Go further, faster®

Transforming Through Consolidation

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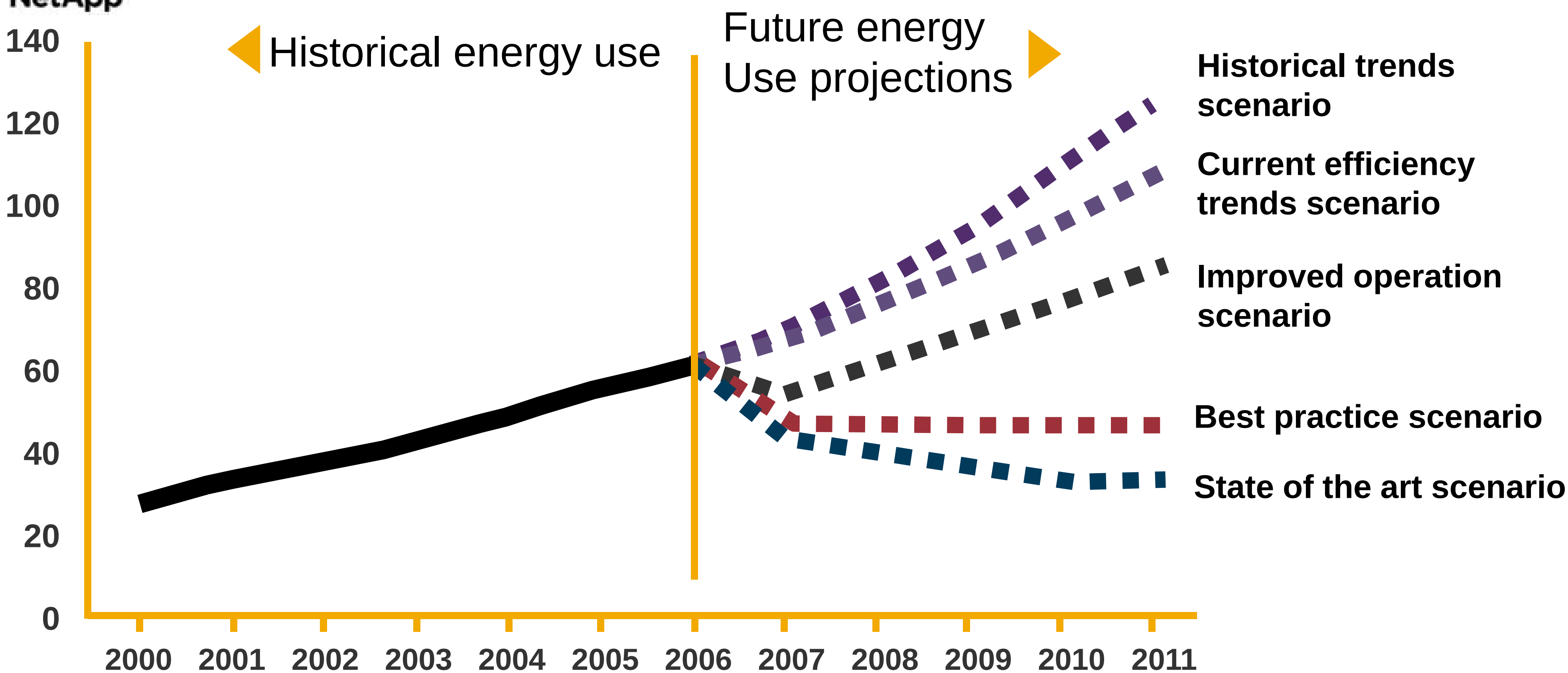
NetApp

State & Local Government/

Education

WHY CONSOLIDATE?

The Power Problem



EPA Report Comparison of Projected Electricity Use, All Scenarios, 2007 to 2011

- Potential savings in power > equal to that used by 7 million homes/yr
- Potential savings in carbon > equal to the emissions of 10 million cars/yr
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Our Journey

- About NetApp IT
  - Challenges
- Responding to the Challenges
  - The 3 “C’s”
  - Server Virtualization
  - Storage Consolidation
  - Cloud

NetApp IT Supporting a $5B Enterprise

- ~11,000 employees and growing
- 46 countries with 130+ offices
- 2 Main Centers; 4 Regional
- 5 Eng data center locations
- Applications
- ~1,350 Servers (from 1,700)
- 3+ PB storage

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Challenges Faced before Consolidation

Data Center Sprawl

"Data Centers" in 57 Field Offices

Power Issues

Power costs spiraling AND rolling brown outs in CA, HQ"

Inability to Scale Quickly

New employees, increased volumes of orders

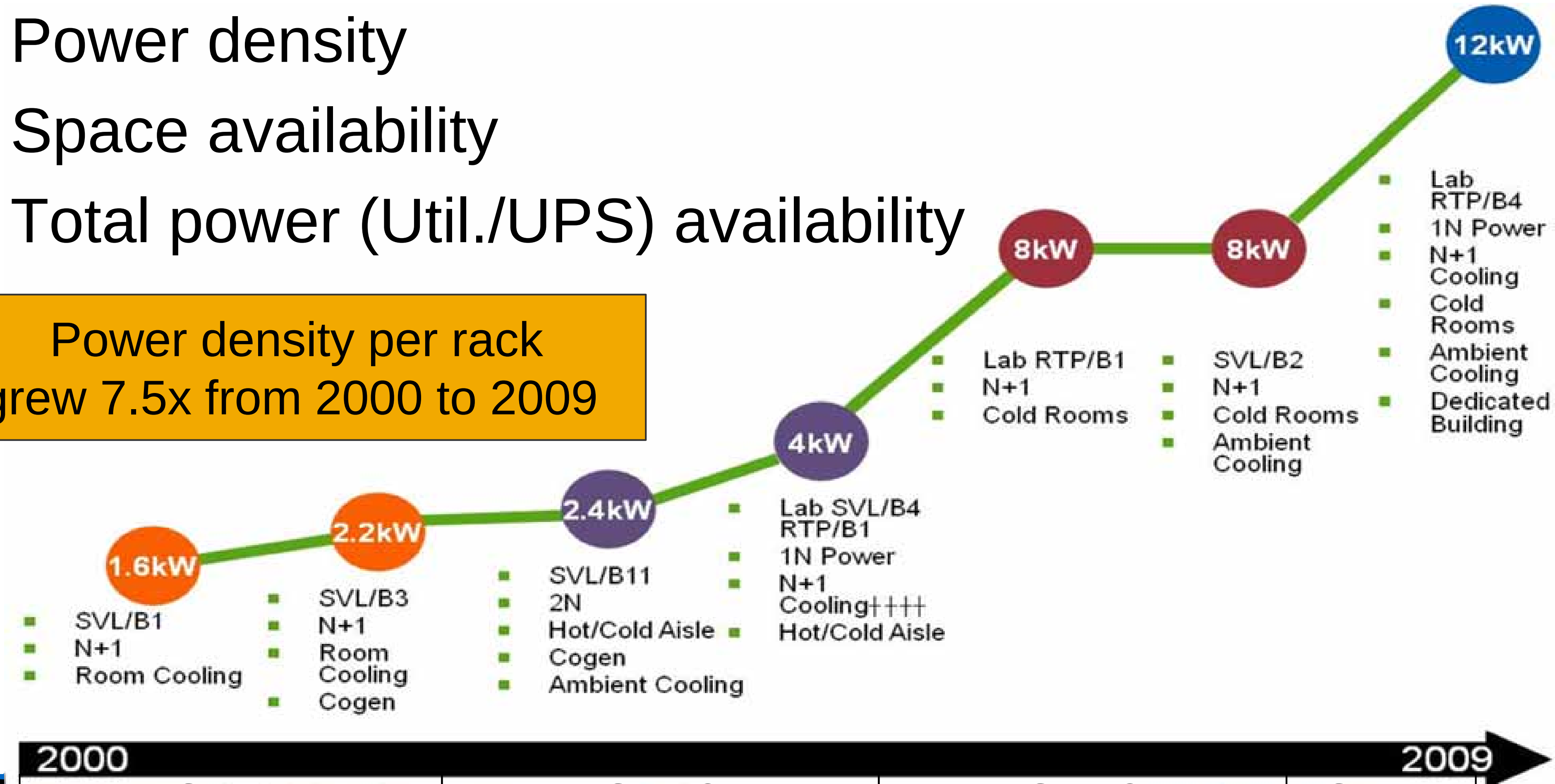
Duplicate Resources

For e.g., Each Engineering team had its own Test lab

Data Center Evolution

- Challenges and constraints vary:
  - Cost and available investment
  - Power density
  - Space availability
  - Total power (Util./UPS) availability

Power density per rack grew 7.5x from 2000 to 2009



Gen 1	Gen 2	Gen 3	Gen 4

Current Business Challenges

Business

- Global Economy
- Pressure to reduce costs & increase productivity
- New Business Models

Information Technology

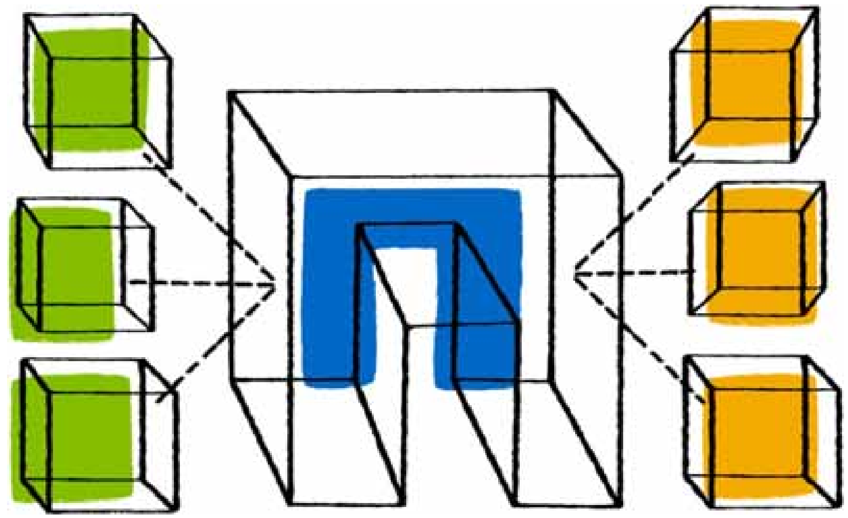
- IT to Business alignment
- Financial agility
- Service agility

User Community

- 4000 engineers – all about building products

There is a real "opportunity" to change – challenge everything

Responding to the Challenges



Our Architectural Strategy- 3 C's

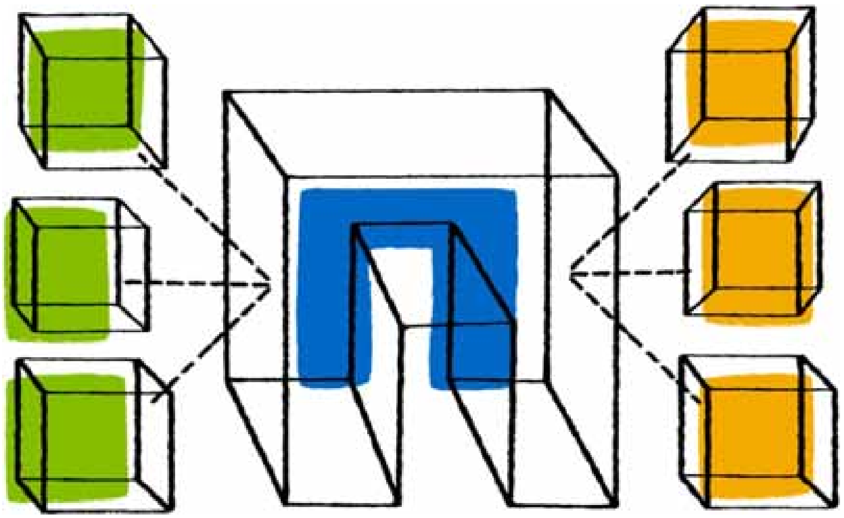
Category	Description	Example
Convergence	Converge on to a minimal number of Vendors, Technologies and platforms.	• Oracle • Cisco • Microsoft • Intel Architecture
Consolidation and Virtualization	Consolidate to eliminate redundancy, and drive convergence. Upfront investment will be required to transition, as will simplification of process to remove customization	• Consolidate Data Centers • Servers, Storage • Virtualization to drive up capacity utilization.
Cloud	Optimal Sourcing strategy capability spectrum ranging from : Some applications moved to Cloud Some are their own private Cloud All Receive Cloud Services – backup/DR	• On premise dedicated (ASP) • On premise private cloud • SaaS • Public cloud PaaS • IaaS • DaaS

Our Approach

- Not a wholesale swap-out, implement as a go-forward architecture
- Challenge every asset refresh and new project
- Innovatively apply technology to Data and Storage Management –
  - High Efficiency tools like DeDuplication and Thin Provisioning to reduce Storage Footprint

- Innovate through Space and Energy Management
  - Challenge old assumptions (“near the gear”, each app needs dedicated resources)

Consolidation and Virtualization



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Server and Storage Consolidation and Virtualization

Optimize storage utilization, energy and space consumption while scaling for growth

Consolidated from 57 Data Centers to 2

Reduced Storage Systems by 80%

Freed 19.5 racks in the data center

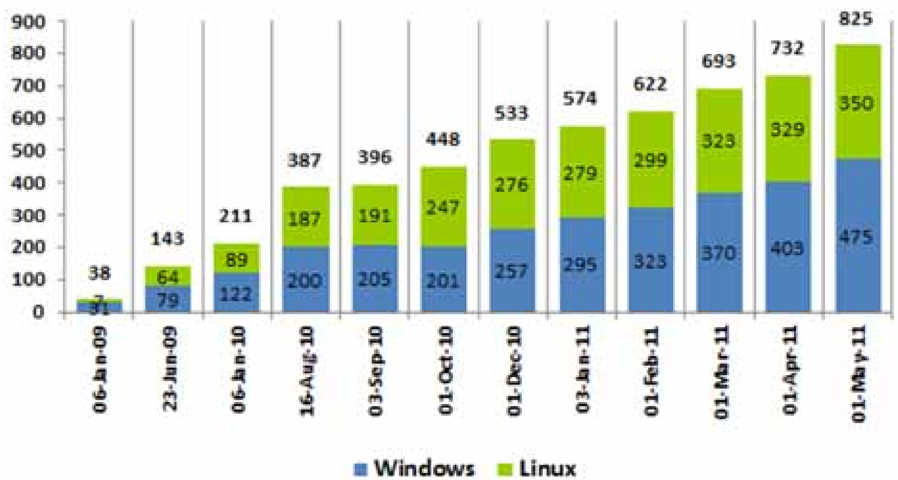
Eliminated 41,184 KWh per month, reducing energy consumption by 32%

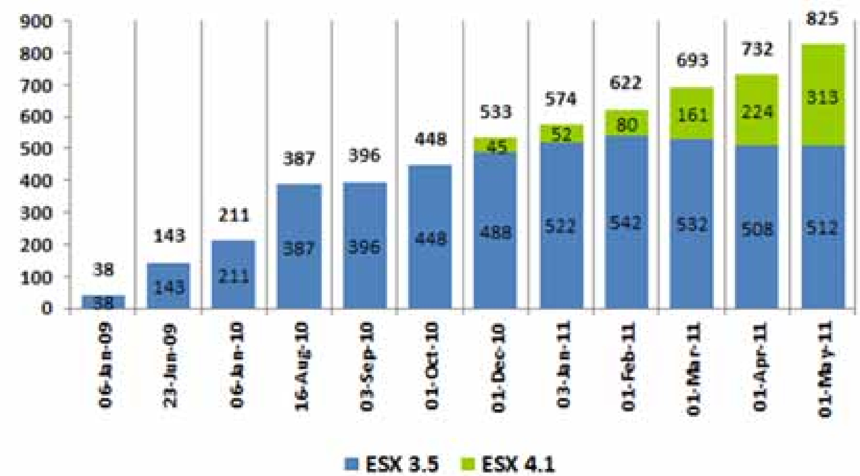
Eliminated 94 tons of air conditioning

Increased storage utilization to 60% (from 40%)

Consolidated all of engineering into 1500 Blade Grid

NetApp IT Application Server Virtualization

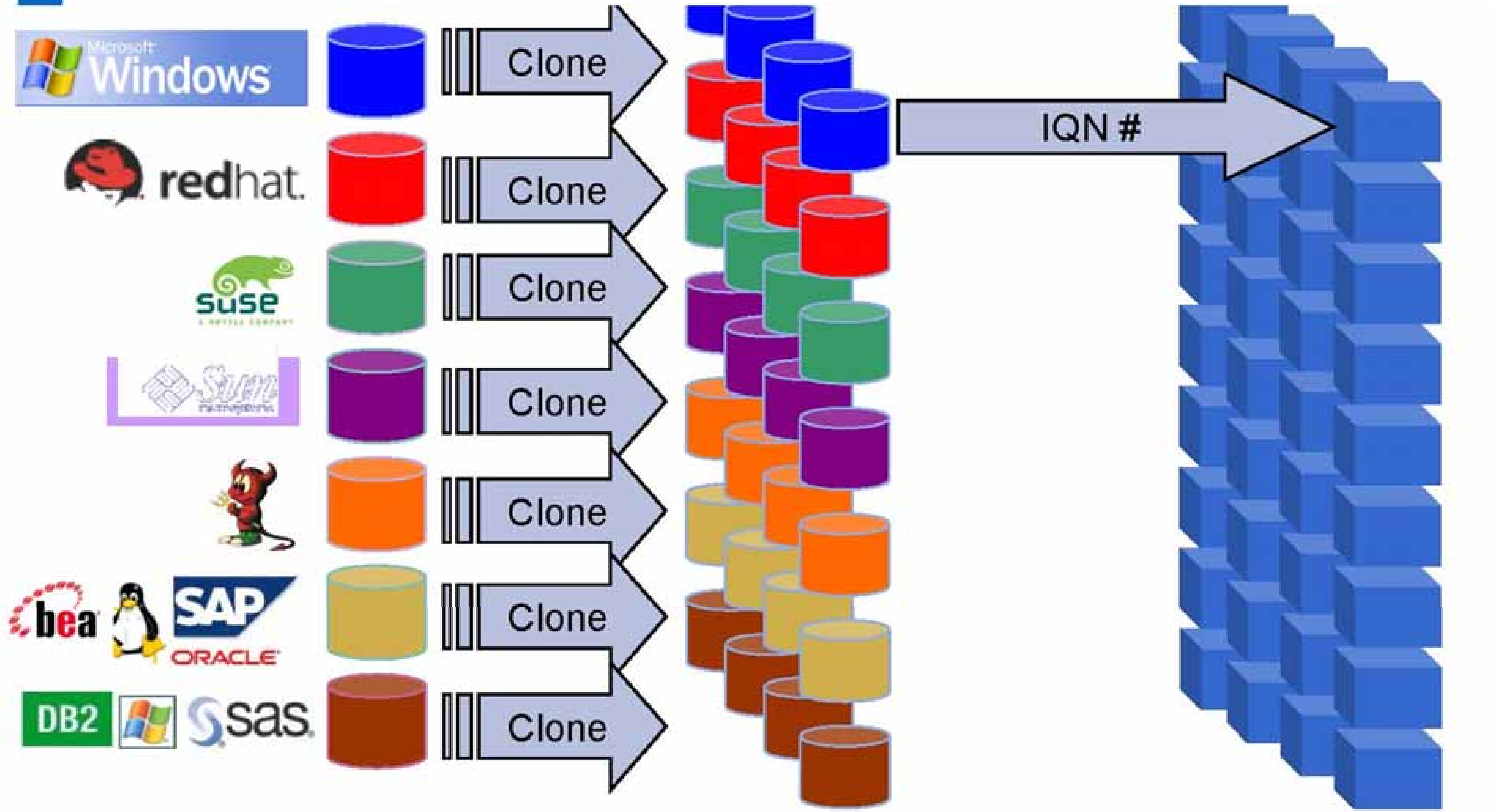




Landscape	Operating System	Physical Hosts	Virtual Hosts	Total Hosts	Percent Virtual
Sub-Prod	X86	357	723	1,080	67%
	Solaris	152	529	681	78%
	AIX	-	81	81	100%
	Total *	509	1,333	1,842	72%
Prod	X86	621	287	908	32%
	Solaris	258	279	537	52%
	AIX	-	71	71	100%
	Total *	879	637	1,516	42%
All	Total *	1,388	1,970	3,358	59%

* DCM & VMware Virtual Center numbers may vary (e.g. project timing, pre-VMware standard, etc..)

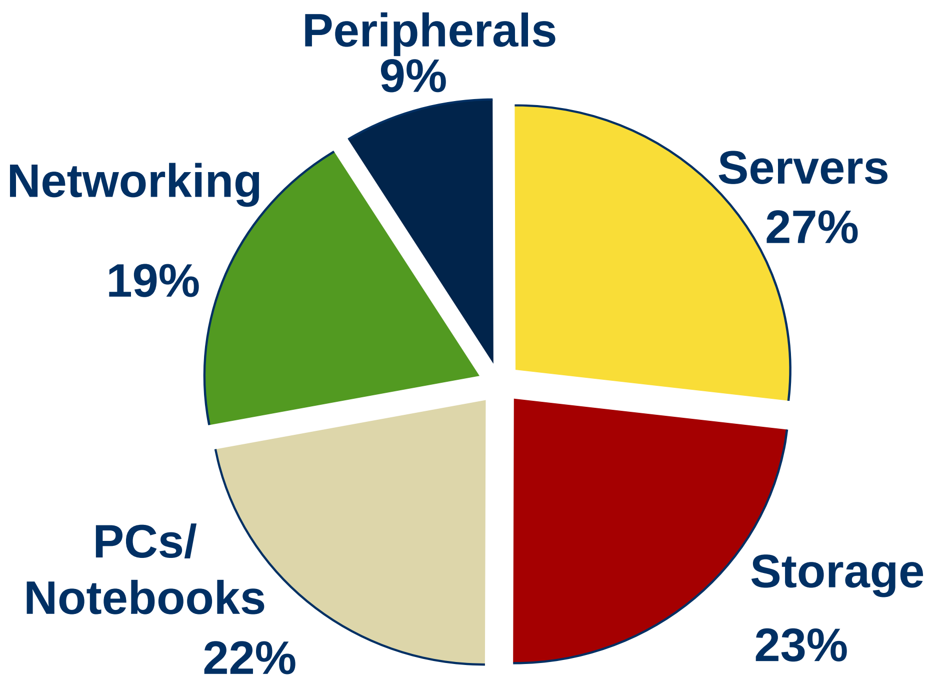
Engineering as a Service "EaaS"



Golden LUNs	Clones	Blades
Golden LUNs are tuned and archived	Then cloned as needed,	Cisco UCS

What about Storage?

- Storage is 2nd highest cost in IT
- Storage costs are growing 50% per year



IDC Perspectives Study , 2008

Storage Challenge

- 50 disparate storage systems, many apps with hard-coded mount points
- 109 different apps, each with Prod and Dev systems
- Low Storage Utilization
  - Overall less than 40% utilization, spindles added for performance, unused capacity. "Orphaned Storage"
- Aging Hardware
  - Out of 50 storage systems, 34 did not have the modern features of current line; older lower capacity drives
- Space Cooling and Power restraints
  - To continue with current state and growth would require significant retrofits and build out

Storage Consolidation Plan

- Consolidate from 50 to 10 storage arrays
  - Less to manage, more consistency
  - Implement best practices – no more hard coding mount points!
- Use Higher Capacity drives
  - More capacity, SATA uses 50% less power per TB than FC
- Increase Utilization to 60%
  - Flexible Volumes and Thin provisioning (unlock dedicated LUNs and Volumes)
- DeDuplicate!
  - Duplicate data is created, distributed, backed up, archived
- Eliminate Test Dev Overhead
  - Spacesaving Clones instead of full copies

Deduplication – Sample Results
Average – 168 volumes = 26.3% recovered

- Unstructured Data (type, vol, used, saved)

– unstructured	/vol/Corp/	4747	2577	35%
– unstructured	/vol/sales/	1675	695	29%
– unstructured	/vol/stanley/	999	307	24%
– unstructured	/vol/REPORTS/	620	173	22%
– ASUPDW	/vol/sac_prd_asup05/	6003	2566	30%
– ASUPDW	/vol/sac_prd_asup03/	5845	2130	27%
– ASUPDW	/vol/sac_prd_asup01/	2784	1055	27%

- VM (Intel) OS Files

– Virtual	/vol/dc06_rr03_cl01_vmdk_dev/	140	501	78%
– Virtual	/vol/dc06_qq02_cl01_vmdk_stg/	14	66	82%
– Virtual	/vol/vmwoimapp02_dev_oim2/	9	13	58%

- VM (LUN) Solaris OS Boot Images

– Boot	/vol/duresxvc01_stg_iboot01/	143	13	8%
– Boot	/vol/durvcdb01_stg_iboot01/	83	2	3%
– Boot	/vol/LUN_repository	353	150	30%

eBI Environment at NetApp

373% RAW Storage efficiency

Production Storage

Test & Dev Storage

460.8 TB Storage
12 copies

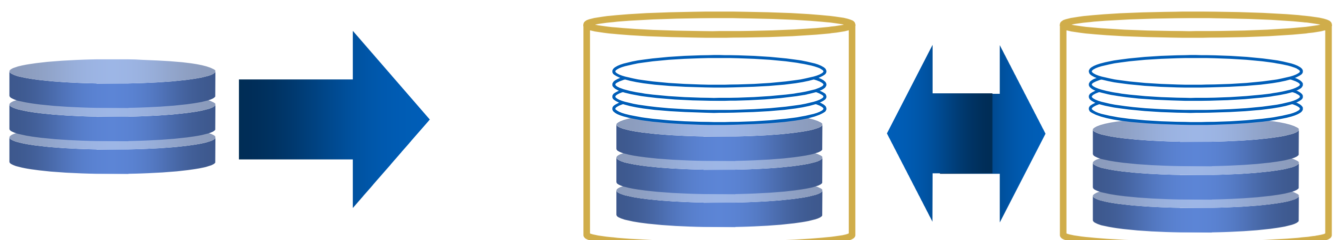
38.4 TB

Without FlexClone™

76.8 TB Storage
2 copies, 24 clones

38.4 TB

With FlexClone



Test/QA

Dev

Lessons Learned

- **Consolidation & Virtualization**
  - Partner with applications teams to understand dependencies – this is not just infrastructure
  - Be conservative in initial time line commitments until you have experience
  - Operation of consolidated systems requires changes in processes –
  - Change Management and Release Management require more rigor in a virtualized world
  - Start with non-critical, non-production, low risk assets
- **Deploying eco-friendly technologies to optimize space & power**
  - Crucial for IT and Facilities to partner
  - Have a plan to optimize credits & rebates from local utilities
- **Re-locate facilities to lower cost geographies**
  - Delivering a single instance global application suite requires sensitivity to distance – drives geographic choice.
  - Per KWh pricing ranges from $.02 to $.12 in North America –break the “be near your gear”

EPA awards NetApp the first Data Center Energy Star Certification (July, 14th 2010)

Recognized Leader in Environmental Responsibility

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FORTUNE 100 BEST COMPANIES TO WORK FOR 2009

COMPUTERWORLD TOP 12 GREEN-IT COMPANIES

2008 InfoWorld GREEN 15

CIO CIO 100 HONOREE 2009

InformationWeek 500 BUSINESS TECHNOLOGY INNOVATORS 2008

SNIA Green Storage Initiative

#1

Uptime Institute

the green grid
get connected to efficient IT

2009
2008
2007
2006
2005
2004
2003

Green Enterprise IT Awards
Best in Class Implementation Winner
The Uptime Institute Global Green 100

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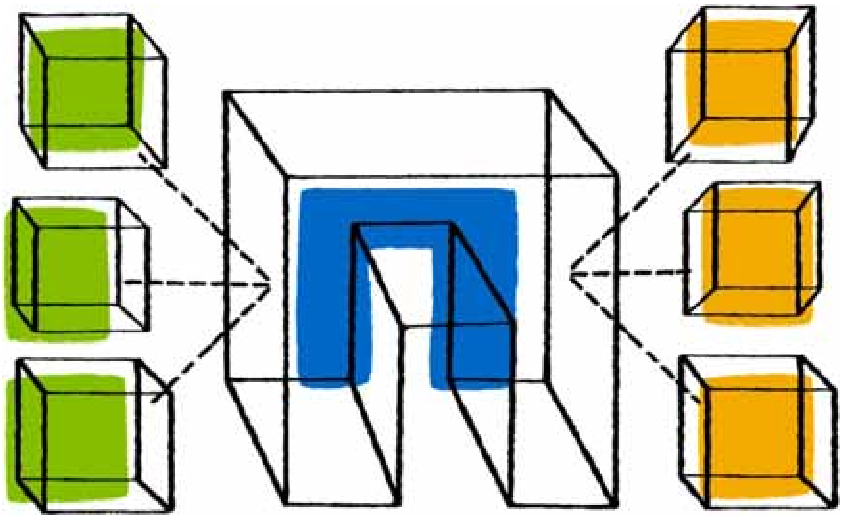
Cloud Based Services



What Drives Cloud Adoption

Business Benefits

- Turn capex into opex
- Faster business innovation
- Risk sharing with vendors
- Increased productivity

Enterprise IT Benefits

- Scalability
- High Availability
- Pay-as-you-go efficiency
- Data access any time, any where
- Predictable cost structure
- Operational efficiency

Scalable

Cost efficient

Flexible

Cloud - What do we do?

- Business users view this as a way to change their consumption model
- Move to the cloud those apps that are our core
- We view as *another* Sourcing opportunity
- Data center capacity constraints can be avoided
- We challenge every asset refresh and new project
- We actively review our portfolio for core/context applications

Developed a Scorecard

Example: Application Viability Evaluation for the Cloud

Target Application for Evaluation		Attribultes		
		Integration	Core	IP
	SharePoint	15	10	30
	Email	15	20	25
	WebMeeting	0	5	10
	Instant Messaging	0	15	15
	AutoSupport ™	50	70	90

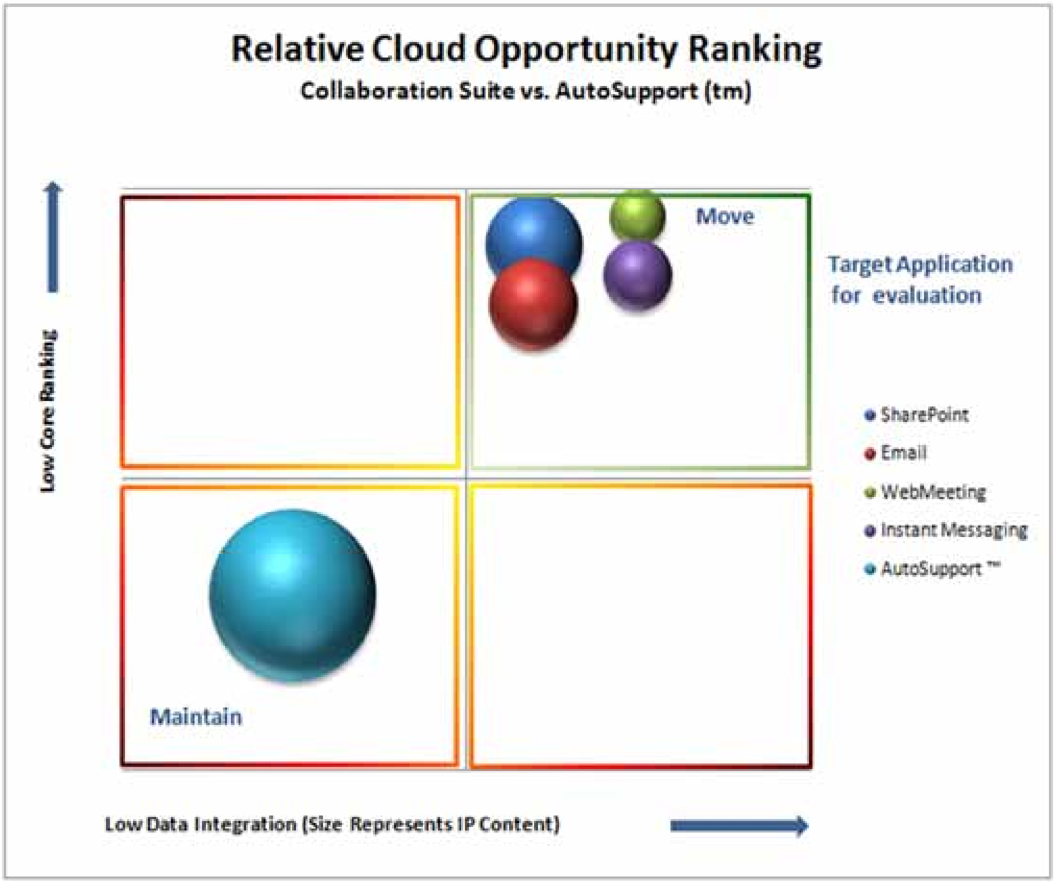
Instructions

Integration describes how much integration with other applications is required for the applicaton to run. A higher number is a contraindication for moving to the cloud.
Core describes how closely the application aligns wiht the the core of your business. A higher number is a contraindication for moving to the cloud.
IP is a measure of the sesativity of the data in the application. A higher number is a contra indication for moving to the cloud.

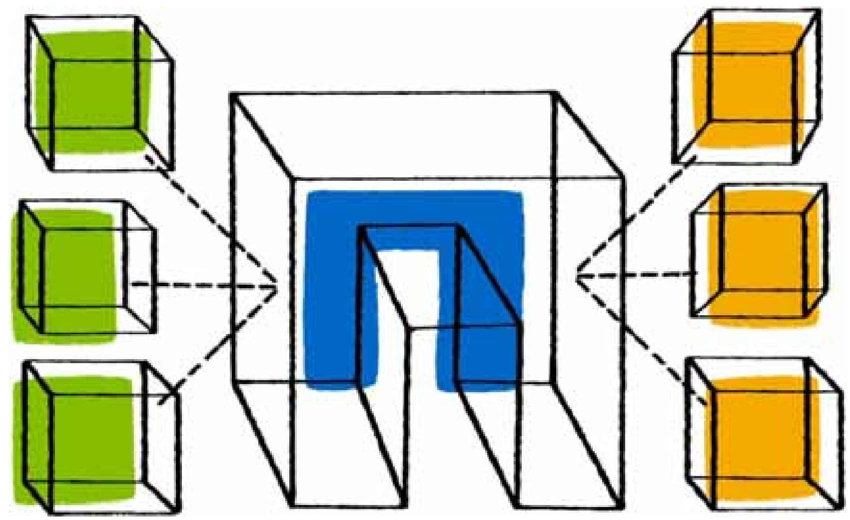
All scores are 0-100.

Small bubbles in the Upper right corner are low risk, easy execution opportunities. Big bubbles indicate higher risk. Low and to the left indicate high complexity.

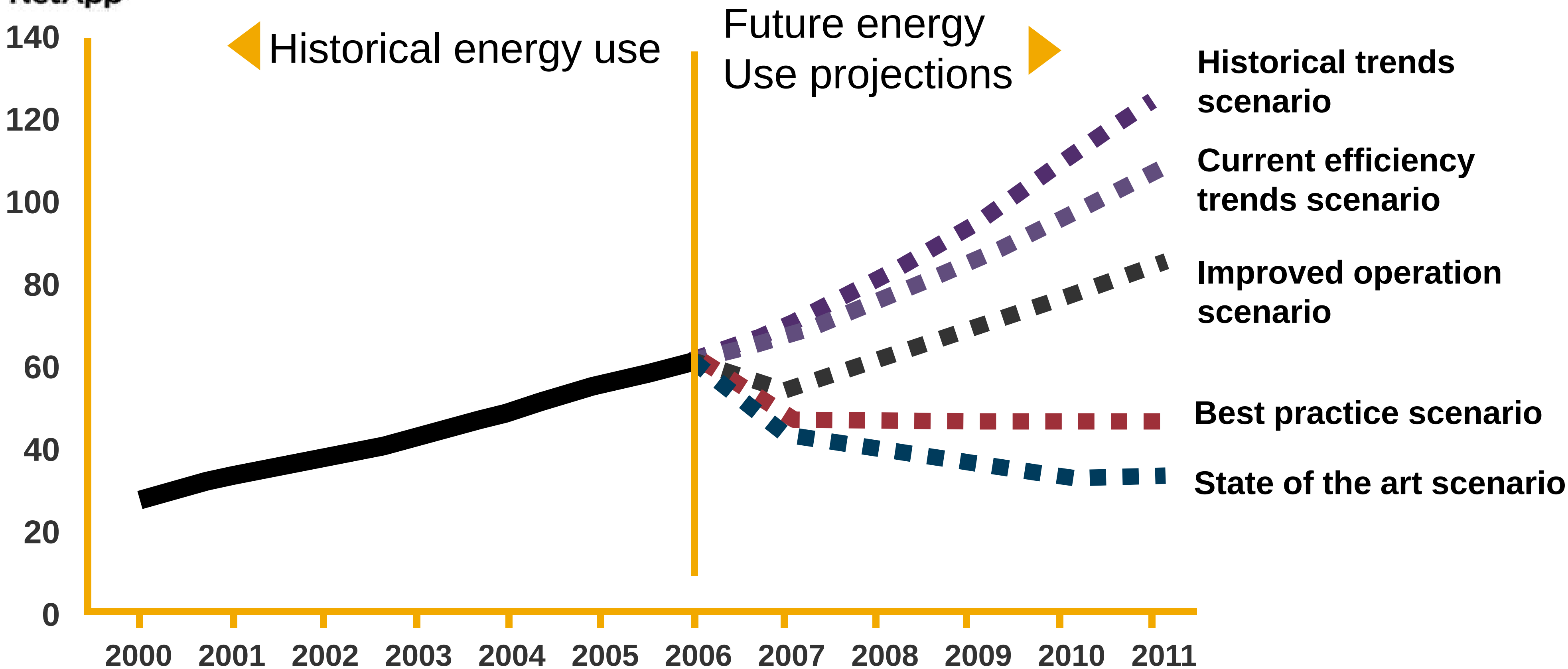
These measurements are relative to the consumers motivation for moving to the cloud. Typically, that means a drive to move to a more dynamic cost model and a away from committing capital to IT.



Closing Thoughts



The Power Challenge



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Pacific Gas & Electric Rebate Check(s)

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WARNING - THIS DOCUMENT CONTAINS A VOID PANTOGRAPH, COLORED BACKGROUND AND WATERMARK ON THE BACK

Pacific Gas and Electric Company
77 Beale Street,
San Francisco, CA

BNY Mellon WCS
Everett, MA 02149
53-292
113

Date: 10/31/2008 Check No. 1842867 Pay $*****1,427,477.00*

*ONE MILLION FOUR HUNDRED TWENTY-SEVEN THOUSAND FOUR HUNDRED SEVENTY-SEVEN*********** AND 00/100 DOLLARS

To The Order Of

NETAPP INC
495 E JAVA DR
SUNNYVALE CA 94089

CEER ACCOUNTS PAYABLE

VP-FINANCE and CFO

ASSISTANT TREASURER

VOID AFTER 90 DAYS

9011208

0001842867 011302920 059978

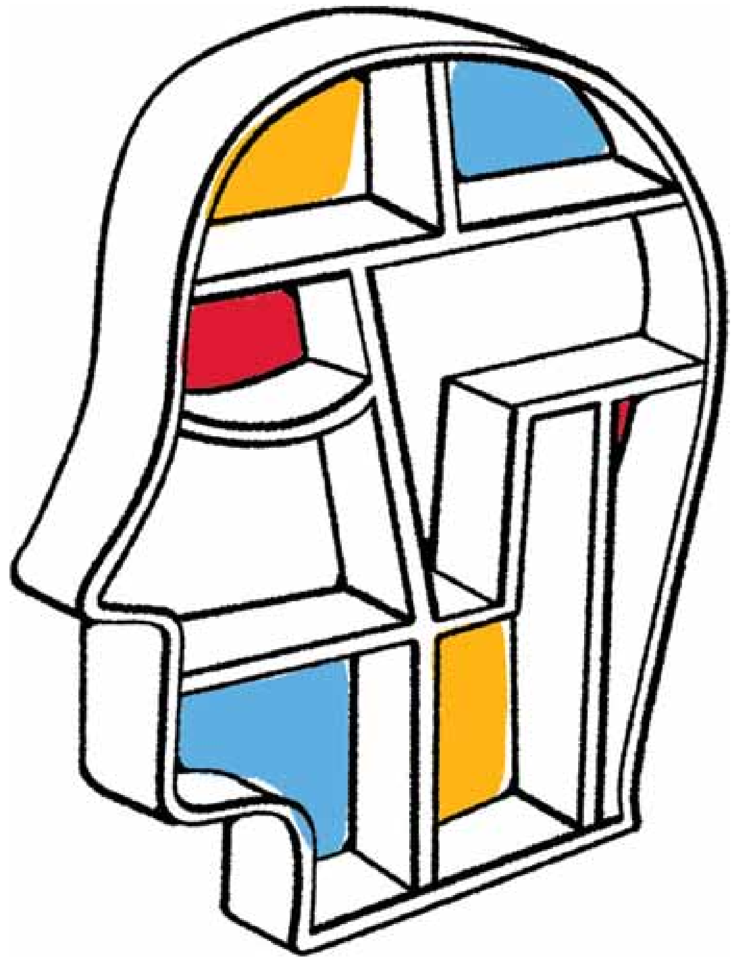
- **2009**: NetApp received a total of $2.2 million in energy rebates and incentives

OPPORTUNITY for Consolidation In Louisiana

- Cost & Resource savings
- Increase speed of delivering citizen and student services by improving Test/dev to production
- Only consume what you need, when you need it, at a reasonable cost
- Your data is secure and protected

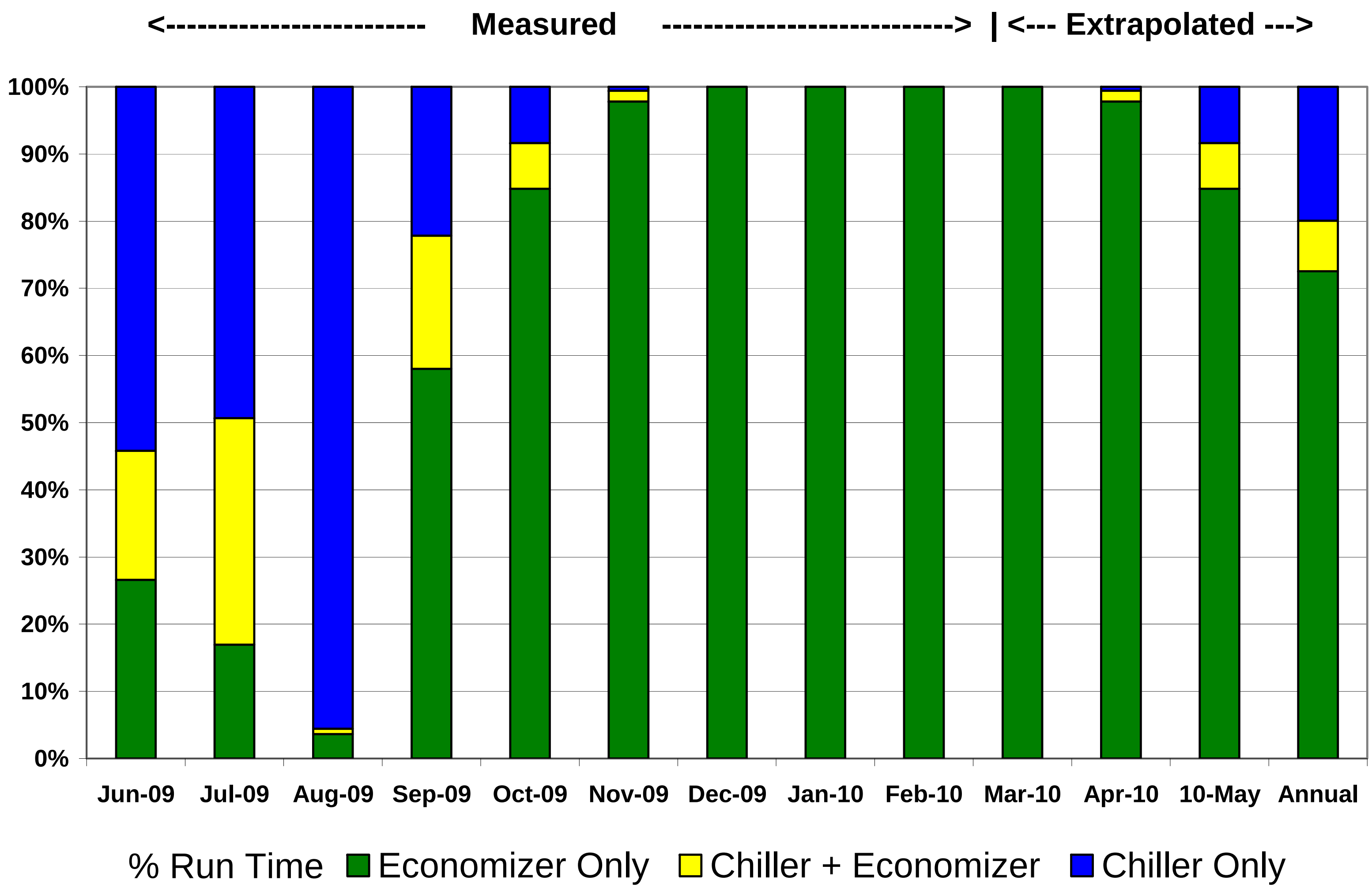
Data center consolidation requires a change in mind set of “my goal is to survive” to look at it as “an opportunity to increase my capabilities”

Go further, faster®

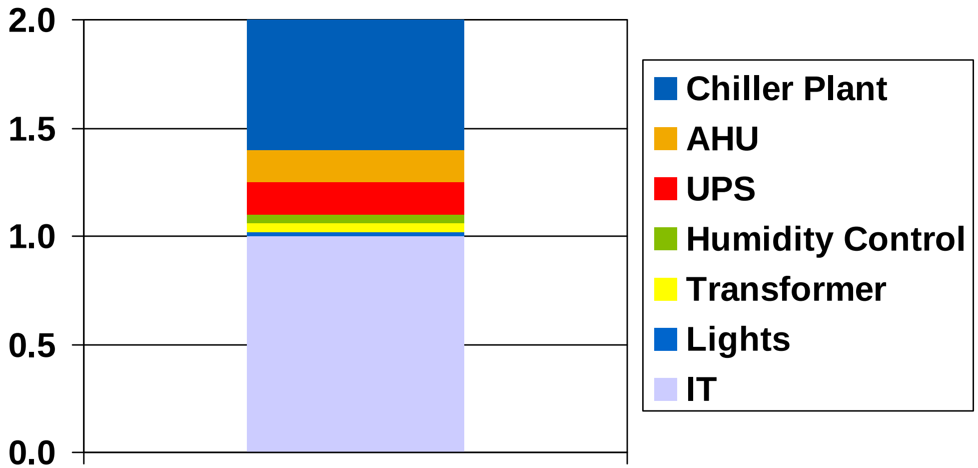


Thank You
Thoughts?

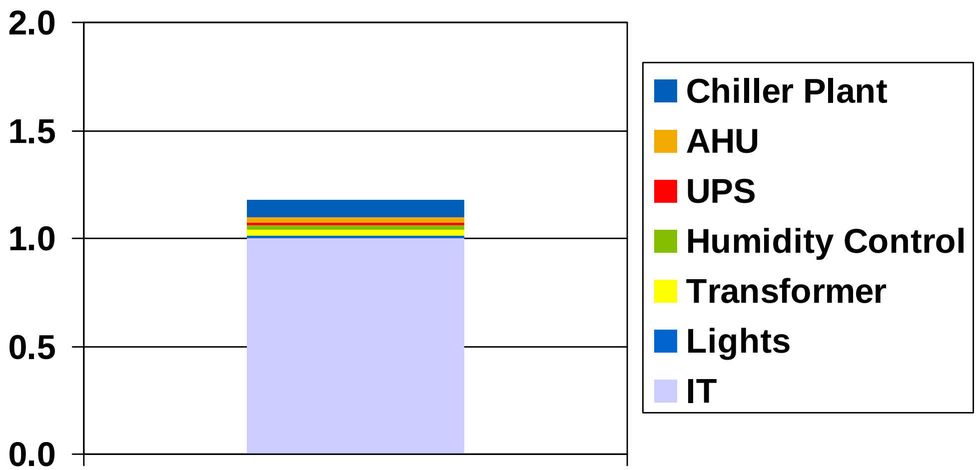
Actual Performance: Free Cooling



Measuring Data Center Efficiency with PUE



Typical 2.0 PUE



1.2 PUE (Annualized)

- Power Usage Effectiveness (PUE) ratio cited as the data center infrastructure efficiency metric
  - Total power / IT equipment power
  - Infrastructure systems account for half of total energy in data centers
  - Typical data center PUE = 2.0
  - Lower the number the more efficient

- NetApp RTP Building 4, predicted PUE = 1.2

State-of-the-Art Data Center	2009	2010	2011
EPA assumed PUE ratio	1.67	1.56	1.45