



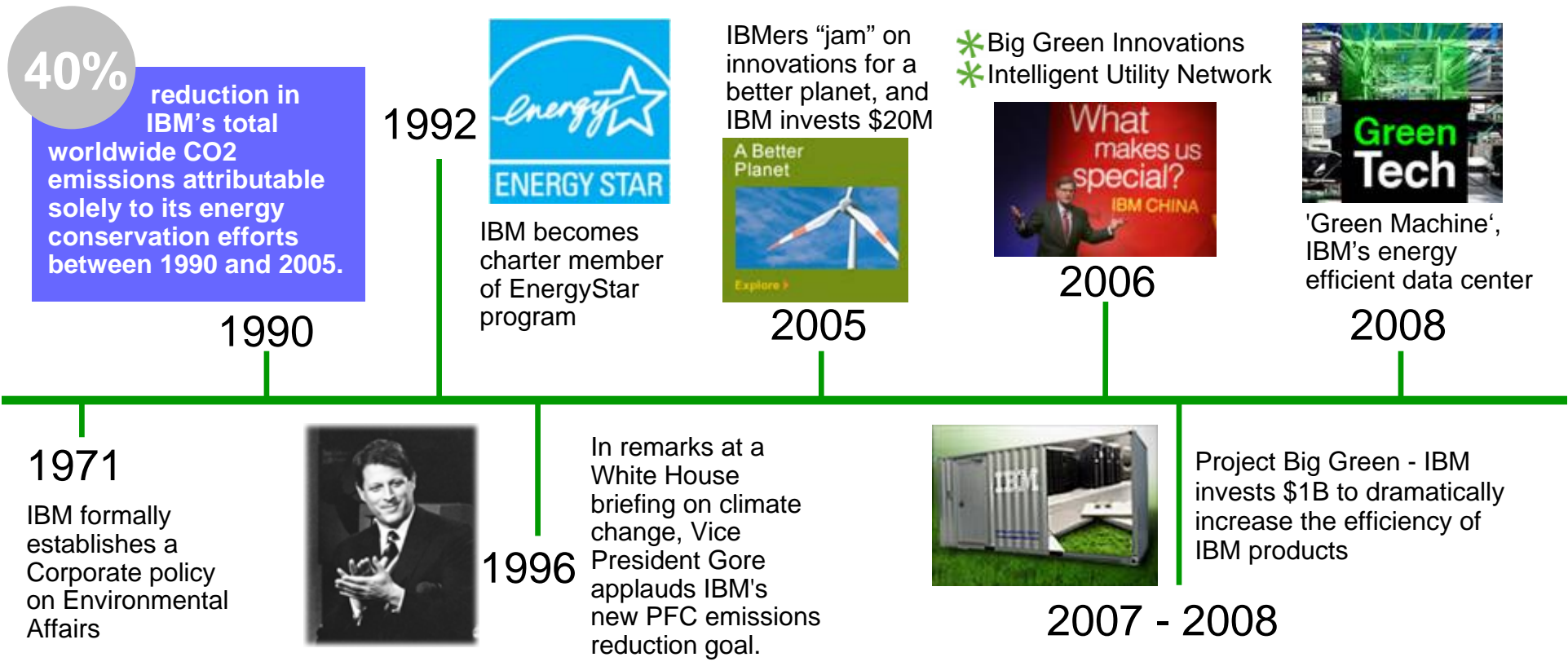
Software for a Greener World

Energy efficiency goes beyond data center

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IBM Has Been Focused on “Green” for over 35 years



Strong collaboration to solve environmental challenges



Information technology can contribute to improve energy efficiency



The Bad News:

IT accounts for 2% of global CO₂ emissions and expected to grow to 3% by 2020



The Good News:

IT can significantly contribute to control and reduce the 98% of CO₂ emissions caused by other activities and industries

“... you can't make a product greener, whether it's a car, a refrigerator or a traffic system, without making it smarter — smarter materials, smarter software or smarter design.” Thomas L. Friedman

Source: “The Green Road Less Traveled” by Thomas L. Friedman, *The New York Times*, July 15, 2007, *The McKinsey Quarterly*, “How IT Can Cut Carbon Emissions”, October 2008

Software for a greener world

- **People:** optimize **people resources** and collaboration beyond boundaries and **reduce travel** and physical estate costs
- **Workloads:** enable **efficient execution of workloads** with processes and applications designed for green
- **Infrastructure:** **visualize, control** and **automate** infrastructure for energy efficiency; optimize operations by **consolidation** and **virtualization**

How Software make you "greener"?

Virtualize the infrastructure to reduce amount of IT staff needed to maintain servers

Reduce use of paper by enabling business processes to use eForms and images

Optimize business processes to reduce energy footprint and costs of operations

Turn the power down when work (transactions) slows down

Compress your data to lower storage and server needs



Reduce commuting with online collaboration and increasing work from home

Reduce business travel by using online collaboration

Shift workloads to underutilized servers to reduce energy and floor space needs

Schedule execution of workload to off-peak hours to use lower cost energy

Optimize applications to reduce needed IT resources and energy

Optimize HVAC for hot spots to reduce energy consumption

Consolidate and Virtualize to eliminate floor space and compute infrastructure

People actions impact the environment

People directly and indirectly contribute to the carbon footprint from the impact of commuting to their physical office space and energy requirements.



U.S. Average Behavior Breakdown

Driving and Flying 44.3%

Home Energy 36.2%

Food and Diet 15.1%

Recycling and Waste 4.4%

Source: The nature conservancy

Workforce globalization allows us to compose world wide teams

- **Employee efficiency** is affected by interpersonal relationships, teaming, cultural differences and structure
- **Travel and face-to-face** are seen often as the only viable alternatives improve efficiency

Wide disparity in “habits”

- US releases 27 tons of CO₂ / year / person
- The world on average releases 5.5 tons of CO₂ / year / person
- 44% of CO₂ release is due to driving & flying

People solutions from IBM Software

Enabling organizations to optimize people resources and collaboration beyond boundaries to drive growth while reducing travel and real estate costs

IBM Software solutions help clients

- **Enable work force to be flexible and mobile with tools for virtual and home office**
- **Reduce travel, utilities and infrastructure costs for physical meetings, conferences and events**
- **Gain benefits of classroom training without travel, paper, and physical infrastructure**
- **Automate innovation process, leverage experts and communities to collaborate on projects**
- **Enable multi-site software development and collaboration to reduce CO₂ emissions from travel**

Collaboration for a Greener World

Energy-efficient email, calendaring and collaborative application platform

- Reduce need for F2F meetings
- Fewer servers required for lower power consumption, Data compression for reduced disk storage
- Enable remote software development

Instant Messaging and Web Conferencing

- Technology-enhanced work/life balance
- Reduce travel, fuel and facilities costs

Efficient ways to reach colleagues, customers, partners and suppliers

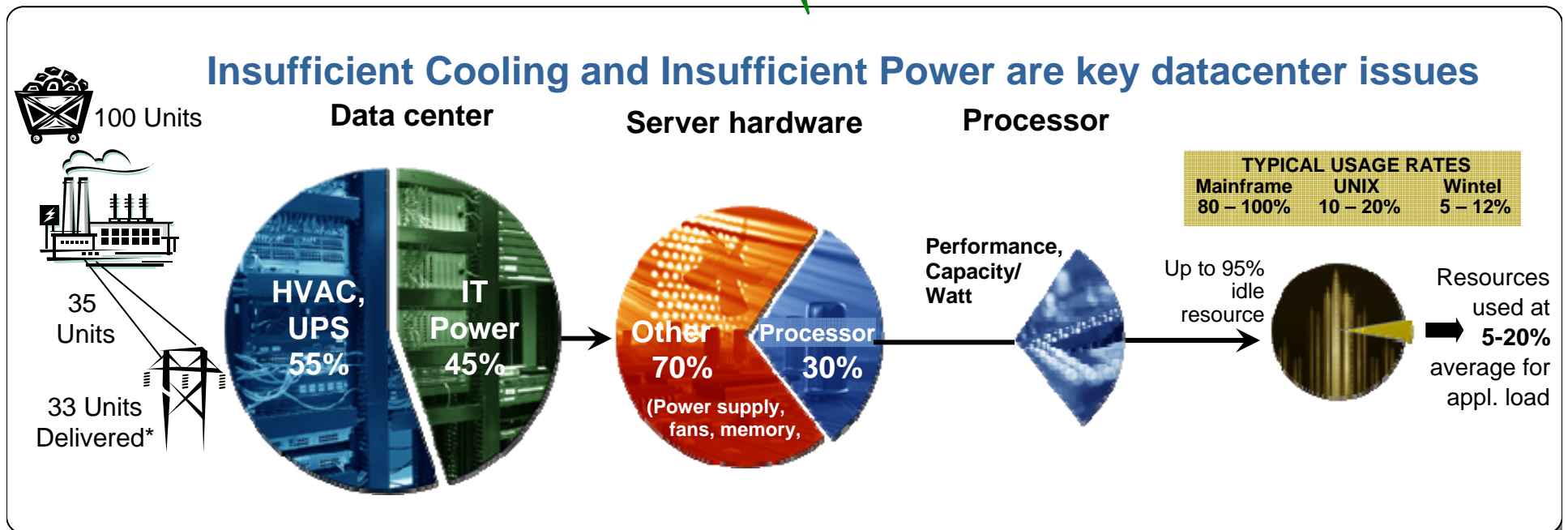


IT and property infrastructure drive energy utilization

On average, **40% of energy use and emissions** come from building heating and cooling
 US commercial electrical costs increased by 10% from 2005-06.4

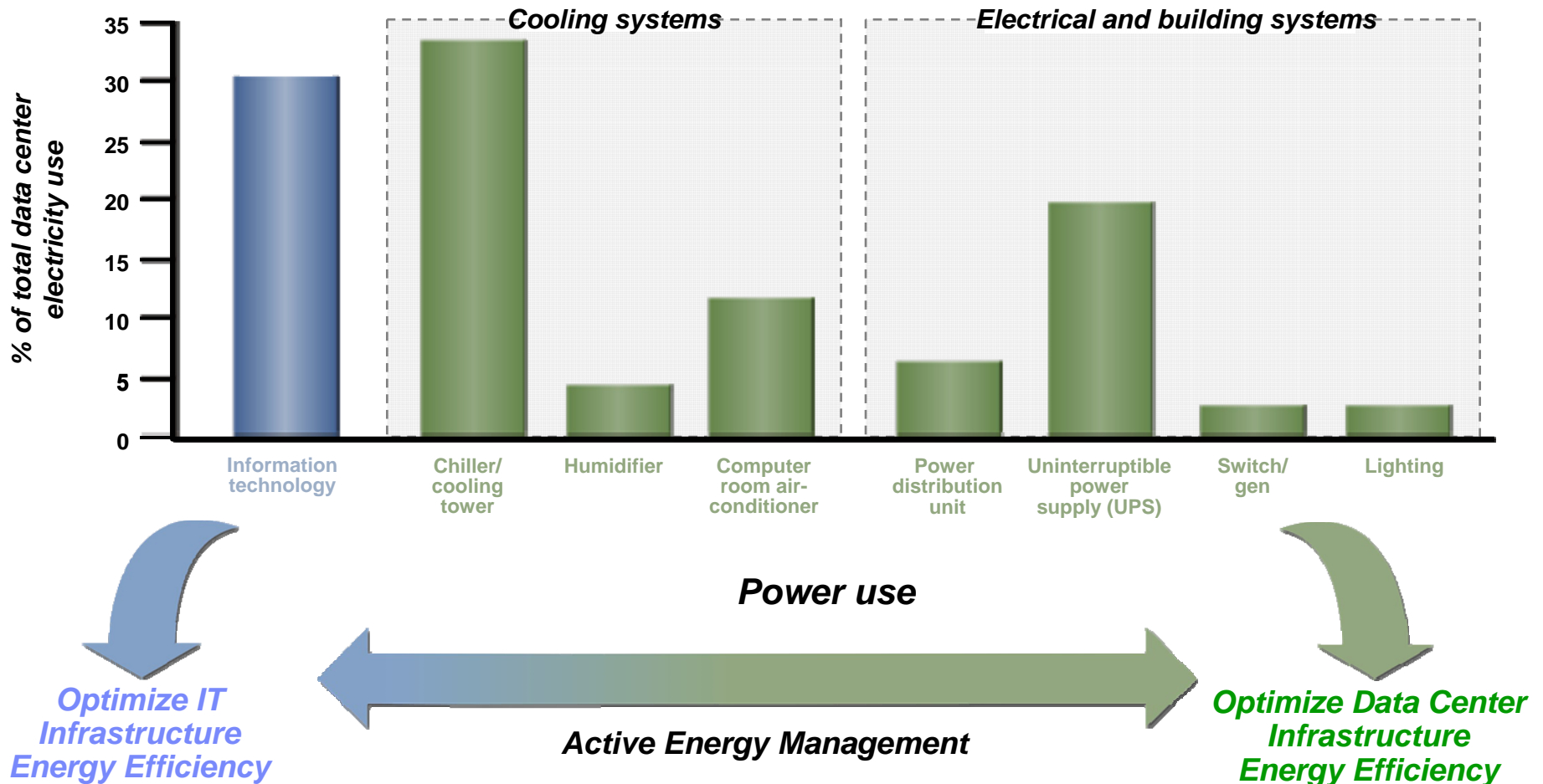
Within the last five years, the total amount of **energy utilized** by all domestic US data centers has **doubled**.

Data centers have doubled their energy use in the past five years.



Where does the energy go?

The data center energy challenge affects both the physical data center and the IT infrastructure. IBM can help address both.



IT and Property solutions from IBM Software

Delivering enhanced visibility, control and automation to optimize power efficiency and enables clients to manage and maintain the lifecycle of assets

IBM Software solutions help clients:

- **Monitor, report and manage resource to reduce consumed energy**
- **Integrate management of I/T and facility equipment**
- **Shutdown systems no longer in use**
- **Dynamically manage virtualized systems to optimize utilization and energy consumption (energy aware provisioning)**
- **Deliver the required level of availability with less hardware or energy resources**
- **Maintain and Manage lifecycle of facilities and IT assets for energy efficiency**
- **Efficiently compress information to reduce storage**
- **Intelligent Chargeback – aggregated power usage by business services**

Admin console (power and performance data)

The screenshot displays the IBM Admin console interface for 'ocean4SOCKdp:UAGENT00 - OCEAN4 - SYSADMIN'. The interface includes a navigation tree on the left, a central data table, and four performance charts on the right.

System Performance Table:

avRT	qLen	LocalTimeStamp
600	10261	04/20/07 15:05:11
595	10730	04/20/07 15:05:26
600	10370	04/20/07 15:05:44

Machine Name	Power cap	Power used	LocalTi
goldensbridge	120	110	04/20/07

Machine name	Processor Temperature	LocalTi
goldensbridge	53	04/20/07
pleasantville	40	04/20/07

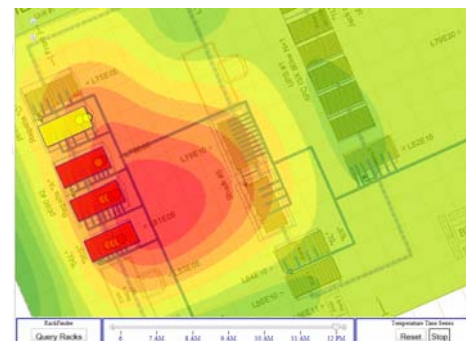
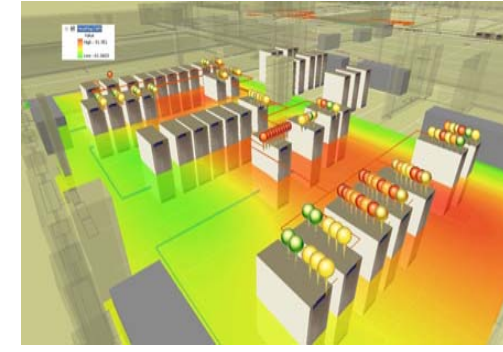
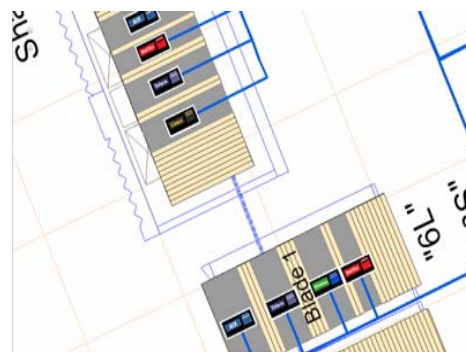
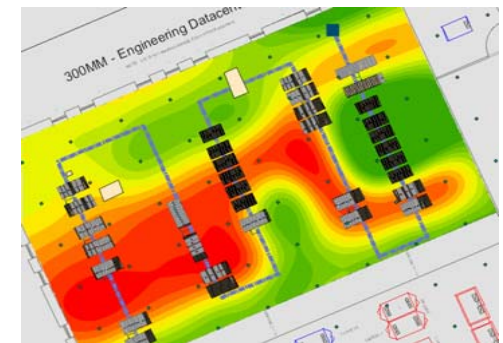
Charts and Data:

- System Response Time (ms):** A 3D bar chart showing response times over time. A red label 'Response Time' points to this chart. A specific data point is highlighted: 594 (04/20/07 15:10:56).
- Goldensbridge Power Cap and Power Use...:** A 3D bar chart showing power cap (yellow) and power used (blue) for the goldensbridge server. A red label 'Power' points to this chart.
- Pleasantville Power Cap and Power Used (Watt):** A 3D bar chart showing power cap (yellow) and power used (blue) for the Pleasantville server. A red label 'Power' points to this chart.
- Goldensbridge Processor Temperature (C):** A 3D bar chart showing processor temperature for the goldensbridge server. A red label 'Temperature' points to this chart.
- Pleasantville Processor Temperature (C):** A 3D bar chart showing processor temperature for the Pleasantville server. A red label 'Temperature' points to this chart.

The bottom status bar shows: Hub Time: Fri, 04/20/2007 03:30 PM | Server Available | ocean4SOCKdp:UAGENT00 - OCEAN4 - SYSADMIN

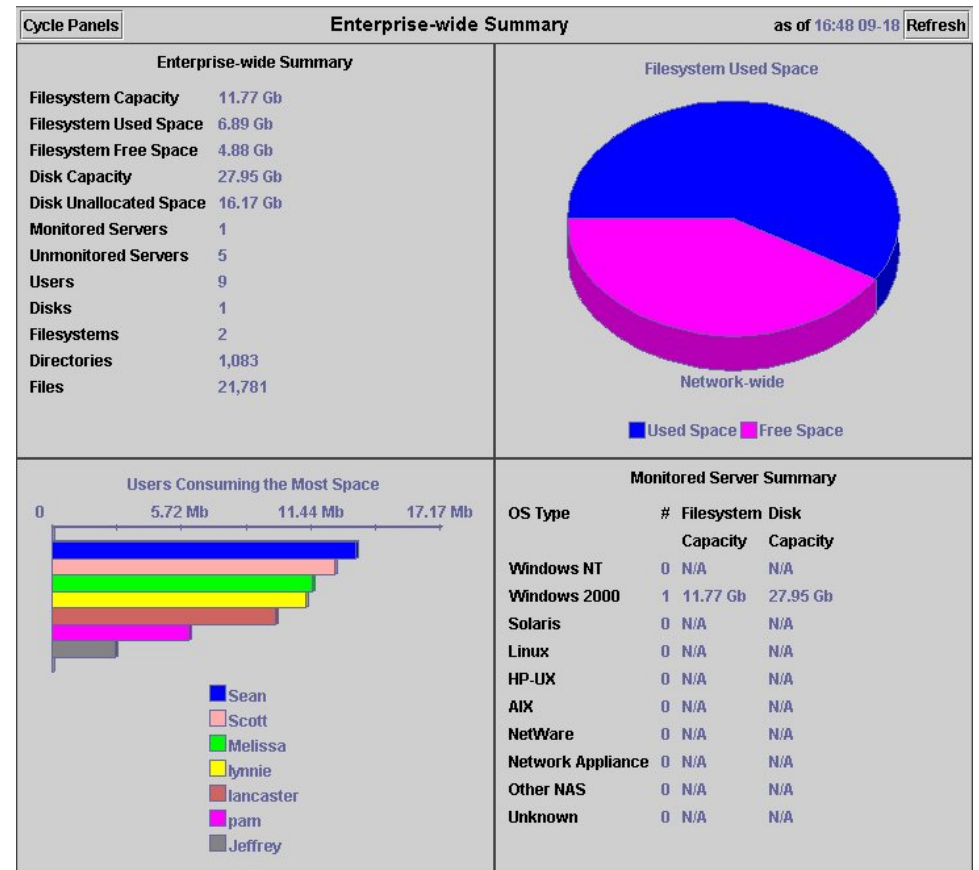
Optimize Assets by Your Energy Usage with Spatial Visualization

- Optimize energy utilization of assets and extend asset life
- Visualize data center thermal dynamics and identify problem areas
- Alert source for Facility and DC “operators” of upcoming energy problems
- Enable workflows that allow you to create role based automation of asset lifecycles



Improve Energy Efficiency of Storage

- Assess your storage usage and utilize storage more efficiently
- Identify data that can be freed to create space on existing storage:
 - Duplicate files
 - Unused files
 - Inactive files
 - Temporary files
- Identify data that can be moved to more power efficient storage
- Initiate automation to reclaim space



Workloads – Optimize your processes for Green

Enabling organizations to model and redesign business processes to reduce energy consumption and improve the energy efficiency of operations

IBM Software solutions help clients

- **Model and redesign business processes to significantly reduce energy consumption and cost**
- **Enhance energy efficiency of operations with automation**
- **Gain deep understanding of application behavior to identify opportunities for green improvements**
- **Increase system utilization for improved power efficiency**
- **Improve energy efficiency of applications by moving them to more efficient platforms**
- **Take advantage of SOA to dynamically allocate and optimize workloads across servers and applications based on the green criteria**
- **Reduce paper form with eForm in business process**

Paper Facts

- *It requires about 768 million trees to produce the world's annual paper supply*
- *The amount of new original information stored on paper increased 36% between 1999 & 2002*
 - *The vast majority of this increase is from the creation of office documents*

- The virgin timber-based pulp and paper industry is the third greatest industrial emitter of global warming pollution.
- A typical office disposes of about 350 pounds of wastepaper per employee per year

Natural Resources Defense Council
<http://www.nrdc.org/cities/living/paper/default.asp>

- 1 tree = 8,333 sheets of copy paper
<http://www.conservatree.com/learn/EnviroIssues/TreeStats.shtml>
- Average U.S. office worker prints 10,000 pages per year
Lexmark Press Release, May 2006
- U.S. used 8 million tons of office paper (178 million trees) in 2004
NADEP North Island; Environmental Program Office, 2005

IBM Software for a Greener World

cutting costs and carbon emissions and streamlining compliance with IBM

Improve carbon footprint by directly reducing travel for collaboration



People



42% of IBM's employees do not regularly come into an office saving \$100M annually in real estate costs



Saved \$70k on one training event by avoiding travel



Workloads



Reduced average process cycle time by 50%



Using SOA to drive energy efficient processes



Consolidating 3900 → 33 System Z servers providing an 80% annual energy savings



Optimized policies and practices to enable regulatory and legal compliance



Infrastructure



Achieved data compression rates of 83%



Consolidated 11 servers down to 3



Saved 90K tons of CO2 with resource planning



40 to 50% reduction in floor space, 30% reduction in power and cooling costs



Consolidate, Virtualize, Compress and maintain to reduce energy costs



Thank
You