

IBM Green Data Center Solution

Cut Electricity Costs by Up to 50 Percent

How IBM Optimizes Energy Consumption
Across Its Datacenter Space with Tivoli
Energy Management

PCTY2010 
Pulse Comes to You

*Energy Management in Data Centers from 500 ft²
to 150000 ft²*

Reduce, Re-Use, Recycle

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How IBM Optimizes Energy Consumption Across 150,000 sqft of Datacenter Space with Tivoli Energy Management

Introduction
Challenges
IBM Tivoli Solution
Integration
Deployment
Questions

_INFRASTRUCTURE LOG

_DAY 89: Our power and cooling costs are out of control. We spend the bulk of our IT budget just keeping the data center cool. I told Gil we need to go green in a big way.

_DAY 91: Gil took us green...kelly green, to be exact.

_DAY 93: You don't go green with paint. You go green with IBM Cool Blue™ technology and energy management services. Advanced server and storage virtualization can help consolidate our boxes to lower energy usage. And the new IBM POWER6™ systems help us use less energy doing the same amount of work.

_Our data center will be green now. And painted white.

IBM

Learn how to make your data center more efficient.
IBM.COM/TAKEBACKCONTROL/GREEN

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Challenges



Lack of Sufficient Electrical Power

The University at Buffalo installed a \$2.3 million (Non-IBM) supercomputer

Upon delivery, officials discovered there was only enough power for 2/3 of the system.
A \$20,000 electrical-system upgrade was required

Escalating Energy Costs Eroding Profits

International Data Corporation (IDC - Doc #204904, Dec 2006)

"Between 1996 and 2010, server spending is will remain flat, but energy costs are expected to increase **8X**

Lack of Sufficient Data Center Cooling

Pomona Valley Medical Center is a California hospital whose data center grew from 30 to 70 servers.

The heat generated overwhelmed the A/C system, temperatures reached 92° and machines behaved erratically.

In 2003, an air-conditioning unit broke down, sending the temperature over 100 degrees.

The event caused a shutdown of systems serving the hospital's laboratory, \$40,000 in damage to servers and hard drives, and prompted a \$500,000 retrofitting of the cooling system.

Government Regulations Driving Greater Energy Efficiency in Data Centers

The US Environmental Protection Agency (EPA)

The EPA was directed by federal legislation (H.R. Bill 5646, now public law 109-431) to study and promote the use of energy efficient computer servers in data centers.

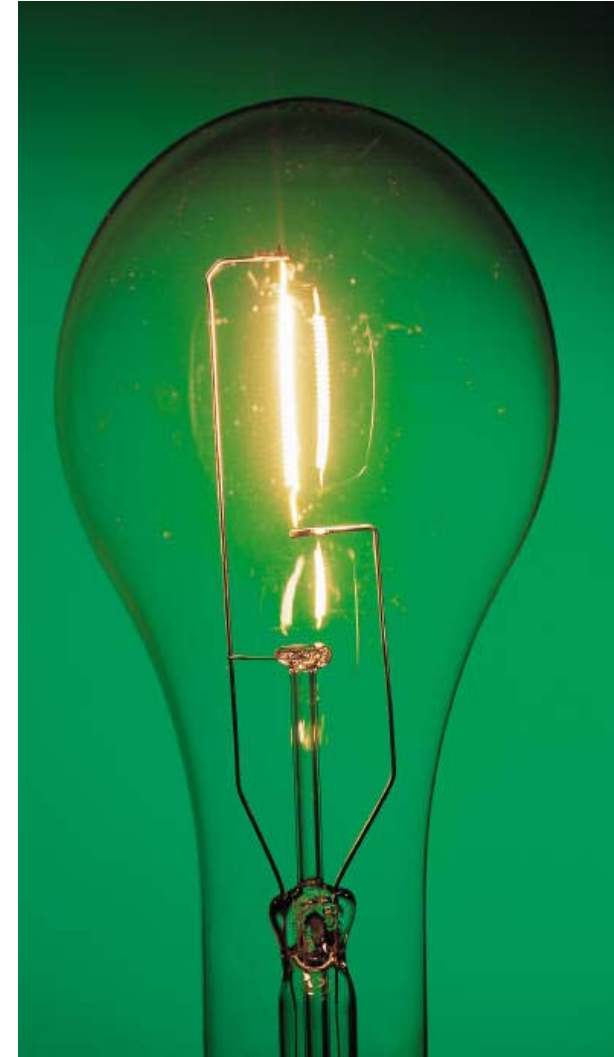
Energy Conservation Center of Japan (ECCJ)

Passed similar legislation to that of the EPA.

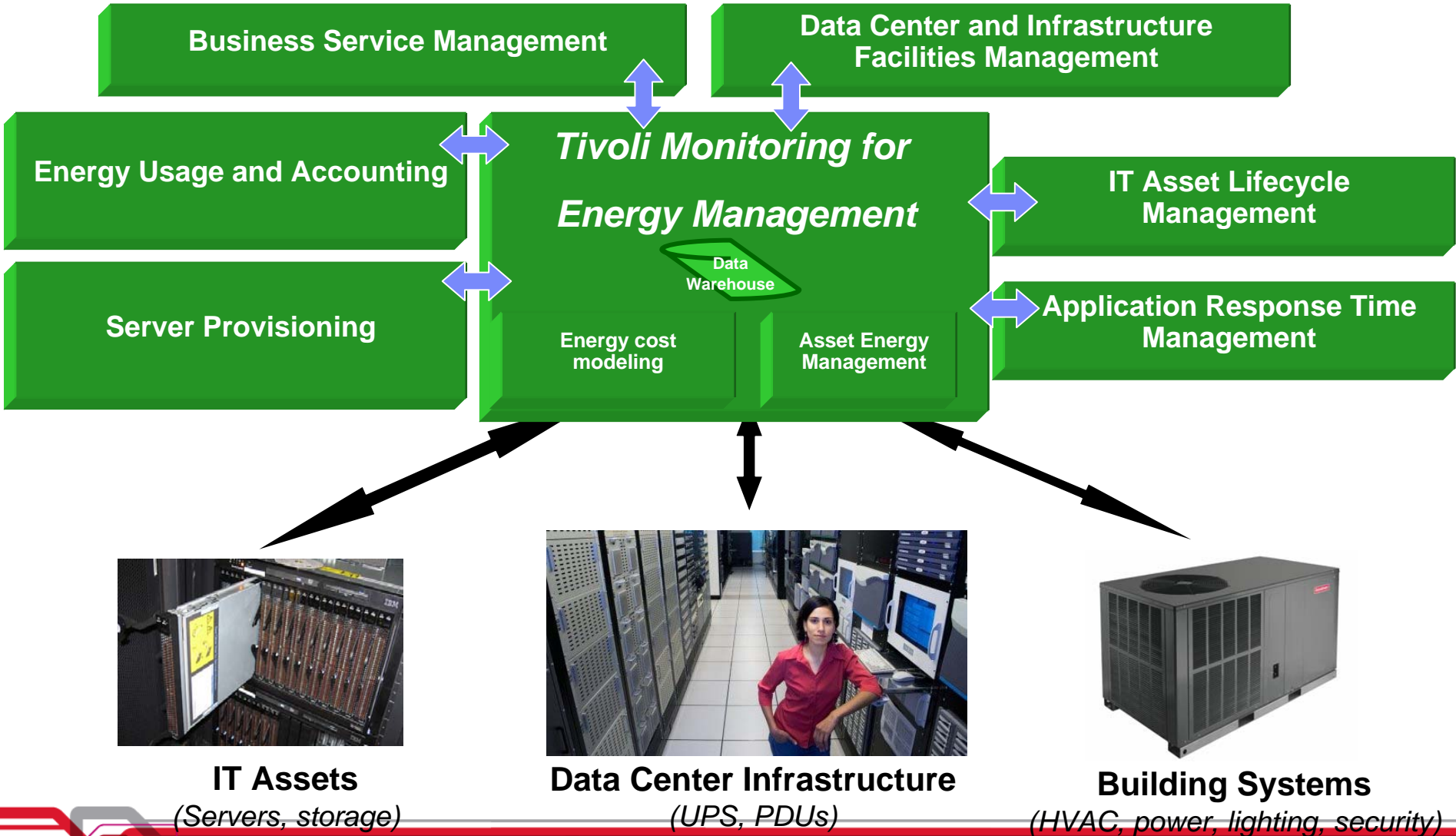
Instrumentation – Catalog Asset and Monitor those Assets

Interconnected – Monitor service paths across all technology domains

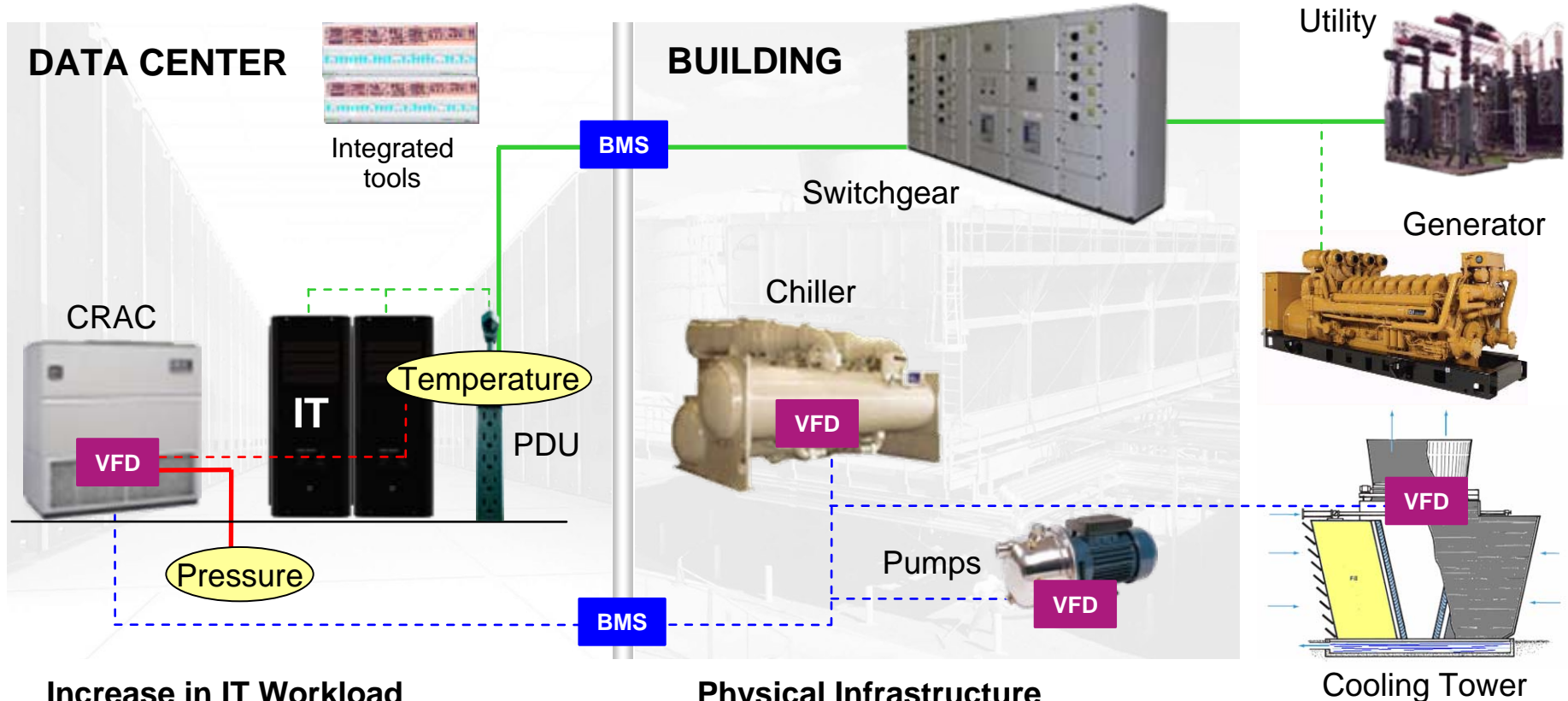
Intelligence – Use this information to make automated decisions with known repeatable outcomes



The Tivoli Green Data Center Solution



Instrumentation & connectivity allows dynamic adjustment of physical infrastructure to changes in IT workload



Increase in IT Workload

- Integrated tools enable optimal placement of additional IT workload in the data center.
- Temperature sensors provide visibility to changes due to increased IT workload.
- Interconnectivity between IT and physical infrastructure communicates need for additional cooling.

Physical Infrastructure

- Design of facilities infrastructure equipment with variable speed drives provides “on demand” cooling.
- Use of variable speed drives in chiller plant automatically responds to the increased cooling requirement with just the right amount of additional capacity.

Integration allows for improved asset purchase and placement decisions to help meet service level objectives throughout lifecycle

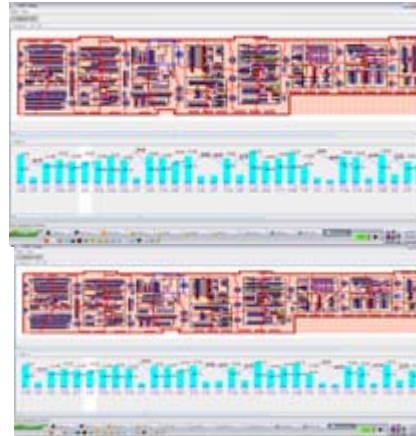
Do I have the capacity to install new servers?



IT & Facilities Dashboard

- Real-time data for visibility to how much system capacity is available at all times.
- Improve visibility to power and cooling utilization for planning of new equipment.
- Include data center and facility assets in the service model.

Where can I locate the new servers?



Asset Planning Information

- Collection and integration of assets and metered data with CAD layout to select optimal location in the service model.
- Reduced time and cost to deploy new IT equipment.
- Continuous feedback on utilization of critical systems.

How to run at higher ASHRAE standards yet avoid hot spots?



Thermal Analysis for Placement

- Analyze “what if” scenarios with Measurement and Management Technology (MMT) CFD modeling.
- Operate at higher ASHRAE temperatures (72-80° F); reduce energy costs & maintain availability.
- Use IBM asset management to keep model content up to date.



Deployments: Austin DEMO Central Data-center

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Austin DEMOCentral - Background

- Motivation
 - The original Data Center ran out of power, which prevented new equipment from being deployed and eventually necessitated a costly move to a new location.
- Goals
 - Reduce Energy Usage
 - Predict Power Capacity
 - Optimize cooling
 - Monitor IT Performance and Availability
- Characteristics
 - Mission: Run Demos for the Worldwide IBM Sales Force, delivers 3000+ demos per day, 24x7
 - Small: 4000sqft, 130kW, with room for growth to 300kW
 - Legacy Space with <12” raised floor, Legacy “Dumb” Facilities Equipment, New Instrumented IT Equipment
 - Full Control of Systems and Software
 - Some cooperation with Facilities

Austin DEMO Central – The Solution

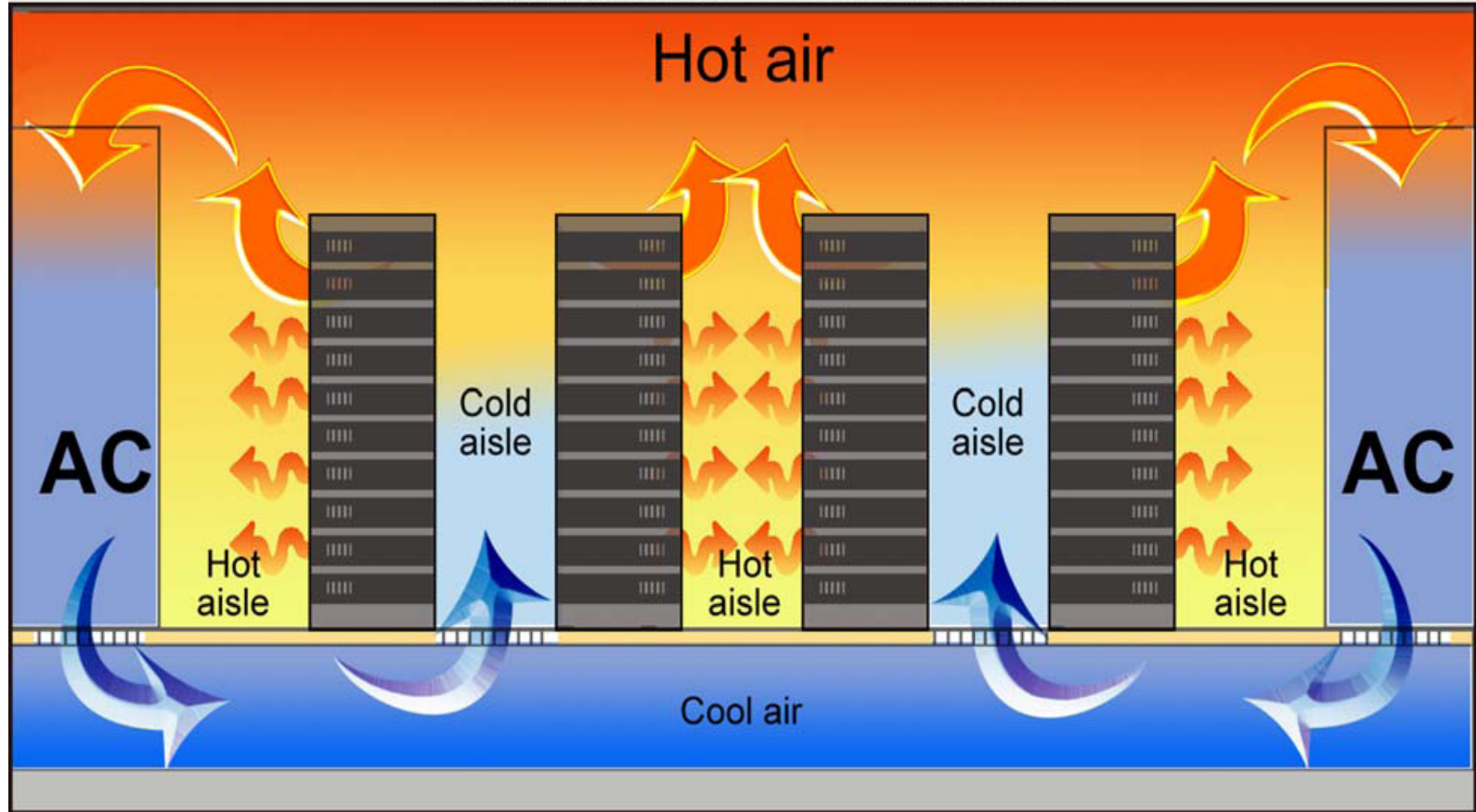
- **Hardware and Facilities**
 - Instrument legacy UPS (15 years old) with new SNMP management card to provide total lab power and UPS fault
 - Integrate to Building Management System to get Lab Temp and Chilled Water Temp at the Chiller Plant
 - Integrate to Rack Mount UPS to provide facilities alerts
 - Pull input, output and core temperature and power utilization from IBM server
 - Deploy Active RFID Sensors to measure temp, humidity, and occupancy
- **Software:**
 - IBM Tivoli Monitoring and IBM Tivoli Composite Application Monitoring for OS, Hyper-visor and Application Monitoring
 - ITM for Energy Management, with Systems Director Active Energy Manager, for monitoring Energy Usage through the UPS, BMS and IT Systems
 - Tivoli Common Reporting, using ITM for EM out of the box reports, to calculate energy usage and carbon footprint
 - Maximo for Energy Optimization to visualize hot spots in the data-center
 - Tivoli Business Services Manager to put the Energy information in context of the business.
- **Work in Progress**
 - Retrofitting legacy Air Handlers for temp and motor voltage/current

Austin DEMOCental – The Results

- Results
 - Energy Use in the lab has dropped by 20% while processing capacity has increased by 50% and storage capacity has increased by 200%
 - Energy Monitoring indicated the need for and provided the justification for projects to virtualize workloads, consolidate servers and replace inefficient hardware
 - Lab Temperature was raised to the point where humans were no longer comfortable
 - Perfect knowledge of input temperatures on all machines allowed the temperature to be raised
 - Facilities Alerts are placed in context of the business services allowing lab admins to respond to events more quickly
- Lessons Learned
 - The full path from the BMS to the Monitoring system must be on battery back-up. Since BMS components exist outside the data center, they may not be hardened against power outages
 - Tivoli Application and Discovery Manager Level 1 scan was useful for determining energy monitoring coverage

Hot and Cold Aisle in Data Center

Data Center Environment





Wrap Up

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Conclusions

Different data-centers present unique challenges which will require slightly different approaches to the problem

However, common goals and common tools emerge in each case

Tivoli provides the building blocks to put together an Energy Management solution that brings Energy into the context of the business.

This is only possible when all assets are “known” and Monitored



Questions?

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