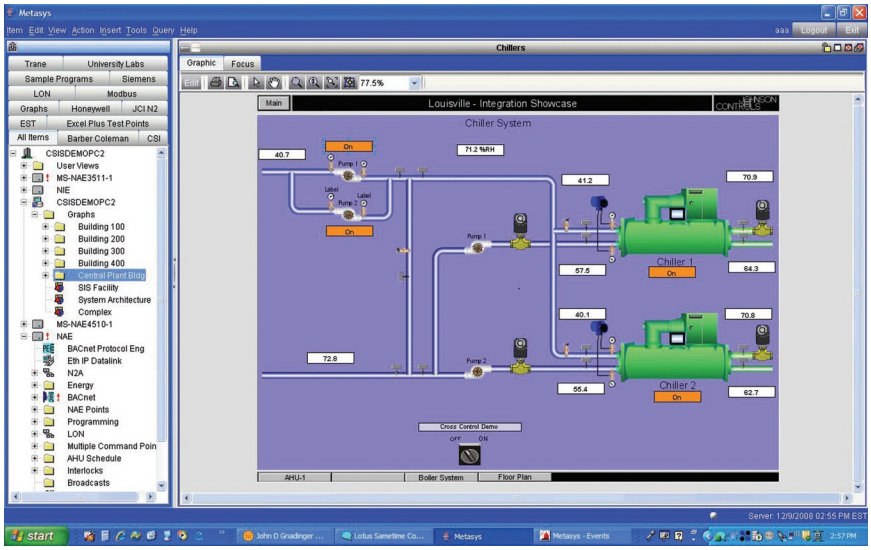
A small Microsoft® .NET application was developed to allow Tivoli Monitoring to retrieve data and set object values from Metasys through its Web service interface.[2] A Tivoli Monitoring agent was built using the Tivoli Agent Builder toolkit that comes with the product. Configuration of the Tivoli Monitoring agent included:

- Defining arbitrary facilities objects, such as Chillers, Air Handler Units or Computer Room Air Conditioners (CRACs).
- Associating Metasys objects and attributes with the arbitrary facilities objects.

As a result, the data can be presented within IBM Tivoli Enterprise Portal, which serves as the operational dashboard for the IT department.

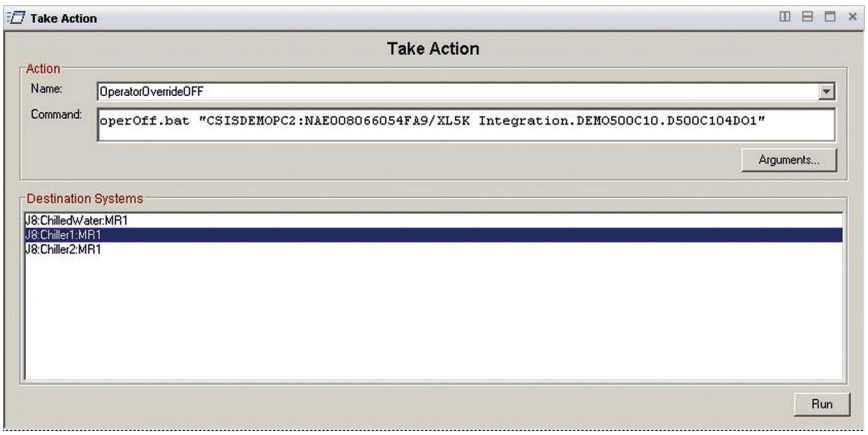


Chiller information displayed within Tivoli Enterprise Portal



Metasys graphical representation of chiller plant

"Take action" commands defined within Tivoli Monitoring allow a user to select a reference within one of the table views and prepopulate a Web services call to the Metasys Site Director. For example, it could submit an "operator override" command to Chiller1, as shown in the following screen shot. Because Metasys treats this request like it would any other, any priorities associated with the command would be respected and existing Metasys policy enforced.



Example of an operator override command issued from Tivoli Monitoring to Metasys

To provide the facilities organization with visibility into the environmental status of the IT infrastructure, a Tivoli Monitoring situation was created that watches the average temperature of a simulated set of servers. When this average reached a predetermined point, a binary point in Metasys was set to "true," allowing the Metasys programming to decide whether to lower the chilled water setpoint. Such capabilities enable data centers to adopt a strategy of increasing data center temperature and adjusting airflow to help minimize wasted cooling capacity.

To make this chilled water scenario more proactive, an organization could leverage the trending capabilities in IBM Tivoli Performance Analyzer. For example, an organization could configure Tivoli Performance Analyzer to

monitor temperature as a service level objective. This would allow IT operations to understand that the temperature trend – or that of another facility – was likely to exceed appropriate levels. Consequently, operations staff could take actions before the building automation system increased cooling output or took another measure that would be less optimal from an energy perspective.

Conclusion

As data center managers and facilities managers come under increasing pressure to optimize energy efficiency while meeting SLAs, they require a coordinated approach to performance management. Providing each group with integrated information enables them to meet shared objectives without sacrificing proven management techniques or giving either group unnecessary authority over the other.

When facilities managers have access to detailed data center performance information, they can find out about potential issues earlier, take proactive steps to avoid SLA violations and plan effectively for facility requirements. Data center managers can leverage facilities information to understand the energy cost implications of management choices and then manage operations in ways that effectively balance efficiency and performance.

For more information

To learn more about how the joint IBM and Johnson Controls solution can help you integrate facilities and IT management, contact your IBM representative or IBM Business Partner, or visit **ibm.com**/software/tivoli/solutions/green

About Tivoli software from IBM

Tivoli software offers a service management platform for organizations to deliver quality service by providing visibility, control and automation – visibility to see and understand the workings of their business; control to effectively manage their business, minimize risk and protect their brand; and automation to optimize their business, reduce the cost of operations and deliver new services more rapidly. Unlike IT-centric service management, Tivoli software delivers a common foundation for managing, integrating and aligning both business and technology requirements. Tivoli software is designed to quickly address an organization's most pressing service management needs and help proactively respond to changing business demands. The Tivoli portfolio is backed by world-class IBM Services, IBM Support and an active ecosystem of IBM Business Partners. Tivoli clients and Business Partners can also leverage each other's best practices by participating in independently run IBM Tivoli User Groups around the world – visit www.tivoli-ug.org

IBM Corporation
Software Group
Route 100
Somers, NY 10589
U.S.A.

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[1] Jonathan G. Koomey, Lawrence Berkeley National Laboratory/Stanford University, "Estimating Total Power Consumption by Servers in the U.S. and the World," February 15, 2007, available from enterprise.amd.com/Downloads/svrpwrusecompletefinal.pdf

[2] Method described in the *Metasys System Extended Architecture Secure Data Access DLL* technical bulletin.

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