Managing Efficiently in a New Enterprise Data Centre

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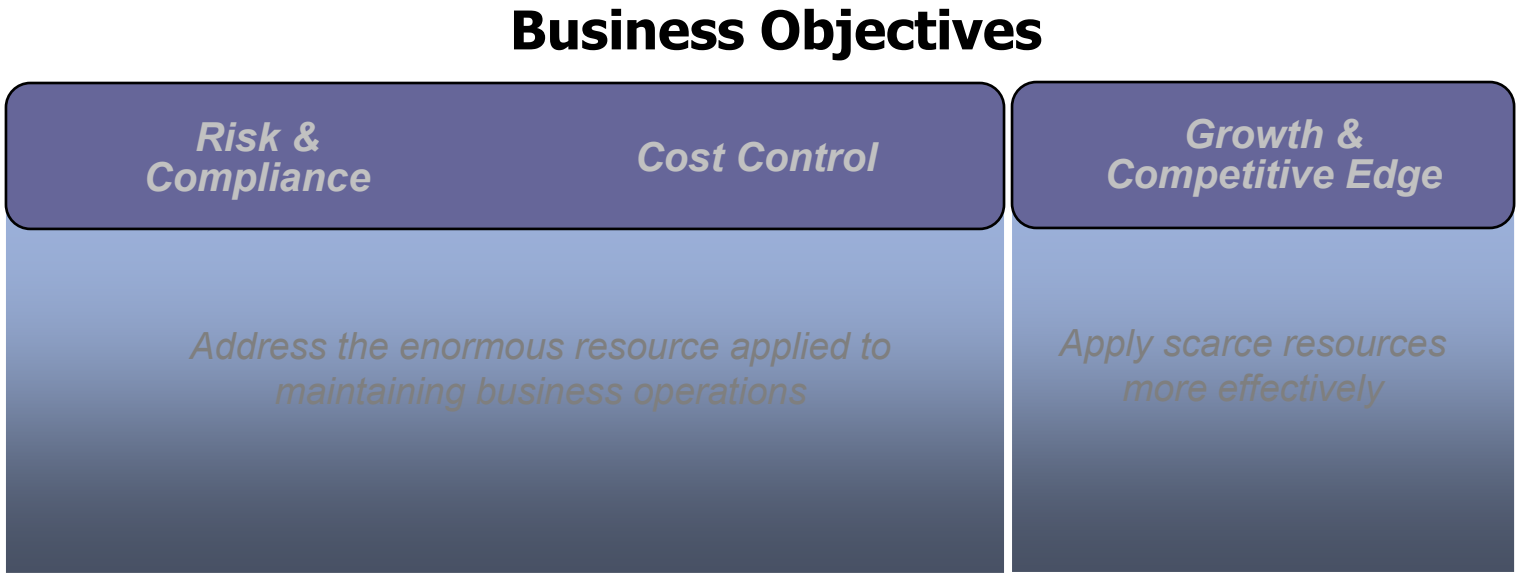
IBM Software Group UKI

NEDC Event - 13 November 2008

Innovation drives competitive advantage

Innovation is the process of delivering new products, services, processes and business models to create unique competitive advantage and accelerate growth.



'Many inhibitors make innovation more challenging….'

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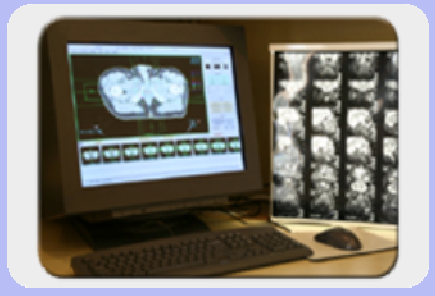
Digital Trend Drives Growth Explosion

Financial services

- ***Market data volumes rose by 1750% from 2003-2006***
- ***Over half of U.S. equities trading will be algorithmic by 2010, with nearly 130 billion messages by 2010***

Medical imaging



- ***1MB / 2D image in 2004***
- ***1TB / 4D image in 2007***
- ***2010: 30% of total world storage***

Wireless communications

- ***In India, Wireless lines doubling every two years and***
- ***Worldwide: 3 billion mobile subscribers in 2007***

Sources: [1]Aite Group, Algorithmic Trading 2006: More Bells and Whistles, November 2006; [2]TABB Group, Trading at Light Speed: Analyzing Low Latency Market Data Infrastructure, March 2007

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Operational costs at a tipping point

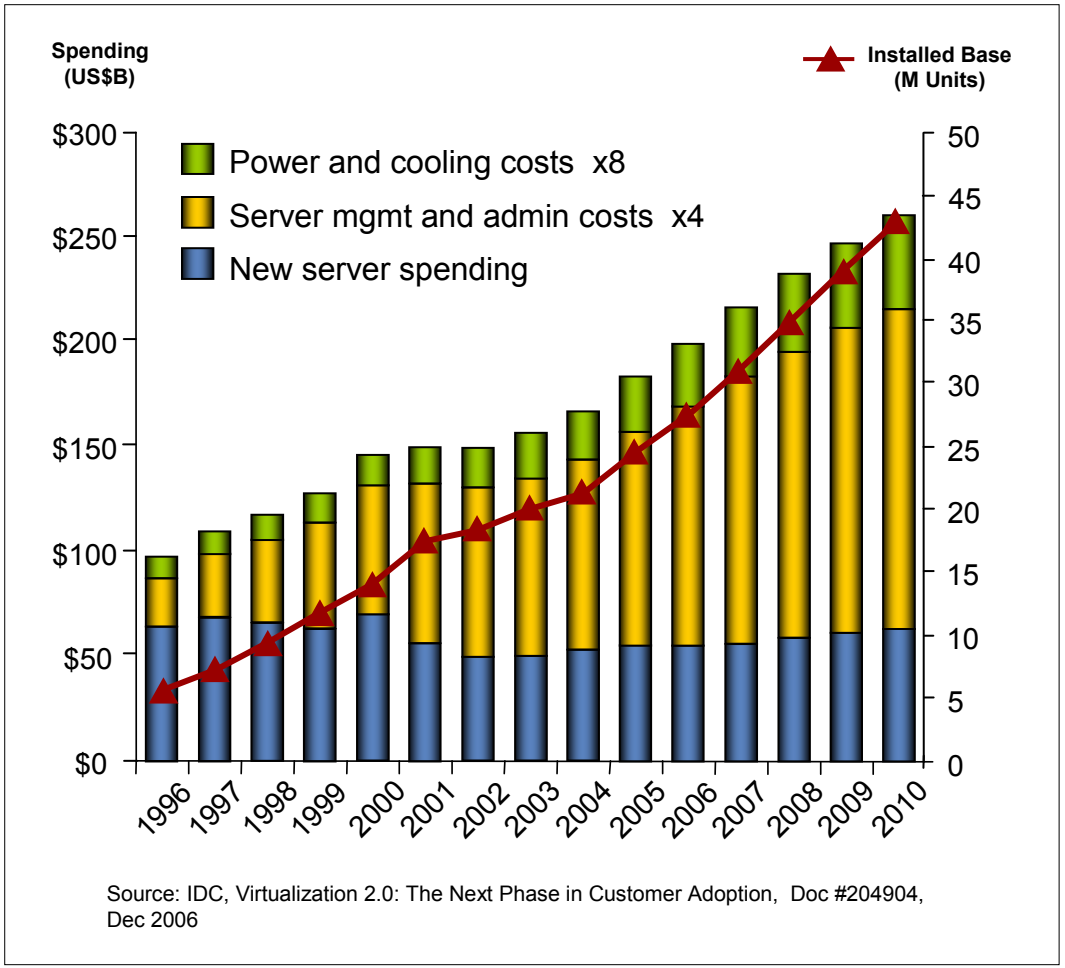
IDC reports that IT operational overhead accounts for 70% of the IT labor budget and is growing at 10% CAGR 2003 – 2008

85-95% of server capacity is excess – nearly $140B in over expenditure

Typical company IT energy costs have been rising 15% per year over the last 5 years and are forecast to *match or exceed* server procurement costs within 5 years

But clients who have optimized their environments have realized…

- **2X increases in efficiency**
- **2X increases in quality and customer satisfaction**
- **3X increases in revenue growth**



Source: IDC, Virtualization 2.0: The Next Phase in Customer Adoption, Doc #204904, Dec 2006

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IBM Service Management & the NEDC

Supporting clients in all stages of adoption

Simplified

Drives IT efficiency

Physical consolidation and optimization
Virtualization of individual systems
Systems, network and energy management

Shared

Rapid deployment of new infrastructure and services

Highly virtualized resource pools – "ensembles"

Integrated IT service management

Green by design

Dynamic

Highly responsive and business goal driven

Virtualization of IT as a service - "cloud"

Business-driven service management

Service oriented delivery of IT

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Multiple new factors now impacting Organizations

Costs

Oil reaches $135 a barrel
May 2008

Regulatory Mandates

Increased regulatory scrutiny, with government regulations around water usage, carbon emissions etc

"Going Green"

Workload Growth

Growth in Application and Business workloads doubles every 2 years driving the need new servers, DASD, power and cooling

Operational

Capacity shortages for data centre power and cooling are limiting ability to expand

Social & People

Customers have started evaluating the green credentials of suppliers and products

Cultural Shifts

Demographics changes and global teams require collaboration across cultural, generational and geographic boundaries

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UK Legislation Summary – Draft Proposals

- **UK Climate Change Bill – CO_2 reduced 26% by 2016, 60% by 2050 v 1990 baseline**
- **EU ETS legislation - covers large energy-intensive industries**
  - **Approx 45% UK CO_2 - 1000 installations**
  - **CCA covers large energy intensive emitters**
  - **CCL tax on use of energy**
- **UK CRC legislation - aimed at non-energy intensive sector**
  - **Regulation effective Oct 09. First phase April 2010 to April 2013**
  - **Organisations with half hourly metered electricity above 6000 MWh per annum**
  - **Applies to total energy usage (gas, elec, other) and aggregated across UK group operations**
  - **Expected to cover 4000 – 5000 organisations**
  - **Mandatory Govt auction based cap and trade system at £12 per t CO_2**
  - **Published performance league table**

Subject to Change

ETS – Energy Trading System
CCA – Climate Change Agreement
CCL - Climate Change Levy
CRC – Carbon Reduction Commitment

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Example Case from Local Authority

2007 Electricity Consumption	5,923MWh annually
2008 Projected Elec Consumption	>6000MWh annually
	(adverse weather, unmanaged energy use, extended opening hours …)
2007 Total Energy Consumption	42,605 MWh equivalent
2007 Total CO_2 Output	11,624 tonnes
Implied cost per annum	£139,488
Potential 3 year impact	£418,464
	(refunded only if baseline consumption is not exceeded)

Conclusion: *"The Council should continue to manage and reduce energy consumption to avoid breaching the Carbon Reduction Commitment threshold."*

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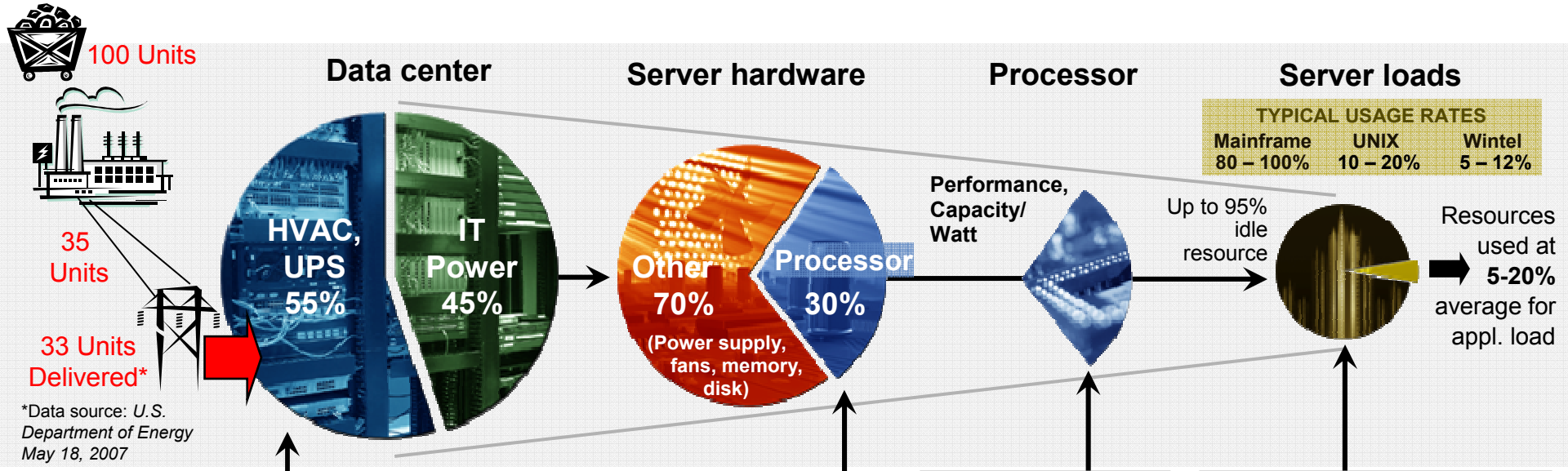
Energy has become significant part of the TCO, how is it consumed?



How to improve efficiency

Reduce cooling/UPS needs vs. energy going in servers, capture heat at source (Potential gain 10%)

More efficient cooling and energy supply

Higher efficiency infrastructure, power management' (≥ 3yrs older is good target)

Better server hardware design

Reduce consumption @ chip level
(Cap power usage)

Advanced processor design + process

Reduce idle/unused capacity which still consumes energy
(Utilization 5 to 20 % gain)

Enhance resource usage rate (consolidation/virtualisation)

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Tivoli ‘Green’ Energy Efficient Data Centre

An Integrated Approach to controlling energy costs

Visibility

See your business

Provide unified views of data center resources, IT services, and costs in the context of energy

Control

Manage risk & compliance

Establish policy-based management to ensure efficient use of available resources and capabilities while maintaining service levels

Automation

Build agility into Operations

Implement closed-loop monitoring and management to ensure optimal power consumption as workloads vary across business cycles.

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Software innovation - changing the game

- Better **Visibility** of data centre assets and change is critical
- Improve **Utilization** and footprint through server consolidation and **Virtualization** with capacity management & provisioning
- Extend systems **Monitoring** to include **Power and environmentals** with **Spatial capability** and integrated **Asset Management**
- Manage **Data Storage impact** on power consumption dynamically
- Extend Service Management to encompass critical Services and **Active Energy Management**
- Integrating **People, Process** and **Technology** with **Workflow Automation**
- **Accounting/Chargeback** for internal and external customers for these new utility resources

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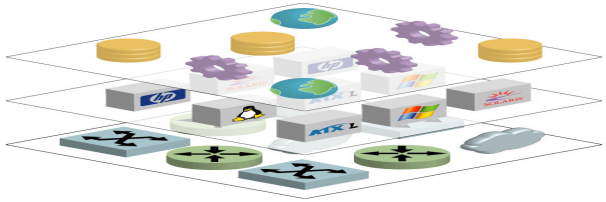
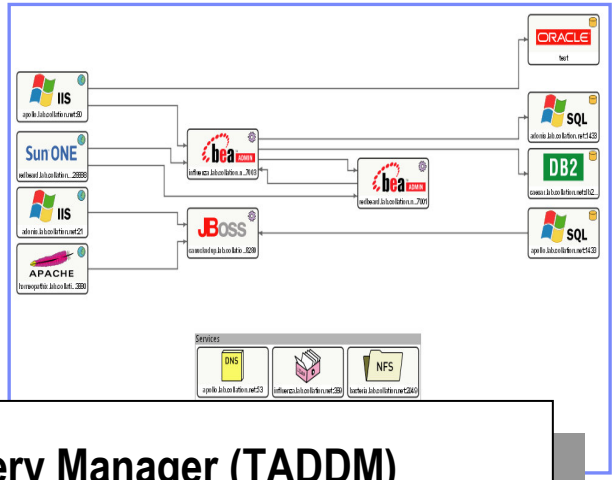
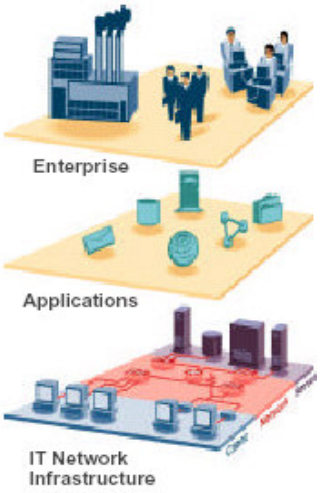
Visibility – Discovery and Mapping



- Understand what assets are actually in the Data Centre
- How they are configured, changes applied and service impact
- Understand inter-dependencies and business service linkage
- How they are being used – what is critical and what is redundant
- The drift from standards and what to 'course correct'





Tivoli Application Dependency Discovery Manager (TADDM)

Agent-less Discovery automates application mapping and device discovery

Records change for compliance and audit control

Populates CCMDB and integrates with IT Service Management processes

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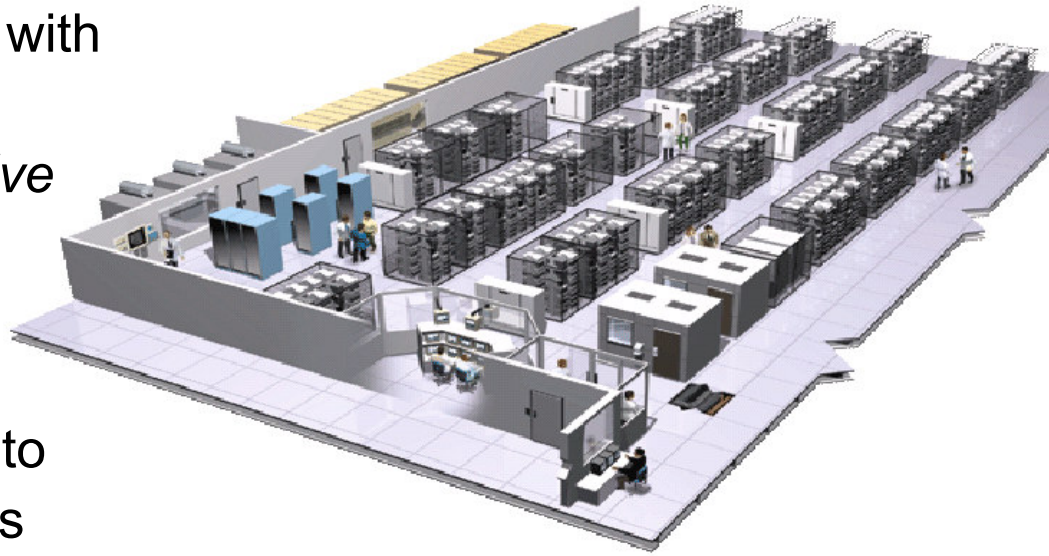
Consolidate, Virtualize, and Optimize by Provisioning with Energy Intelligence

Provision new servers as needed with
Tivoli Provisioning Manager
instead of keeping servers active



Exploit virtualization to increase utilization of individual servers to minimize number of active units

Move workload to alternative data centers where energy is less expensive or less constrained

Support for mainframe, VMWare, MS Virtual Server, LPAR, DLPAR. Provisioning of servers, storage and network infrastructure.

Dynamic on-demand capability.

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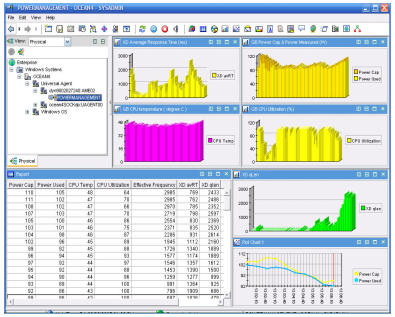
Monitoring for active energy management

Tivoli Monitoring family provides the ideal platform for gathering IT and enterprise events for effective operations

Critical resources can be monitored for availability and running data, including events relating to power, temperature and system stability from many sources including:



- IT Infrastructure – Systems, software, applications
- Facilities – Generators, Air Conditioning

Event management has traditionally been limited to IT assets only, however intelligent facilities equipment can now be integrated e.g.

- HVAC (Heating, Ventilation, Air Conditioning)
- Intelligent power supplies and generators

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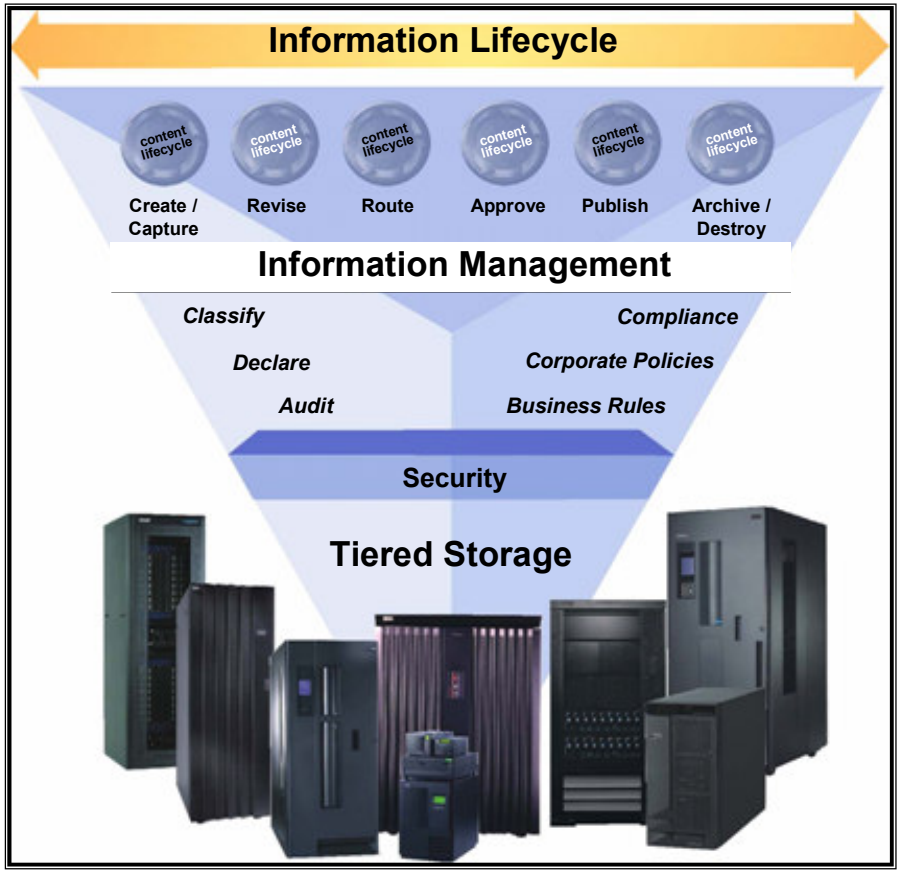
Power efficiency in Information Risk Management

Tivoli Storage management

Virtualize the storage
All storage can appear as a cohesive platform to increase utilisation

ILM traditionally was to . . .
Move data to the most cost effective storage for its current use

In the future it will . . .
Move data to the most power efficient storage that satisfies usage requirements



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Data Centre Security and Entitlement

Tivoli security solutions provide a seamless operational and enterprise approach to Security, Risk & Compliance.

Manage enterprise threats and vulnerabilities

Deliver continuous and reliable access to information and services

Manage identity to enable secure, seamless collaboration

Increase compliance & reduce reputation risks and audit deficiencies

Virtualized management of enterprise entitlement and access

Maintaining a securely managed data centre provides business resiliency and effectiveness in managing highly Virtualized, dynamic and efficient data centres.

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Managing the converged asset lifecycle

Discover & manage the lifecycle of assets, from procurement to decommissioning

Understand the energy efficiency of assets, from servers to HVAC units

Efficiently manage the maintenance and pro active swap out procedures

Contract management with suppliers

Asset inventories, geo spatial detail and ownership information for compliance reporting

Manage incidents, problems, changes and configurations from a single platform

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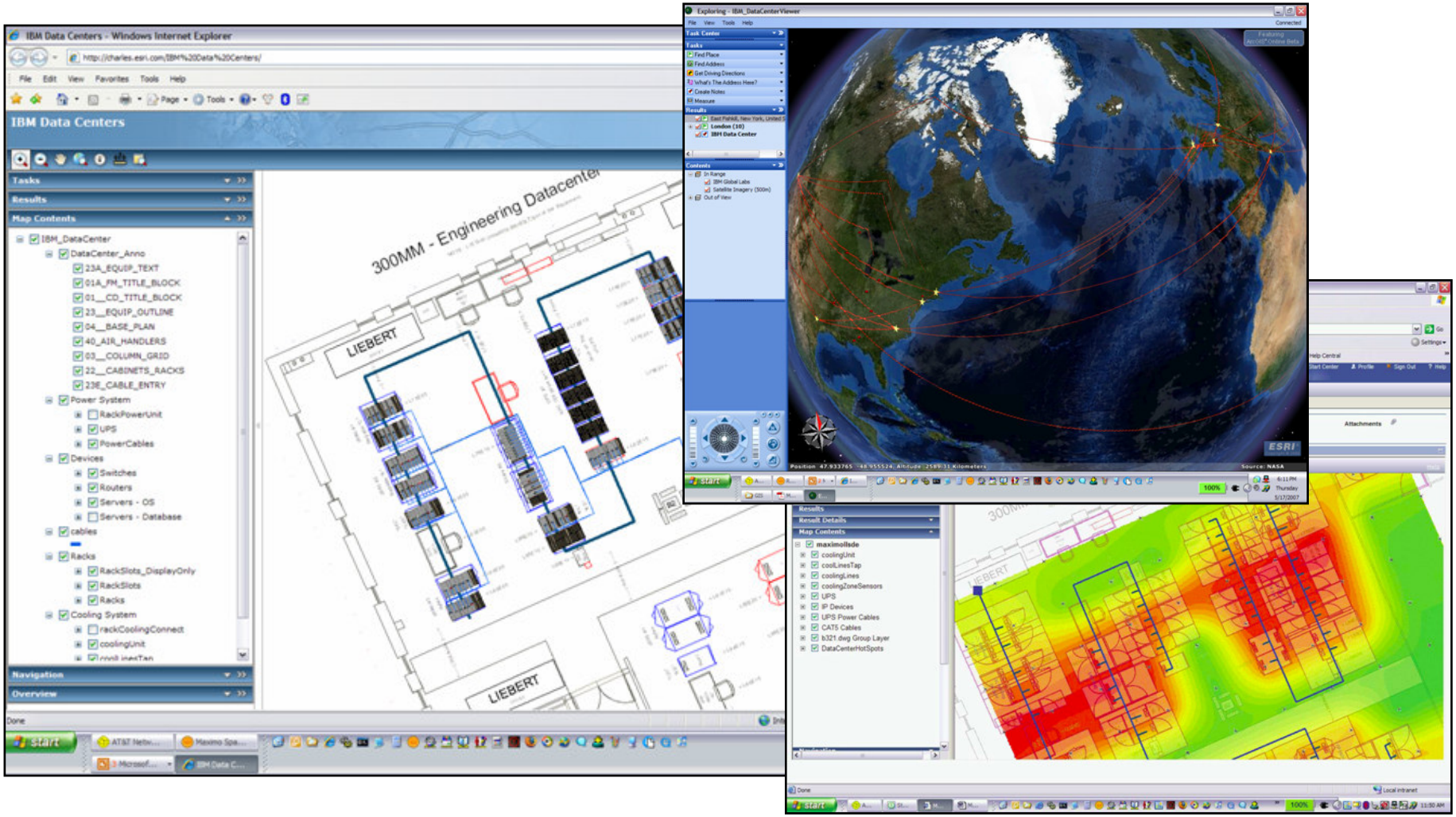
Geospatial integration for assets and data centres



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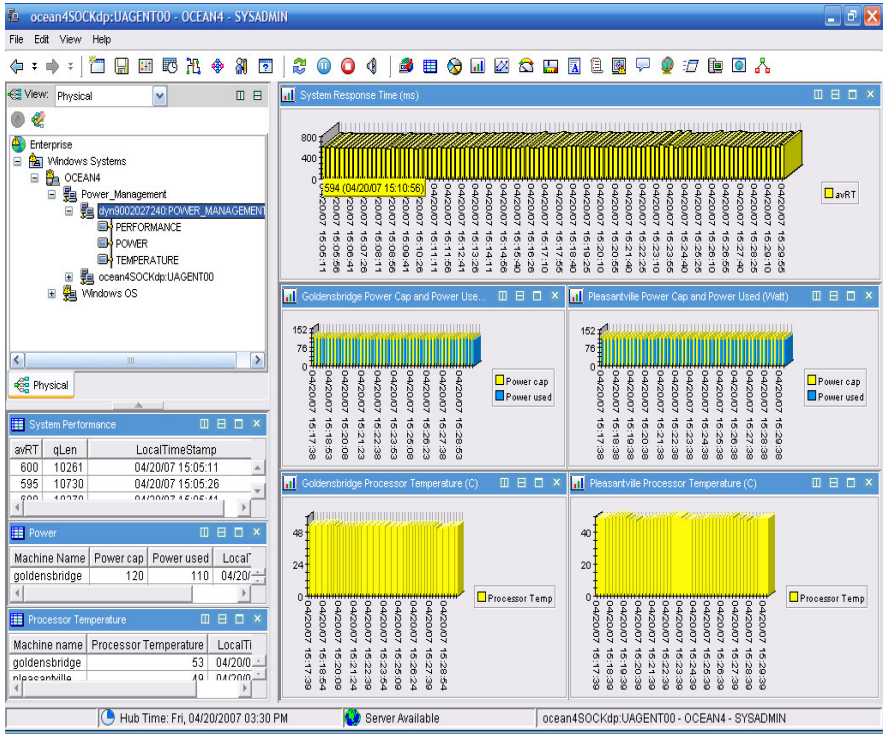
Tivoli Monitoring for Energy Management

Now all your IT compute data plus all your facilities metrics in one spot ! ! !



Visualize the power consumption and thermal signatures of data center resources

Alert operators and facility managers before servers reach critical energy and temperature thresholds

Automate and control server's energy usage to optimal levels including triggers to 3rd party partners

New Partner Ecosystem Announced May 08:

vmware Johnson Controls t.a.c EATON APC by Schneider Electric OSIsoft. MatrikonOPC SIEMENS SYNAPSENSE

IBM

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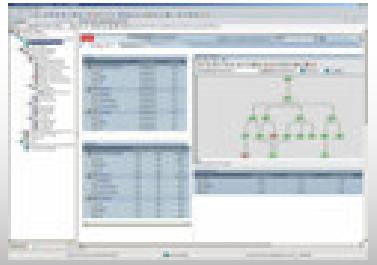
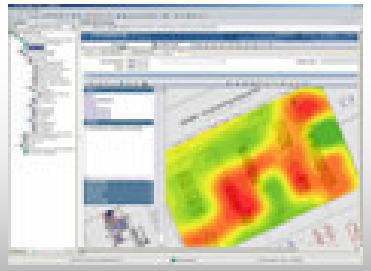
Infrastructure Management from IBM Tivoli

Optimize your infrastructure by blending IT and Facilities capabilities

***New* IBM Tivoli Monitoring Green Energy Adapters**





***New* IBM Tivoli Asset Management spatial visualisation**

Data Centre Infrastructure Assets

EATON

APC by Schneider Electric

Tivoli software

Tivoli Green Management
(Monitor, Measure and Manage)

Tivoli Software
IBM® Systems Director
and Active Energy Manager

Facility Infrastructure Assets

Johnson Controls

t.a.c

SYNAPSENSE

SIEMENS

MatrikonOPC

OSIsoft

IT Assets

3rd Party Servers and Storage

vmware

IBM Systems

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Energy Service Management Capabilities

Optimize your enterprise for energy efficiency

How much power am I using?

How much money can I save by reducing power?

What services are costing me the most in power consumption?

Can I change and still meet my service level agreements?

What should I do first?

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Gain Visibility to Energy Usage

New energy Optimization reports included in ITM Tivoli Monitoring

- Track and trend changes in energy usage over time
- Combine different data types and energy usage into a single report.
- Obtain information needed to qualify for power company or government rebates and incentives
- Model incremental changes to analyze effect on data centre environment

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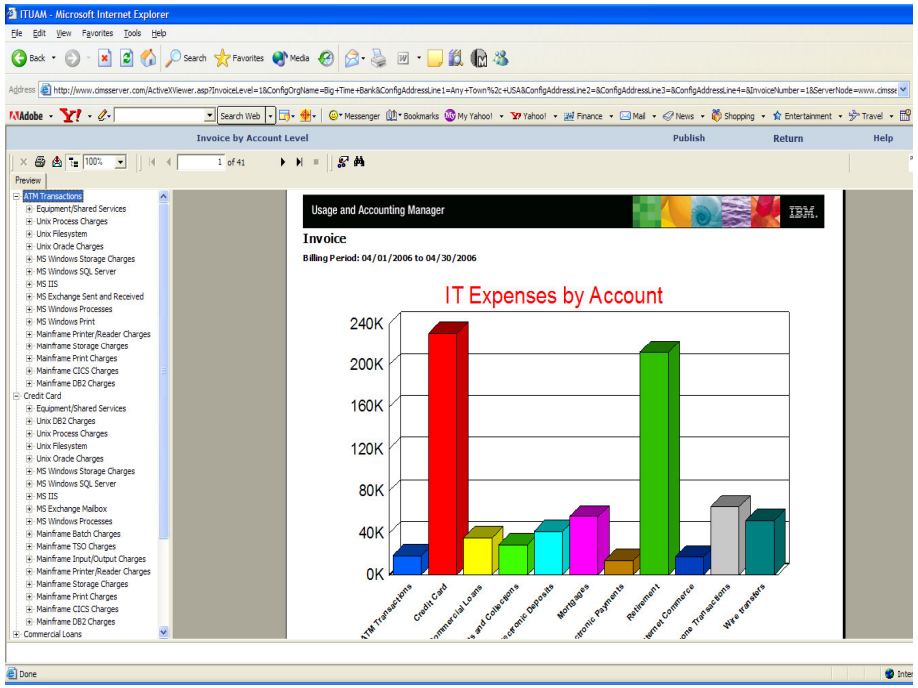
Chargeback of resources including energy used, plus power and thermal trends.



Who used what?
How much did it cost?
Usage based accounting & chargeback

Aggregate power consumption data and determine cost of power via ***Tivoli Usage and Accounting Manager***

Set a benchmark for energy usage to better track improvements

Report on the amount of power consumed, when it was consumed, and which services consumed it

Introduce power utilization accountability

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Integrated Role-Based Dashboards

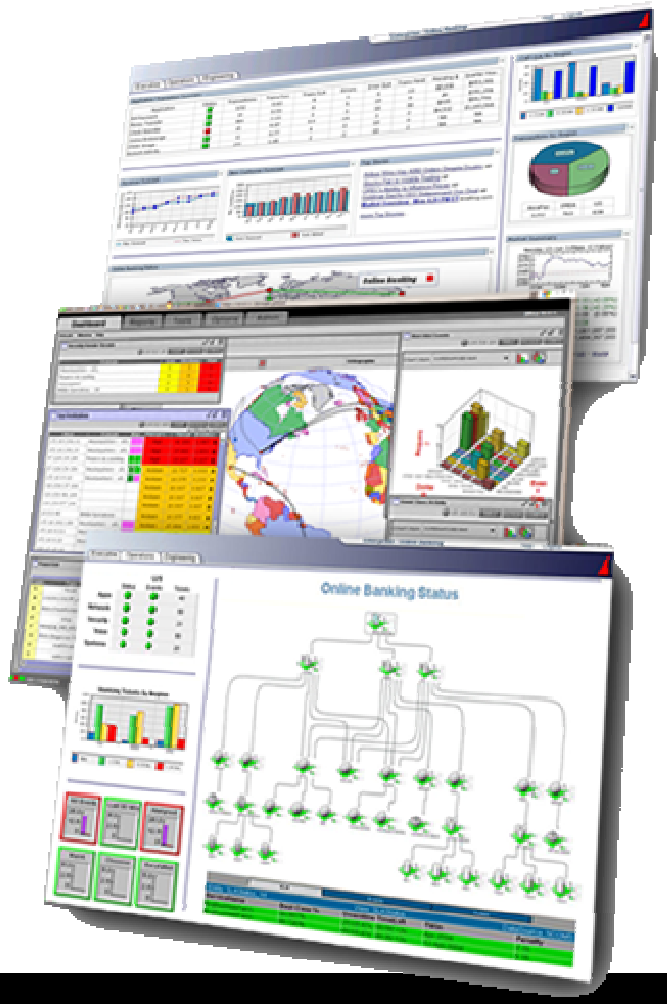
Enabling better & faster decisions across all operational areas of the Data Centre

Different roles have different informational and operational requirements.

UI integration strategy focused on dashboard and portal requirements of common operational organizations:

- IT Operations
- Service Provider
- Business Operations
- Storage Management
- Security Operations
- Energy & carbon dashboards
- Common reporting

Delivers appropriate data and capability to different operational and business audiences.



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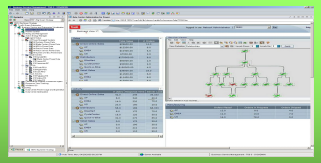
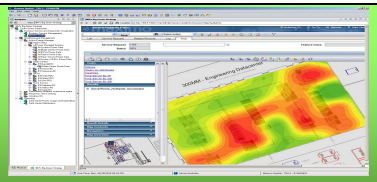
IBM Service Management's 'Green' Data Center

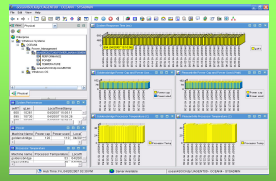
Using Green Data to accent Tivoli's existing event architecture and data model



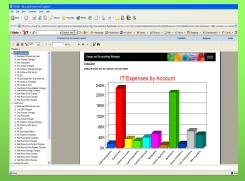
Green Business Services



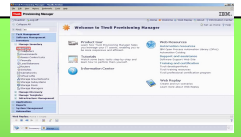
Optimize Assets by Energy Usage



Tivoli Monitoring for Energy Management



Intelligent Chargeback



Energy Aware Provisioning

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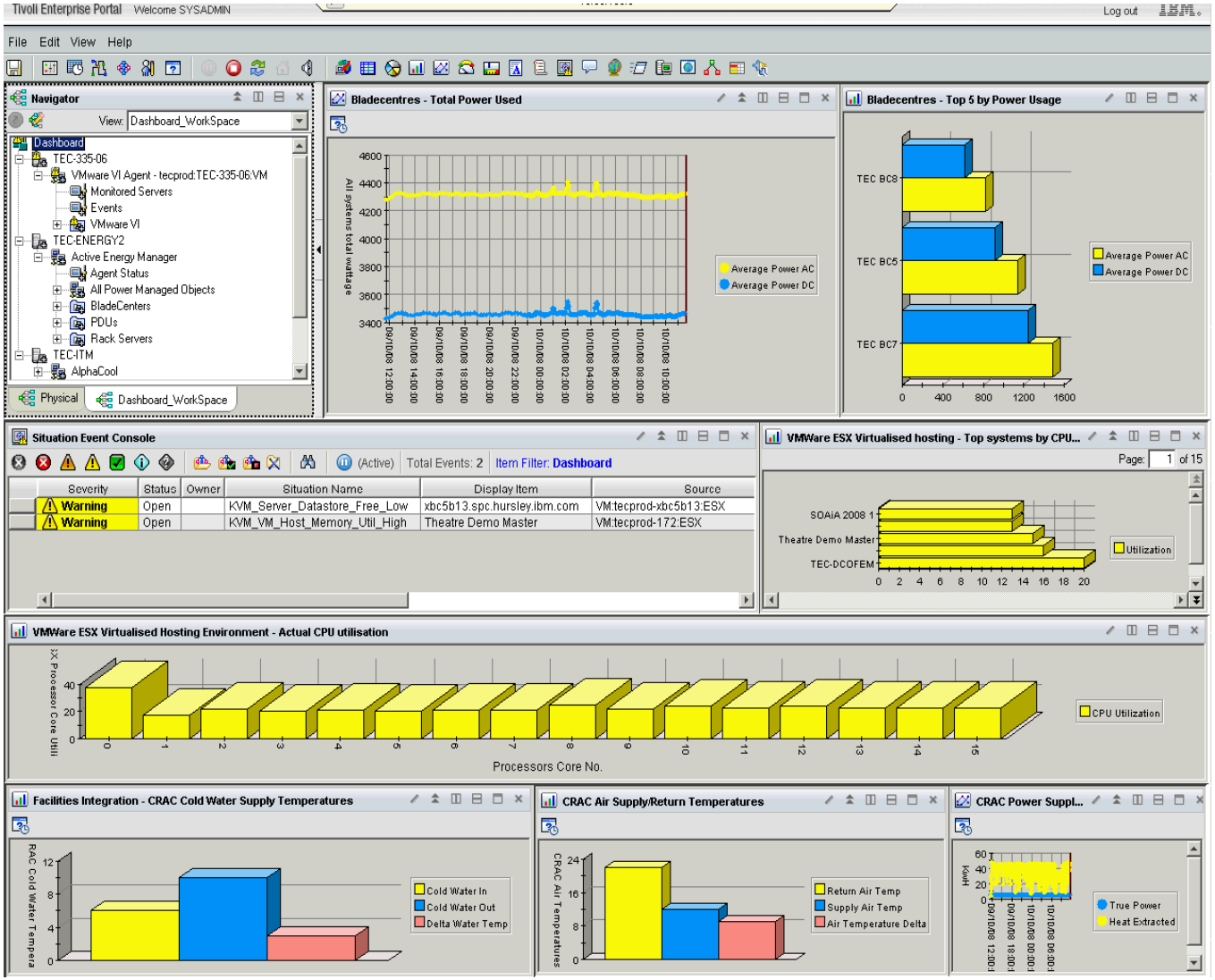
Tivoli Datacentre – Consolidated IT and Facilities Visibility



Example at
IBM Hursley
Innovation Centre

Tivoli Monitoring &
Active Energy
Manager
Live Demo

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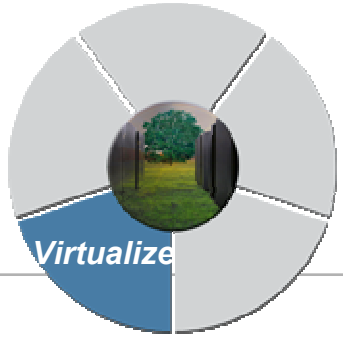
IBM Global Infrastructure

Improve operational efficiency and risk management while reducing energy usage by 80%



Client requirements

- Needed to reduce systems management complexity
- Needed to increase stability, availability, and provide world-class security
- Improve operational costs and energy efficiency

Solution

- Consolidate 3,900 servers to 33 System z mainframes
- Migrate servers delivering largest savings first
- Eliminate assets with lowest utilization first
- Aggregate by customer work portfolio to leverage strong customer buy-in
- Focus on freeing up raised floor space (30xoffice cost)
- Provision new applications to the mainframe

Benefits

- Annual energy usage reduced by 80%
- Total floor space reduced by 85%

Tivoli

DB2

Lotus

WebSphere

SAP

Initial priority for consolidation to Linux on System z

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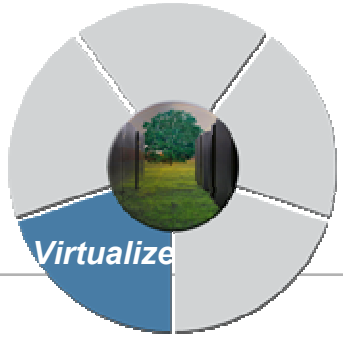
Rationalization at UPMC



Maximize service level and mitigate costs by saving $18-22M over 3 years with Wintel, Unix and storage virtualization

Client requirements

- **Server growth 4x in 5 years – data center chaos**
- **Centralize IT services and consolidate data centers**
- **Free up space to produce revenue – more hospital beds**

Solution

- **Wintel and Unix virtualization**
- **Reducing from 40 storage databases to two centralized SAN arrays**
- **Consolidating 1,000 physical servers to 300 IBM servers (multiple platforms)**

Benefits: $18-22M savings over 3 years

- **Virtualization saved $9.8M in first five months**
- **Utilization rates increasing from 3% to 80% per server**
- **Server capacity increase by 150%**
- **Maintained flat infrastructure support staff**

UPMC | University of Pittsburgh Medical Center

"These accomplishments help position UPMC as a leader in the adoption of server virtualization technology among health care provider organizations…will fundamentally alter how IT is deployed and managed in the industry"

- Health Industry Insights, IDC, January 2007

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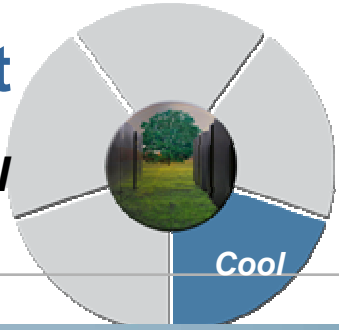
Cool - Data Center Stored Cooling - IBM Bromont



Implement innovative cooling technology to reduce operational costs from the largest data center energy user by 45%

Client requirements

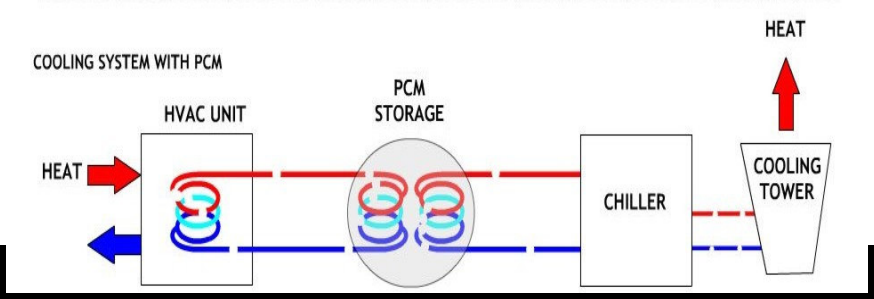
- **Identify and attach the largest areas of energy consumption**
- **Reduce energy consumption and operating costs of chiller plant supporting Bromont (Quebec, Canada) site**

Solution

- **Install "Cool Battery"**
- **Increase chiller utilisation by storing cold for use throughout the day**
- **Leverage environment - free cooling**

Benefits

- **Reduced chiller plant energy cost by 45%**
  - Over 5.3 million kwhr per year
  - Demand reduction of approximately 1 MW
- **Avoided need to install additional chiller**
- **Environmentally-friendly, non-toxic, no-maintenance**



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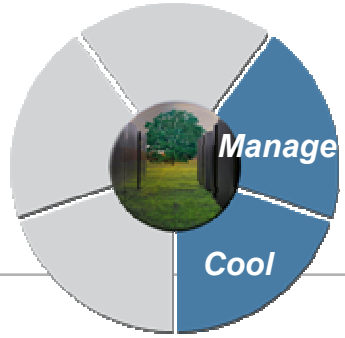
Manage, Measure & Cool - IBM Southbury



Implement IBM Energy Management Solution and IBM Rear Door Heat eXchanger for 10-30% energy savings

Client requirements

- Improve how to meter, control, and cap power usage
- Actively moving workloads and power up/down resources

Solution

- Power density of 200 watts per square foot
- Use of 2-3 “Thermal Zones” for targeted power and cooling
- Power and thermal meters to measure baseline and changes
- Rack based thermal cooling

Expected Benefits

- Integrated Facilities and IT solution
- Rack Level Cooling Improves Efficiency 20-30%
- Match Cooling Load to Heat Load: 10-30% Savings
- Combined Air and Water or Refrigerant Cooling
- Reduces Equipment Costs/More Flexible Facility

IBM Active Energy Manager

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Tivoli Service Management Summary

Visibility

See your business

Provide unified views of data center resources, IT services, energy and costs

Control

Manage risk & compliance

Establish policy-based management to ensure efficient use of available resources and capabilities while maintaining service levels

Automation

Build agility into Operations

Implement closed-loop monitoring and management to ensure optimal utilisation and efficiency as workloads vary across business cycles.

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