Virtualizacija in energetska učinkovitost – - kako zmanjšati stroške za energijo ?

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Direktor tehnične podpore prodaje IBM sistemov

IBM Central and Eastern Europe

Rising Tide of Information

Proliferation of Devices

Real-time Information Explosion

20th Century

21st Century

Evolving Business Models
Internet Spawns New B-B and B-C Models

Business-to-business

Business-to-consumer

20th Century

Evolving Business Models
A New Approach to Business and Consumer Services

Rise of social networking

21ˢᵗ Century

The **reality** of a globally integrated world

- Economic downturn requires doing more with the same

- Frozen credit markets and limited access to capital

- Energy shortfalls and erratic commodity prices

- Growing concerns about the effects of climate change

- Increasingly empowered and interconnected consumers

Our infrastructure needs to become smarter and more energy efficient – now more then ever

The **pressure** to change is increasing

COSTS AND AVAILABILITY

Rising costs and uncertain availability of energy

"World energy demand will double by 2030"

- Mark Ellis, International Energy Agency March 2007

LAWS, REGULATIONS & STANDARDS

Increasing regulations and laws to reduce emissions of greenhouse gases and protect the environment

82% of executives expect some form of climate change regulation within 5 years[1]

Legislation for a national cap and trade system for the U.S. is on the Obama agenda

CUSTOMER EXPECTATIONS

Growing demand for companies to consider the environmental and economic impact of their actions

80% of CEOs view sustainability as impacting brand value[1]

25% of consumers would switch brands if given an ethical alternative[2]

The **need** for energy efficient infrastructure is clear

35%

IT energy expense is expected to increase 35% in the next five years.[3]

12x

Technology energy consumption is growing 12 times overall demand.[4]

3%

For every 100 units of energy piped into a data center on average only 3 units are used for processing.

10x

Digital information is estimated to increase ten fold between 2006 and 2011.[5]

85%

In distributed computing 85% of computing capacity sits idle.[6]

40%

Buildings account for 40% of worldwide energy consumption – and present the biggest opportunity for future abatement.[7]

Managing energy across your **infrastructure domains**

ASSETS

FACILITIES & PROPERTY

INFORMATION TECHNOLOGY

Data Center Infrastructure

Building Infrastructure

COMMUNICATIONS INFRASTRUCTURE

PRODUCTION INFRASTRUCTURE

MOBILITY INFRASTRUCTURE

Servers	UPS	HVAC	
Storage	PDU	Lighting	Cell Towers
Network devices	CRAC	Security	Production Equipment
Distributed Systems	Chiller	Fire	Trucking Fleets

A **practical approach** to energy management

INFORMATION TECHNOLOGY

FACILITIES & PROPERTY

ASSETS

IBM

DISCOVER
Measure, collect, and benchmark energy information to identify opportunities

MANAGE
Monitor, trend, and manage energy to control costs and risks

OPTIMIZE
Optimize assets and infrastructure for energy efficiency

REPORT
Track and verify energy efficiency for compliance and stakeholders

Modify infrastructure to optimize usage

**Utilization Reporting**

DESIRED RESULTS

- Lower energy costs by dynamically adjusting capacity to needs

- Control energy use during peak periods to avoid disruptions and to qualify for incentives that may be offered by local utility companies

Performance Reporting
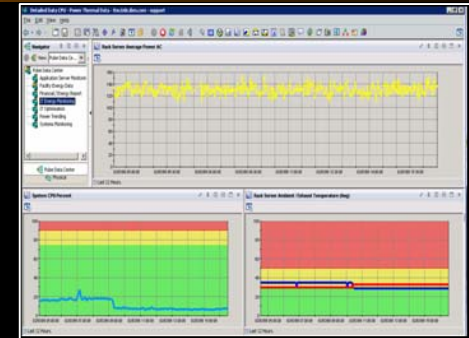
KEY CAPABILITIES

- Correlating historic usage requirements to make informed decisions regarding appropriate energy control policies

- Power saving modes, power capping, power and thermal trending

- Ability to implement policies and control mechanisms for IT and non-IT assets
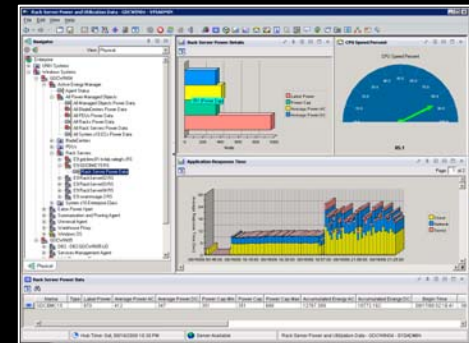
FEATURED IBM SOLUTION

Control & Power Management

Click here for reference architecture
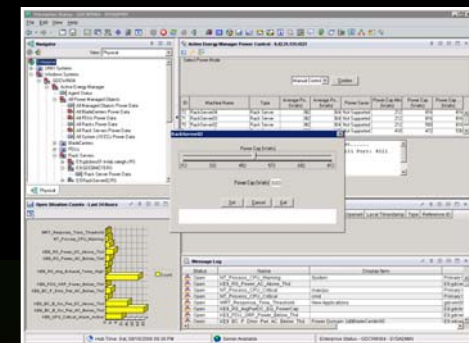
- IBM Active Energy Manager
- Tivoli Monitoring for Energy Management
- IBM Monitoring (recommended)
- Tivoli Composite Application Manager (recommended)
- IBM Middleware Implementation services (optional)

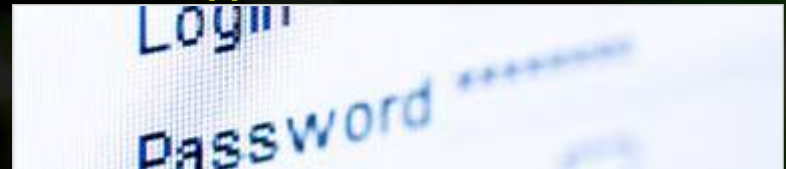# Building a green infrastructure requires new focus.

IT Equipment

- Energy efficient hardware
- Virtualization and consolidation
- Innovative cooling technologies
- Active energy management
- Tiered storage

Data and applications

- Lifecycle management, retention, archiving of data
- Optimization of application servers
- Application performance monitoring
- Chargeback and usage accounting for energy
- Consolidation and rationalization

Data Center

- Accurate thermal and energy usage assessments
- Extend life of existing infrastructure
- Rationalize data center infrastructures across company
- Design flexibility into new data center infrastructure

Facilities / Property

- Instrumentation of all assets for power, temperature, layout, and problem identification
- Intelligent building management systems

Energy Management

- Measure, collect, benchmark
- Monitor, trend, manage
- Tracking, verify, readiness for compliance
- Earn energy efficiency certificates

IT Equipment:
Servers and storage designed for leadership energy efficiency.

IBM System z10

- Advanced Virtualization supporting the highest utilization rates
- Modular and efficient design

Over 80% savings in energy costs for consolidation

IBM POWER Systems

- More Work per Watt with POWER6 and EnergyScale technology
- Virtualization leadership

Over 2x the performance per watt versus HP and Sun

New generation of x86 servers deliver 2X performance in the same energy envelope.

IBM System x

- Scalability up to 96 cores
- Performance per Watt leadership

Up to 67% less power than competitive equivalents

IBM BladeCenter

- Energy efficient consolidation platform
- Broad set of chassis, blade, and I/O options

Up to 36% better performance per watt than Dell

IBM iDataPlex

- Designed for optimal energy efficiency supporting HPC and Web 2.0 workloads

Cuts energy costs 40% compared to competitive rack servers

IBM Storage

- Tiered storage solution can be 3X efficient compared to an all disk solution.

Eliminating the inadvertent storing of redundant information can save as much as 10X

IT Equipment:
Virtualization and consolidation boost utilization.

Server Virtualization

Up to 30-70% TCO savings

- Up to 33-50% floor space and facility costs.
- 33-70% hardware costs.
- Up to 50% maintenance costs.
- Up to 33% support costs.

Storage Virtualization

Up to 25% less capacity needed

- Up to $50,000 power savings per 1,000TBs of installed storage.
- Up to 60% migration costs savings.
- Up to 300% increase in utilization

Client Virtualization

Up to 40% overall TCO savings

- Up to 45% power savings.
- Up to 90% deskside support.
- Up to 50% on helpdesk.
- Up to 75% in security and user administration.

IBM's History of Virtualization Leadership

A 40 year tradition continues with PowerVM™

| 1967	1973	1987	1999	2004	2007	2008
IBM develops **hypervisor** that would become VM on the mainframe	IBM announces first machines to do **physical partitioning**	IBM announces **LPAR on the mainframe**	IBM announces **LPAR** on POWER™	IBM intro's POWER Hypervisor™ for System p™ and System i™	IBM announces POWER6™, **the first UNIX® servers with Live Partition Mobility**	**IBM announces PowerVM**

Blue Gene/P

Blue Gene/P continues Blue Gene's leadership performance in a space-saving, power-efficient package for the most demanding and scalable high-performance computing applications
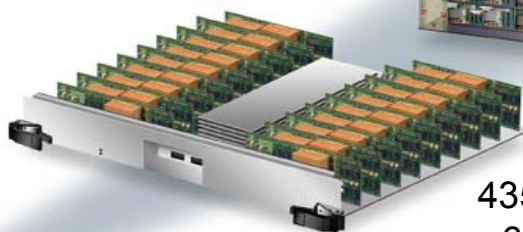
System
1 to 72 or more Racks

Rack

Cabled 8x8x16

32 Node Cards
1024 chips, 4096 procs
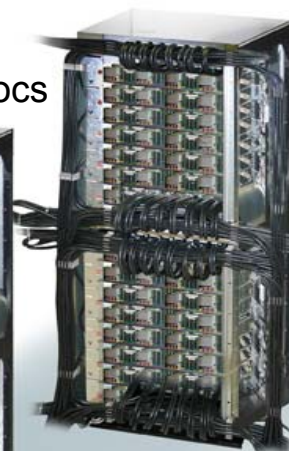
1 PF/s +
144 TB +

14 TF/s
2 TB

Node Card
(32 chips 4x4x2)
32 compute, 0-2 IO cards

Compute Card
1 chip, 20 DRAMs

435 GF/s
64 GB
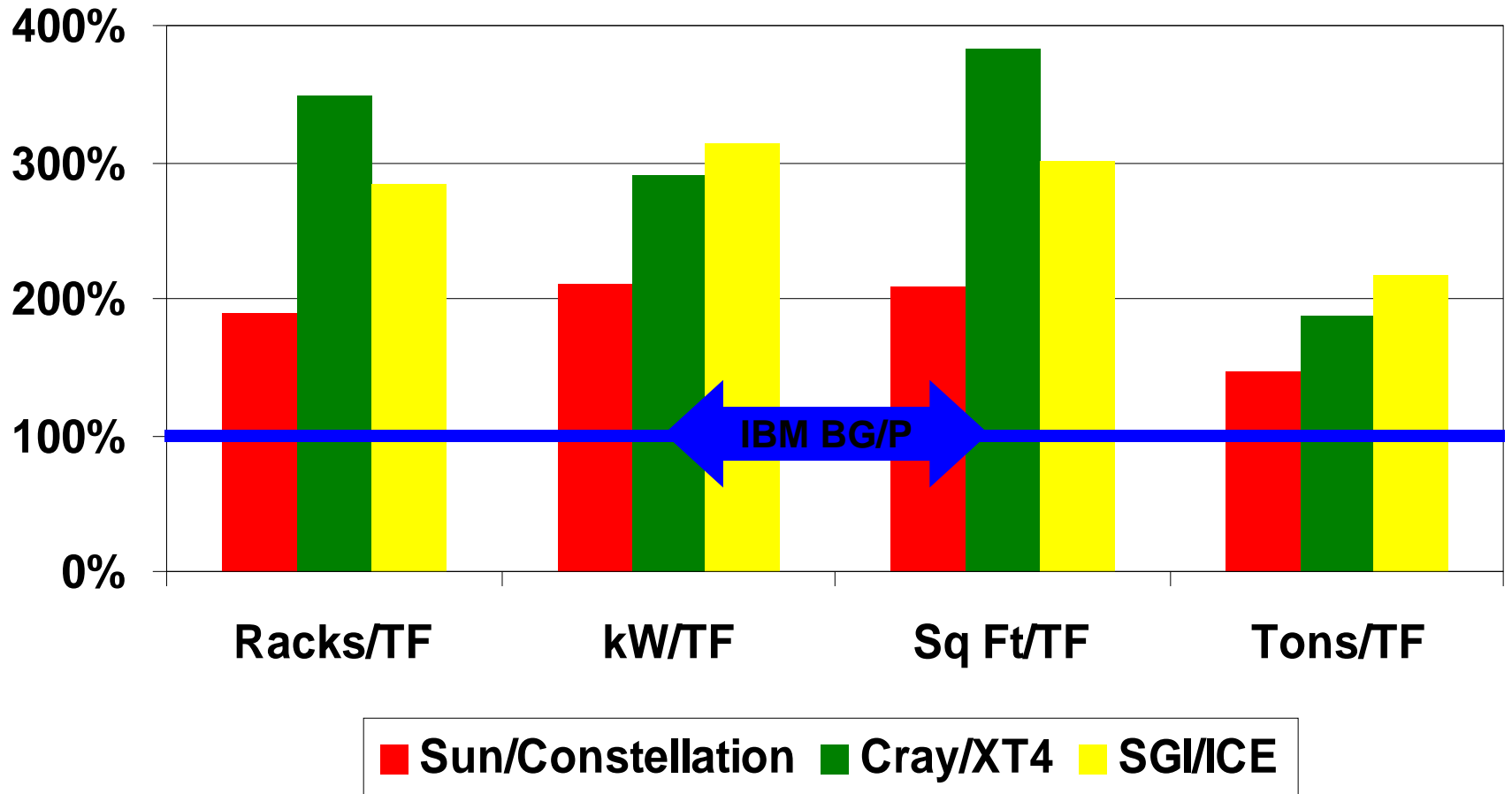
Chip
4 processors

13.6 GF/s
2.0 GB DDR
Supports 4-way SMP
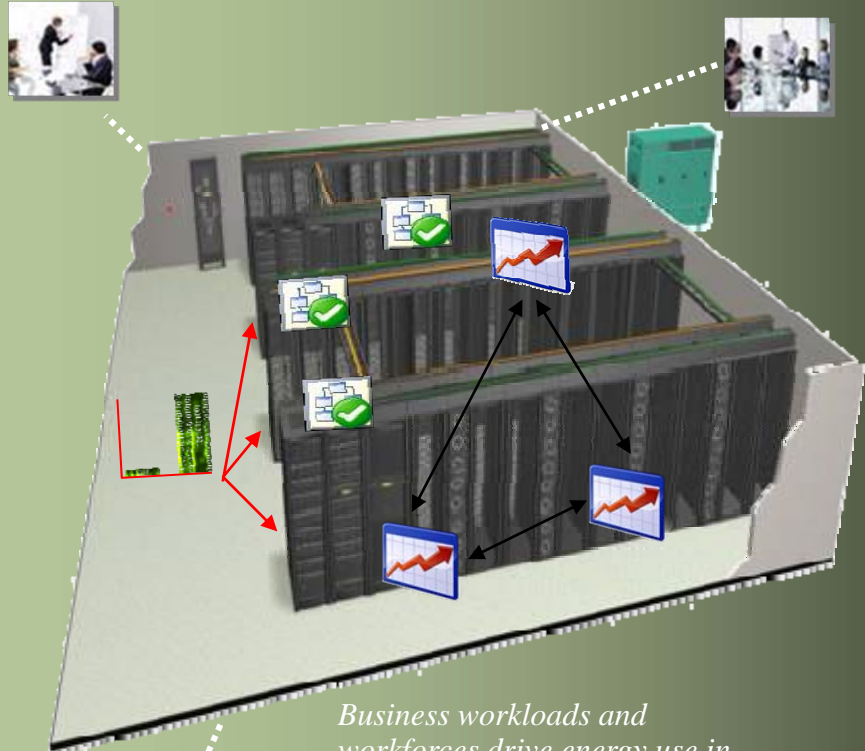
13.6 GF/s
8 MB EDRAM

Front End Node / Service Node
System p Servers
Linux SLES10

HPC SW:
Compilers
GPFS
ESSL
LoadLeveler

Energy & Space Efficiency: BG engineering for TCO

Data and application:
Improve operations and environmental impact.

Business workloads and workforces drive energy use in data centers, server rooms, and with departmental data.

Measure and demonstrate energy usage and improvements. **Allocate** energy costs to departmental services.

Tivoli. software

Lower energy cost of **applications** by moving to most efficient platform at optimal time and developing applications tuned for virtualization.

WebSphere. software
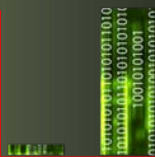
Intelligent management of **business data** to control energy use by dedupliction and compression of data.

Information Management

Enable multi-site software development and **collaboration** reducing travel and paper usage.

Rational. software

We've only just begun to uncover what is possible when building a green infrastructure.
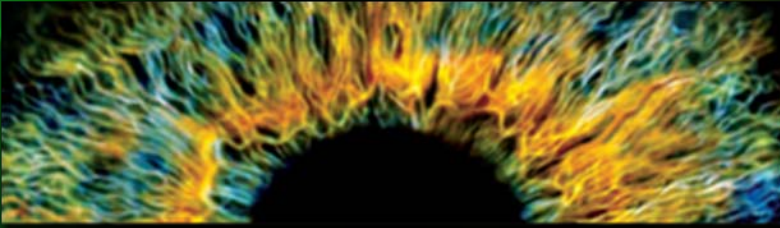
The world will continue to become smaller, flatter and hotter.

By building green infrastructures we can drive sustainability and economic growth systemically –achieving benefits for both business and the planet.

Let's work together to drive real progress in our time.

Primeri iz prakse,…

Environmental leadership:
IBM case study results.

Improving customer <u>awareness</u> of the issues with articles

Building a <u>smarter planet</u> TV advertising

Providing Transparent and <u>verified results</u>

COMPUTERWORLD'S TOP 12 GREEN-IT COMPANIES

WWF

climate savers

the green grid™

CCX Chicago Climate Exchange

Setting an example by <u>earning awards</u>
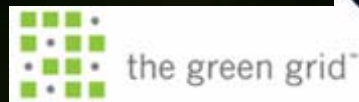
▪ **1990-2007 Lessons Learned**

– Avoided energy-use-CO_2 emissions equivalent to 45% of IBM's 1990 energy use

– Saving $18.2 million per year in utility costs

▪ **Earned Leadership Status**

– Top 3 analysts recognize IBM leadership in data center services (Gartner, IDC, Forrester)

– Over 3100 customer efficiency projects undertaken

– #1 Green IT Vendor, Computerworld

– #1 Vendor "Green 500" Supercomputing

– CNET UK Business Technology "Green IT Initiative of the Year"

– One of top 15 Green IT companies, InfoWorld, February 2008

http://www.ibm.com/ibm/responsibility/

Rationalize IBM's data center infrastructure
Smart transformation has delivered cost savings and operational efficiency

Data center infrastructure consolidation	▪ Cumulative benefit yield of $4.1B over the past 5 years. ▪ For every dollar invested, we saw a $4 cumulative benefit	
IT consolidation and virtualization	▪ 80% less energy, 85% less floor space ▪ Substantial TCO savings ▪ Consolidate and virtualize thousands of servers onto approximately 30 IBM System z™ mainframes	

	1997	2007
CIOs	128	1
Host data centers	155	7
Web hosting centers	80	5
Network	31	1
Applications	15,000	4,700

Actual example,...

ANNUAL OPERATING COSTS							
	Existing IT	**Alternate case 1**	**Alternate case 2**	**Alternate case 3**	**Alternate case 4**	**Alternate case 5**	unit
TYPE of servers	MISC	9133-55A	9116-561	9117-570-16w	9119-595-64W-MOP	9119-595-64W-UPG	
# of CPUs		8	16	16	64	64	
# of Logical servers	486	486	486	486	486	486	
# of Physical servers	291	28	14	12	3	3	
Total #of CPUs	1.439	224	224	192	192	192	
Total amount of RAM	2.762	1.792	1.792	1.536	1.536	1.536	
Total # of Ethernet adapters	1.052	168	196	204	63	177	
Total # of FC adapters	974	196	224	180	120	165	
Total # of HDDs		56	56	264	150	240	
Total capacity	366.227	155.680	159.594	161.400	179.910	179.910	RPE2
Average utilization	10%	24%	23%	23%	20%	20%	
Total workload	36.623	36.623	36.623	36.623	36.623	36.623	RPE2
Adjusted kWh/year	4.300.225	271.157	337.714	716.805	563.619	604.821	kWh
Btu/hr	1.217.662	105.112	124.236	213.120	232.500	232.500	Btu/h
Costs							
SW maintenance	0,00	0,00	0,00	0,00	0,00	0,00	USD/year
HW maintenance	2.506.920,40	64.350,72	165.412,80	291.468,67	584.954,92	603.496,80	USD/year
System management	3.000.000,00	2.700.000,00	2.400.000,00	2.400.000,00	2.100.000,00	2.100.000,00	USD/year
Electricity	387.020,24	24.404,13	30.394,24	64.512,49	50.725,73	54.433,90	USD/year
Floor space	184.992,00	5.510,40	5.510,40	5.904,00	3.690,00	7.380,00	USD/year
Total AOC	6.078.932,64	2.794.265,25	2.601.317,44	2.761.885,16	2.739.370,65	2.765.310,69	USD/year

Bryant University aligns energy consumption with server workload

Client Problem

Bryant University views IT as the "the fourth utility" and has implemented an ongoing optimization program that applies standardization, consolidation and virtualization techniques. Recently, the University launched an initiative to address existing energy inefficiencies in its IT infrastructure — specifically the amount of energy consumed by servers during idle periods.

Infrastructure Domain Focus

Information Technology

Initiatives

- Measure & benchmark energy and thermal performance
- Modify infrastructure to optimization usage

Solution:

Working with IBM Global Technology Services, Bryant University consolidated and virtualized its server environment and deployed a modular datacenter to drive a 30% savings in operational expenses and a 21% reduction in capital expenditures. In 2009, Bryant participated in the IBM Tivoli Monitoring for Energy Management beta program to capture energy-related metrics in its server environment. Through this project, Bryant IT staff can view power, thermal and IT resource utilization on a single screen to identify and address inefficiencies, such as capping power on underutilized servers.

Benefits

"IBM software provides us with the ability to actively manage and reduce power usage in our datacenter. Our current work with IBM will help us realize an estimated 15% savings in energy consumption."

– Rich Siedzik, Director of Computing and Telecommunication Services, Bryant University

IBM can help you find the value in green

visit **ibm.com/green**