



Changing The Way Companies Run Their Data Centers



Managing Today's Data Center

Avoiding the Impending Crisis

Organizations Cannot Meet Future Demands Without Changing the Way They Run Their Data Centers

Over the next five years power failures and limits on power availability will halt data center operations at more than 90% of all companies – AFCOM (DCI)

By 2008, 50% of Data Centers will have insufficient power and cooling capacity to meet the demands of high density equipment – Gartner

IDC and Gartner predict that power and cooling spending will exceed server spending within 2 years

In the past two years, 37% of data centers have run out of space, power or cooling capacity without having sufficient notice - Aperture Research Institute

Two Primary Issues

1. Addressing the Density Issue
2. Bridging the IT-Facilities Gap in Data Center Management

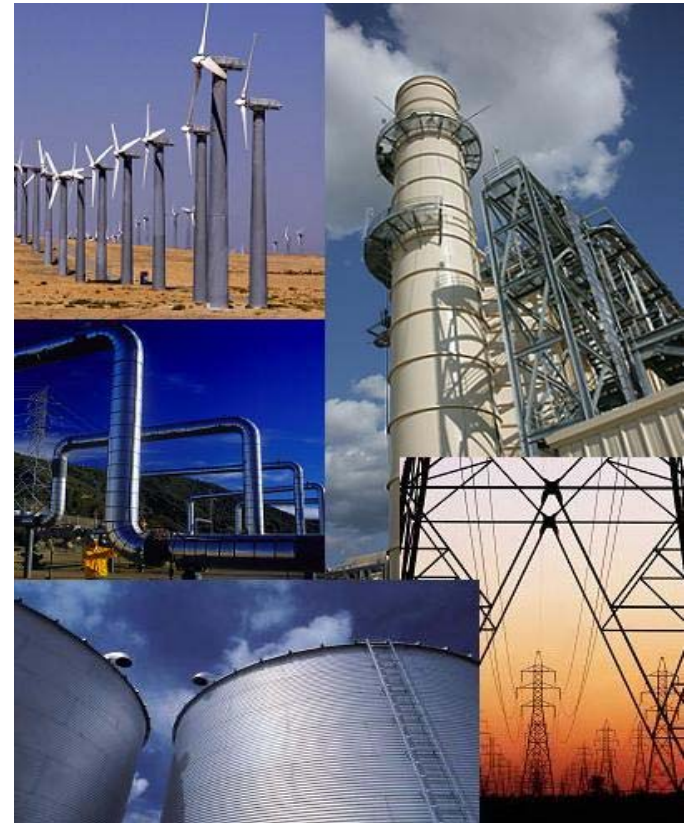


The Density Issue

Managing Power and Cooling in Today's High Density Data Center

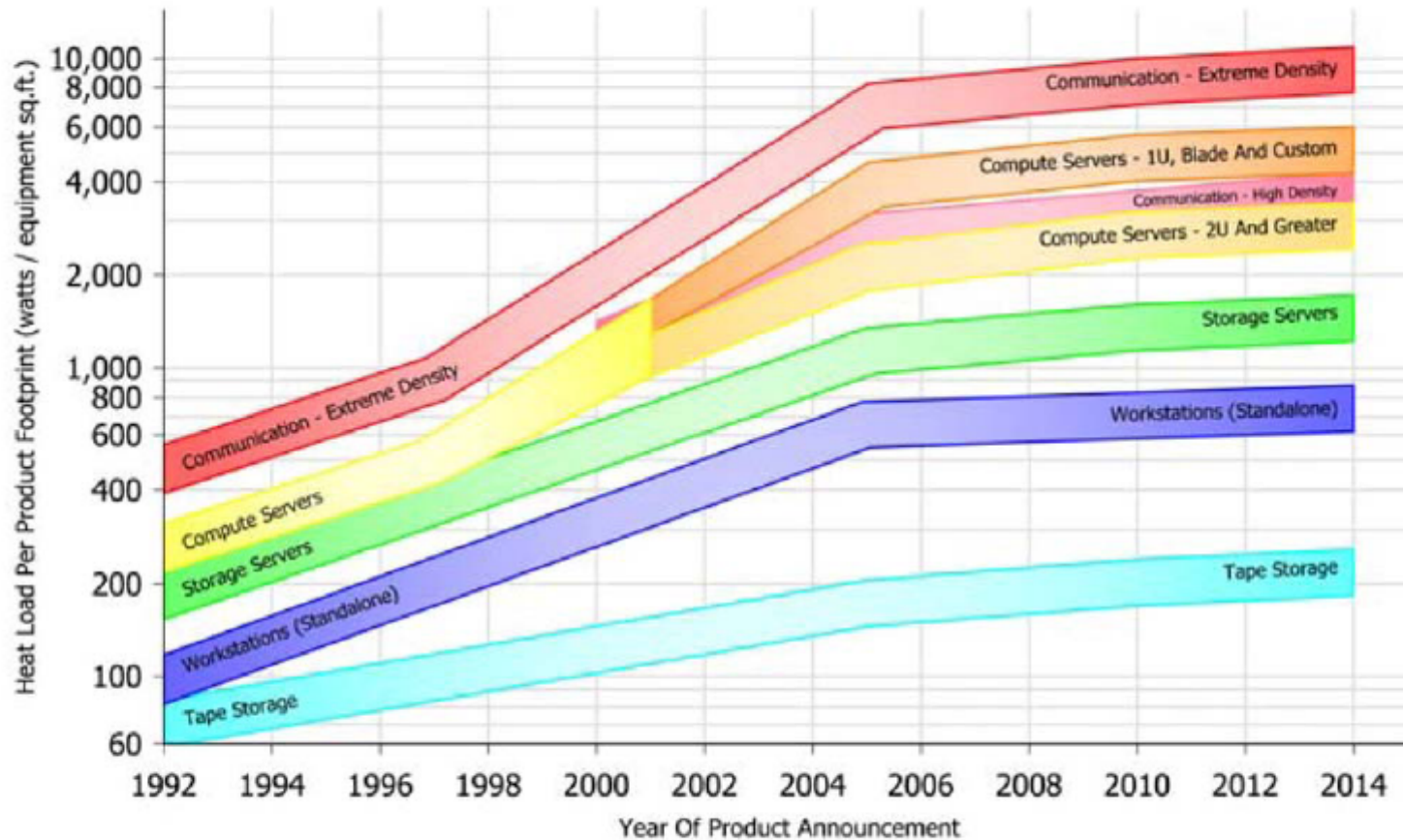
Addressing the Density Issue

- » What are the Challenges Associated with Power/Cooling Density?
- » How Dense Should Data Centers be Operated?
- » What are the Economics?
- » Will the Government Step in?



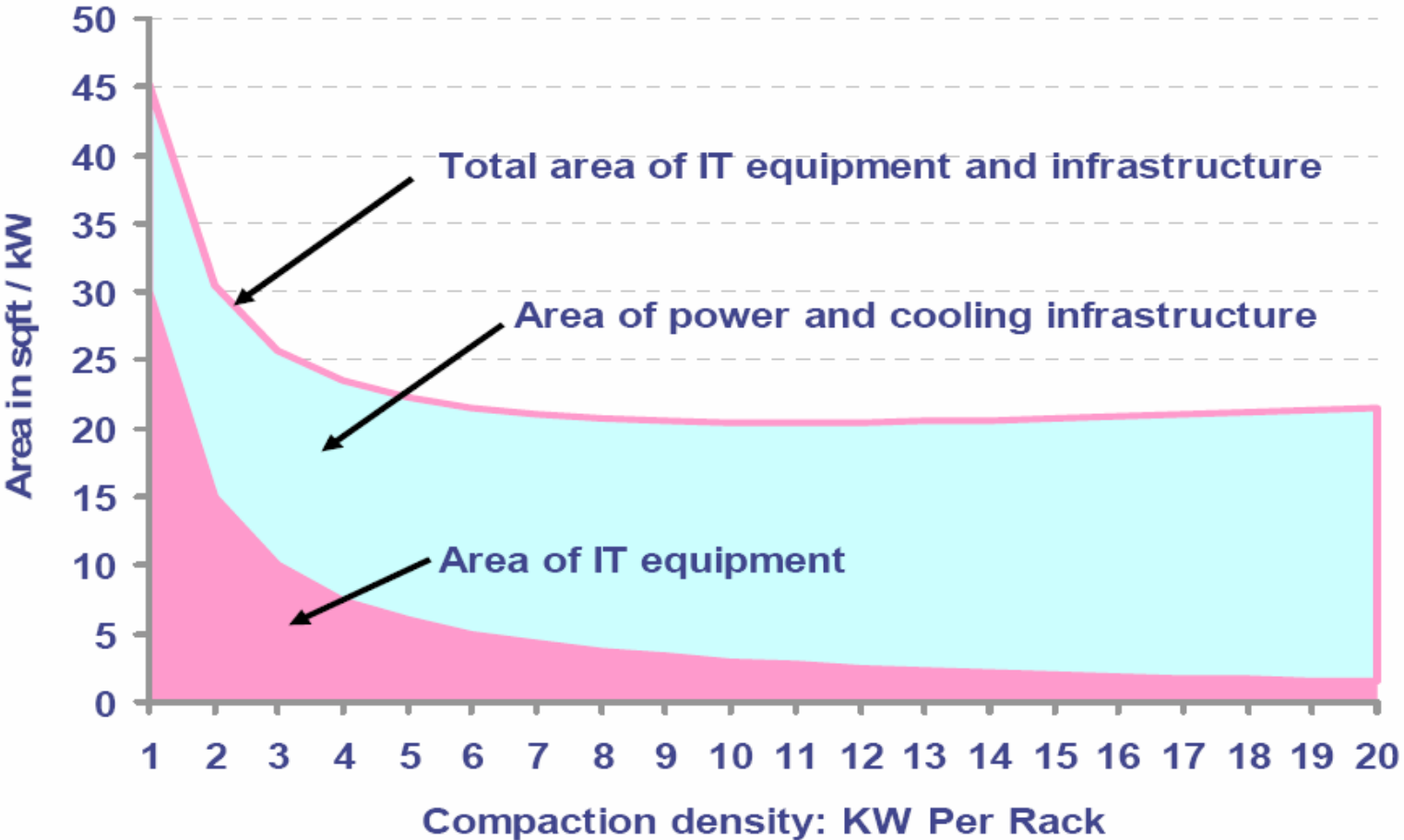
The Power and Cooling Problem

New ASHRAE Updated and Expanded Power Trend Chart (2005)



Source: ASHRAE Publication: Datacom Equipment Power trends and Cooling Applications, 2005; page 24

Impact of Density on Overall Space



Source: APC

The Economics of Power Density



Equipment Power per Rack	3 KW	6 KW	12 KW
Cooling %	60%	100%	200%
Cooling Power per Rack (KW)	1.8 KW	6 KW	24 KW
Annual Cost – Equipment Load	\$3,153	\$6,307	\$12,614
Annual Cost – Cooling Load	\$1,892	\$6,307	\$25,229
Total Annual Power Cost	\$5,045	\$12,614	\$37,843
Power Cost per Sq Ft	\$168	\$420	\$1,261
<i>Assumptions: 30 Sq Ft/Rack, \$0.12 per KW Hour</i>			

Source: Gartner

Recommendations: Addressing the Density Issue Aperture®

- » Determine What is Best for Your Organization
 - Work with the Business
 - Everything is About Economics
- » Apply Design Principles
 - Determine Your Rack Design Limit
- » Proactively Manage Data Center Capacity, Design and Operations

Bridging the IT-Facilities Gap

Planning and Managing Today's High Density Data Center

- » How Should the Data Center be Organized/Managed?
- » How Can Facilities and IT Communicate Better?
- » Can Process Methodologies be Leveraged in the Data Center?
- » Are There Tools Available to Help?

Data Center Management - The Human Equation



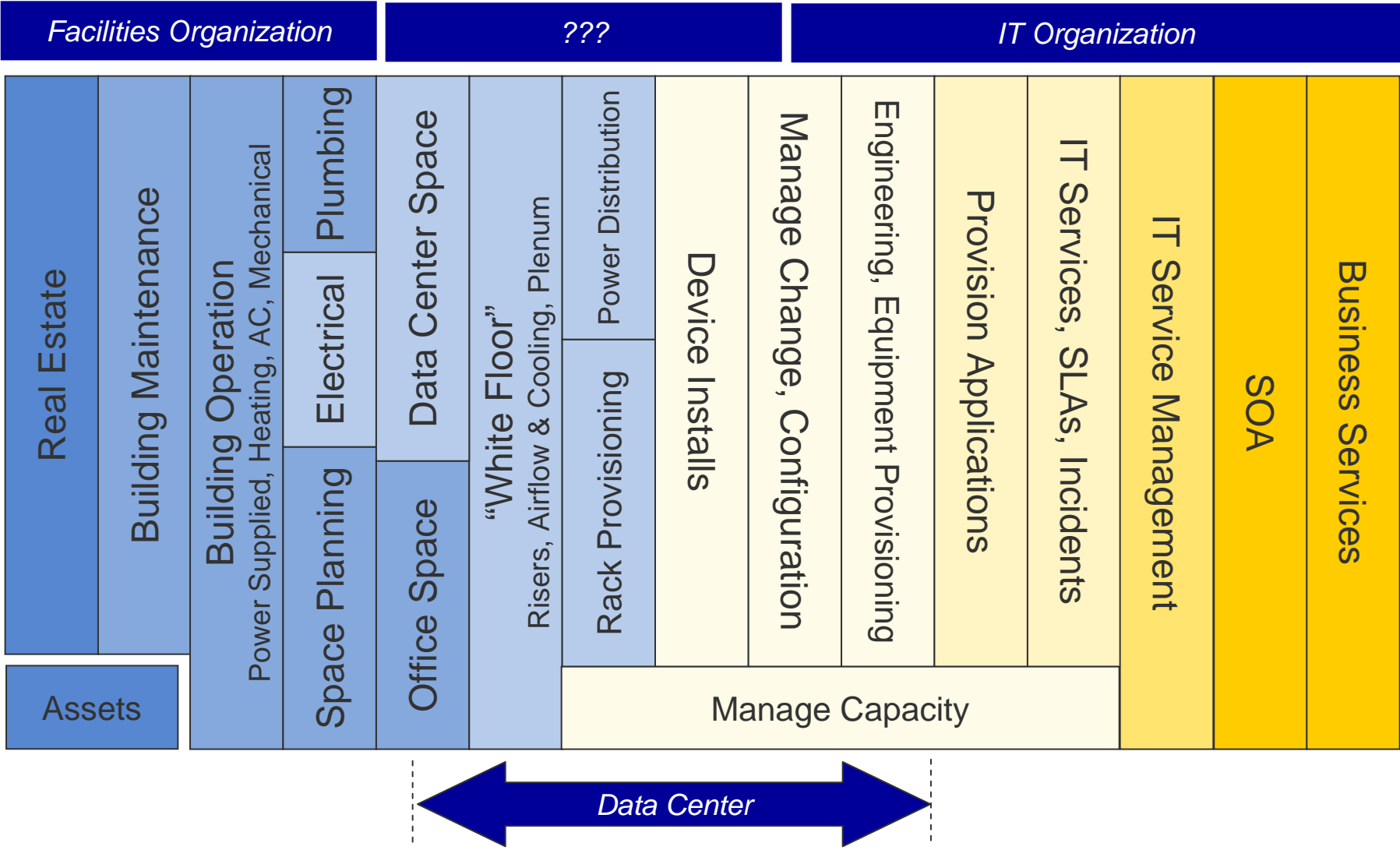
	Tier I	Tier II	Tier III	Tier IV
Building Type	Tenant	Tenant	Stand-alone	Stand-alone
Staffing	None	1 Shift	1 + Shifts	“24 by Forever”
Useable for Critical Load	100% N	100% N	90% N	90% N
Initial Gross Watts per Square Foot (W/ft²) (typical)	20-30	40-50	40-60	50-80
Ultimate Gross W/ft² (typical)	20-30	40-50	100-150 ^{1,2,3}	150+ ^{1,2}
Uninterruptible Cooling	None	None	Maybe	Yes
Support Space to Raised-Floor Ratio	20%	30%	80-90% ²	100+%
Raised-Floor Height (typical)	12”	18”	30-36” ²	30-36” ²
Floor Loading lbs/ft² (typical)	85	100	150	150
Utility Voltage (typical)	208, 480	208, 480	12-15 kV ²	12-15 kV ²
Single Points-of Failure	Many + human error	Many + human error	Some + human error	None + human error
Annual Site-Caused IT Downtime (actuals)	28.8 hours	22.0 hours	1.6 hours	0.4 hours
Site Availability	99.671%	99.749%	99.982%	99.995%
Months to Implement	3	3-6	15-20	15-20
Year First Deployed	1965	1970	1985	1995
Construction Cost (± 30%)^{1,2,3}				
Raised Floor	\$220/ft ²	\$220/ft ²	\$220/ft ²	\$220/ft ²
Useable UPS Output	\$10,000/kW	\$11,000/kW	\$20,000/kW	\$22,000/kW

¹ 100 W/ft² maximum for air-cooling over large areas, water or alternate cooling methods greater than 100 W/ft² (added cost excluded).

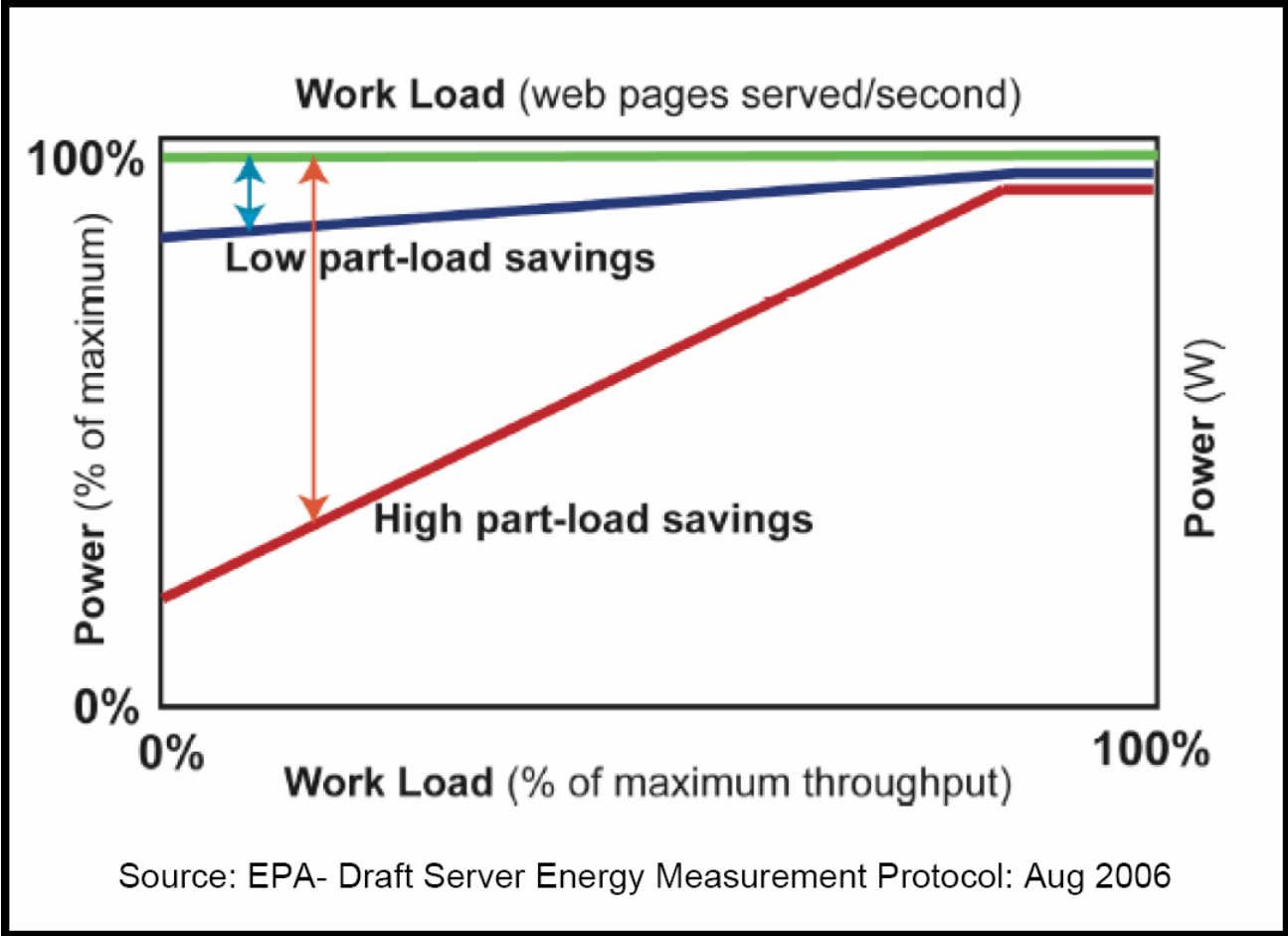
² Greater W/ft² densities require greater support space (100% at 100 W/ft² and up to 2 or more times at greater densities), higher raised floor, and, if required over large areas, medium voltage service entrance.

³ Excludes land; architectural, engineering, and commissioning fees; permits and other fees; interest; and abnormal civil costs. These can be several million dollars. Assumes minimum of 15,000 ft² of raised floor, architecturally plain, one-story building, with power backbone sized to achieve ultimate capacity with installation of additional components or systems. Make adjustments for NYC, Chicago, and other high cost areas.

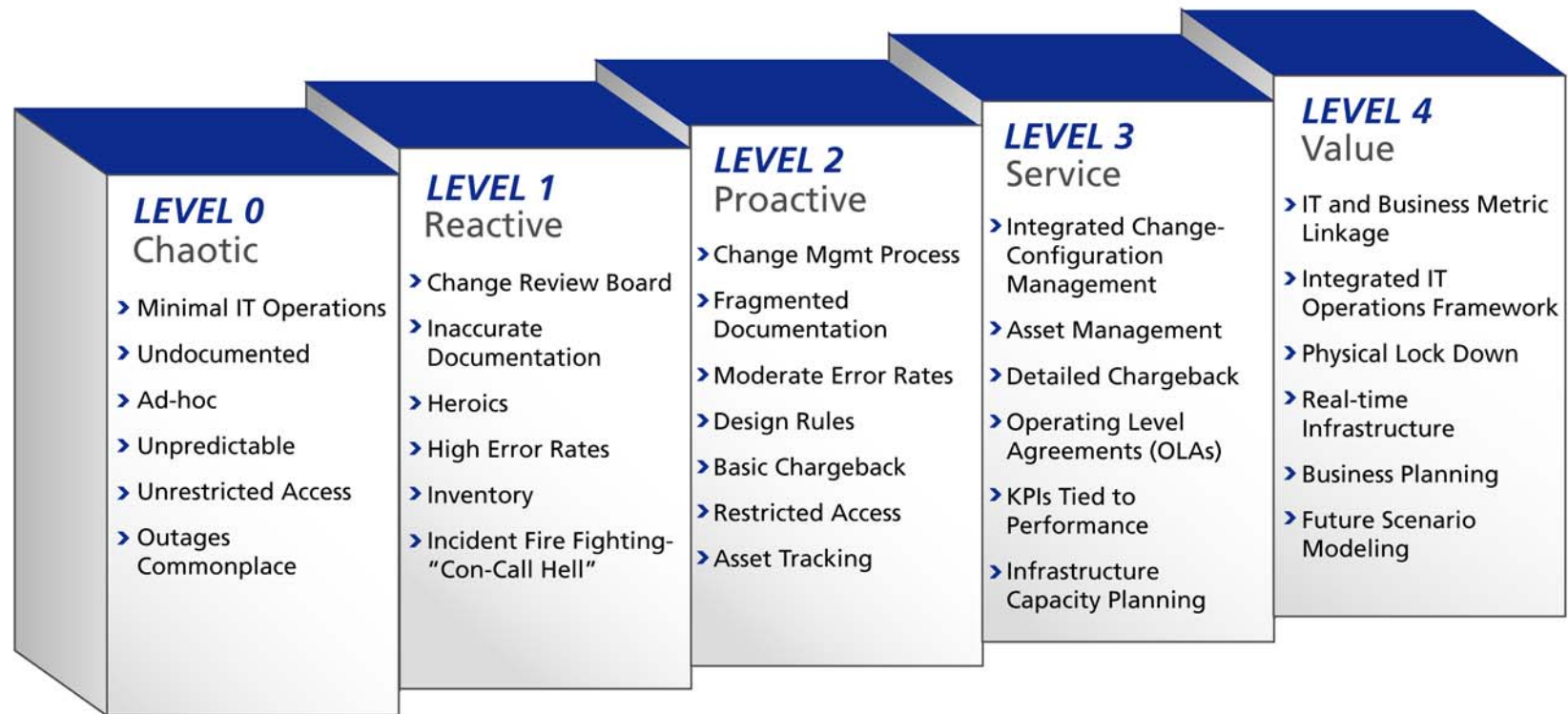
The Market Challenge



Virtualization Still Impacts the Data Center



Immature Processes are Inadequate

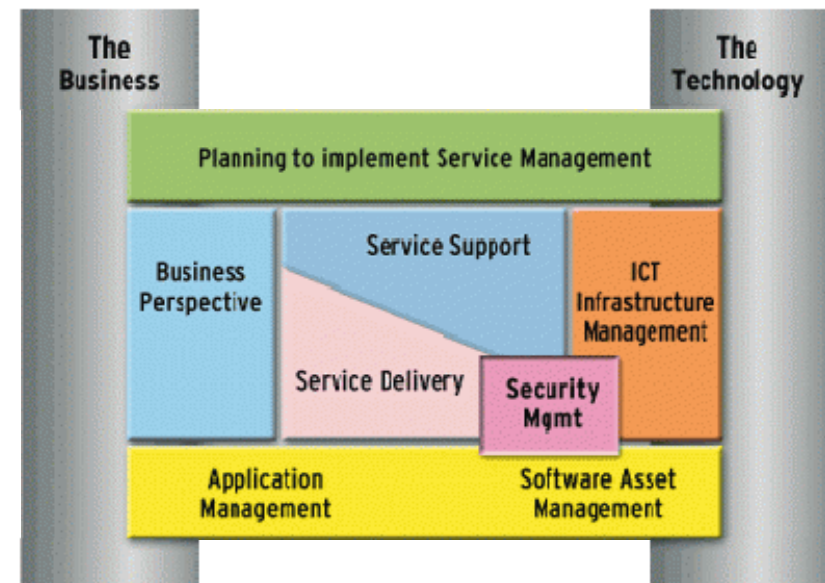


» Service Delivery

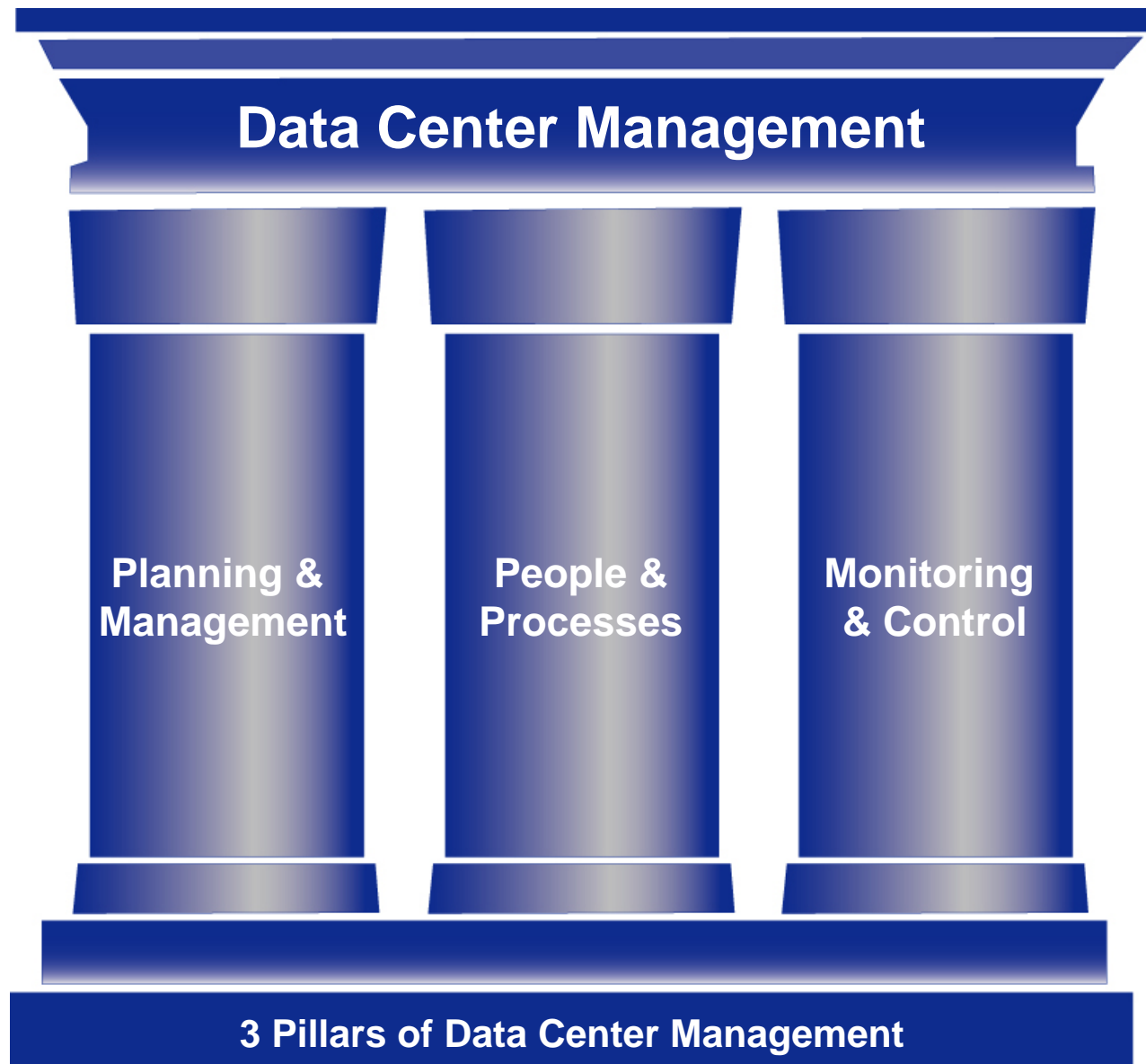
- Service Level Management
- Availability Management
- IT Service Continuity Management
- Capacity Management
- Financial Management for IT Services

» Service Support

- Incident Management and Service Desk
- Problem Management
- Configuration Management
- Change Management
- Release Management



- » This is an Operational Issue
 - Don't Stop after the Facility is Built
- » Institute IT Service Management Processes Across IT-Facilities
 - IT-Facilities Process Integration
- » Leverage Enterprise Systems to Improve Management
 - Completely Integrate Facilities with IT



Aperture is the leading global provider of software for managing the physical infrastructure of data centers



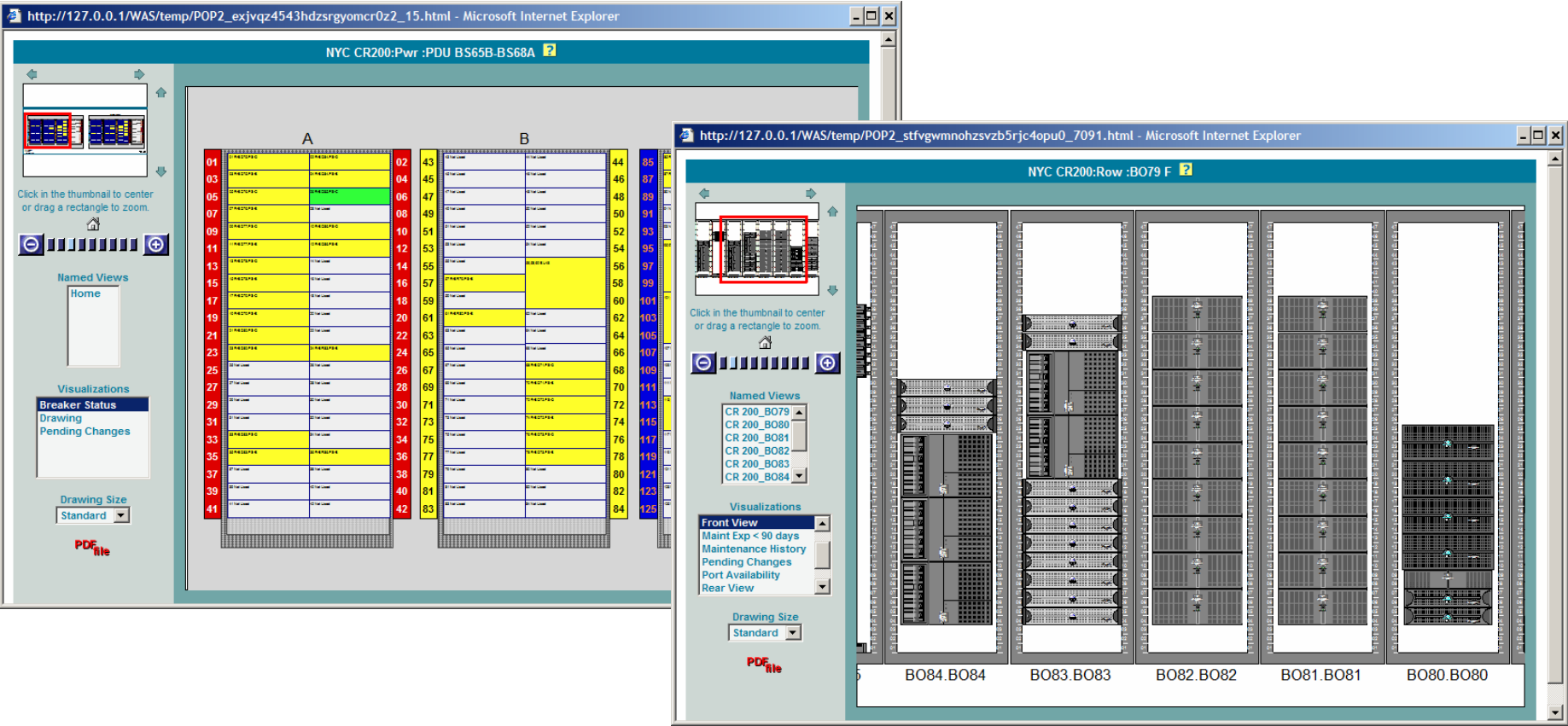
- » Founded in 1987
- » Over 20 years of Data Center Experience
- » Over 120 VISTA Customers, Over Half in Fortune 1000/Global 500
- » FY07 Record Revenue
- » Acquired The Advantage Group in July 2007
- » Headquarters in Stamford, CT; European Headquarters in London
- » New Offices in Atlanta, Boston, Phoenix, Raleigh, Philadelphia and Toronto

The industry's only complete vendor-independent, holistic solution to the most challenging and complex data center management issues

- » Aperture VISTA combines modeling of the entire data center physical environment with best practice process management for infrastructure changes
- » Aperture VISTA Capacity Management enables proactive management of critical infrastructure resources
- » The Advantage Group's Enterprise Device Manager provides vendor-independent, real-time monitoring of key infrastructure components with intelligent alarm processing and event logging
- » The combination supports every aspect of data center management through the entire lifecycle of planning, provisioning, operating and decommissioning of physical assets

» Data Center Infrastructure Management

- Equipment, Space, Power, Cooling, Network/Storage Connectivity



Integrated Change and Configuration

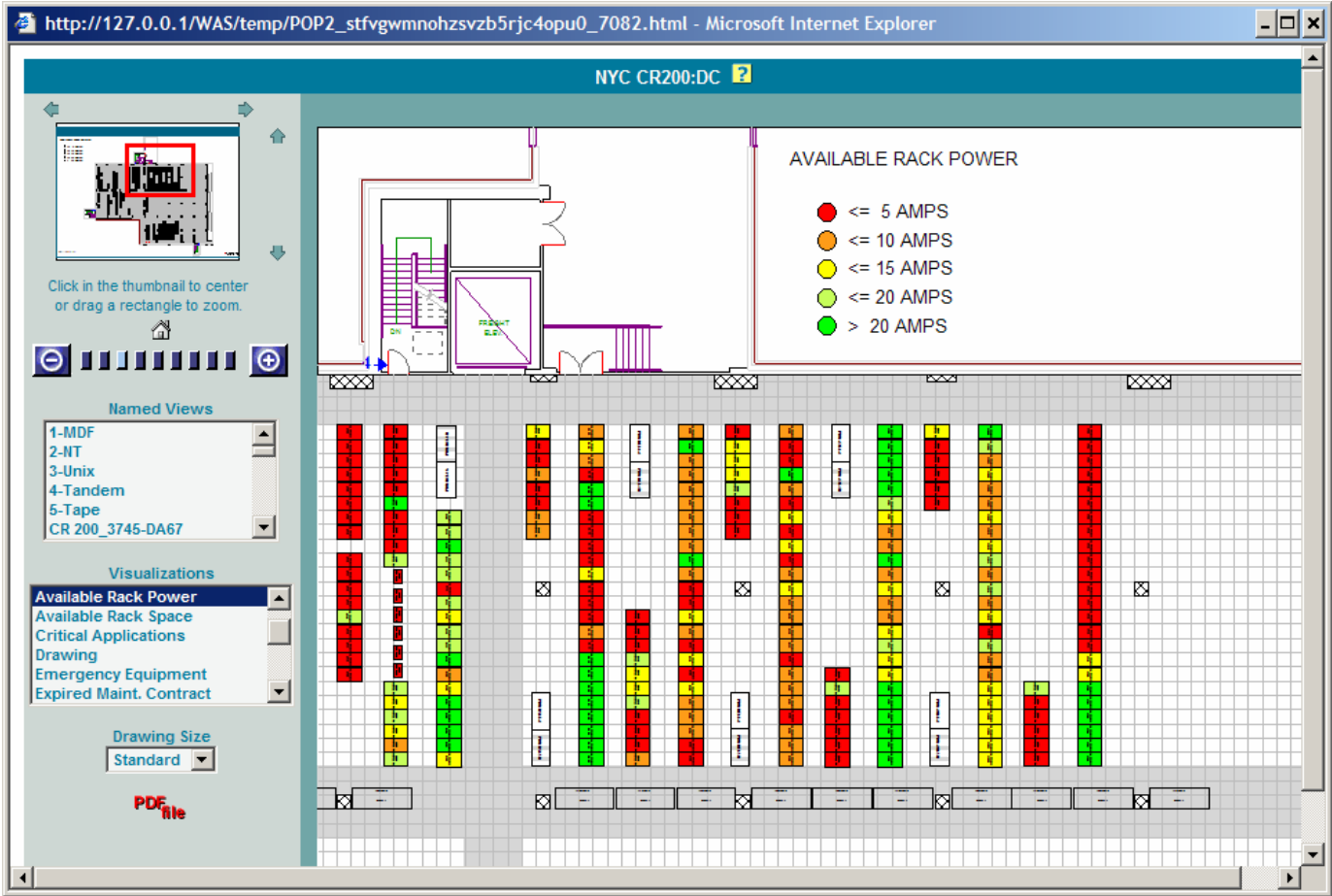
The screenshot displays the Aperture VISTA web application interface. The left sidebar contains a navigation menu with items such as Request List, Data Center Reports, Work Process Reports, Map Drawings, Data Center Portfolio, Locate, Outage Analysis, Documents, Document Repository, Add / Remove, Equipment, Update Information, Help, User Administration, Content Management, Development, Portal Configuration, Shelly's Info, and Login as someone else.

The main content area is divided into several sections:

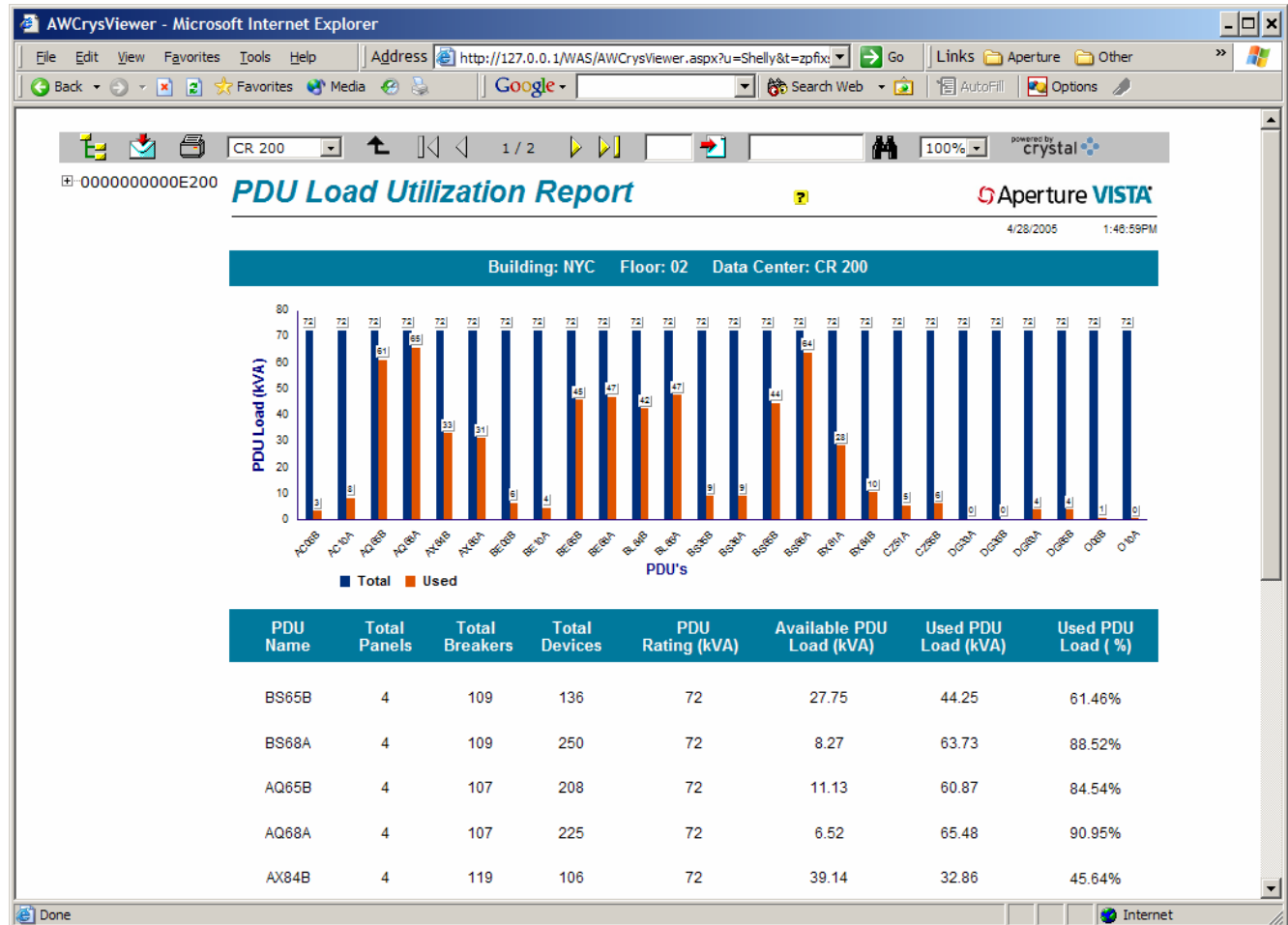
- Installation Information:** Includes fields for Proposed Installation Date, Urgent Request (Yes/No), Power Provisioning (Yes/No), Network Provisioning (Yes/No), and Storage Provisioning (Yes/No).
- Preferred Location:** Includes fields for Building (NYC), Floor (02), and View (NYC CR200.DC), along with buttons for Select Data Center and Show Data Center Drawing.
- Project Information:** Includes fields for Project Name, Cost Center, Cost Center Manager, and Project Comments.
- Supporting Documentation:** Includes an Upload a file section with a Browse... button and an Attached files section showing a file named Diagram.ppt (Uploaded: 1/20/2006 1:05:25 PM).
- Devices:** A table listing device details.
- Subforms:** A table listing subform details.

The right side of the interface shows a floor plan diagram of a server rack labeled NYC CR200:Row :B079 F. The diagram shows a grid of server racks with various components and connections. Below the diagram, the following labels are visible: 85.B085, B084.B084, B083.B083, B082.B082, B081.B081, and B080.B080.

Rack Level Analysis



Reporting and Analysis



Dashboard View into Key Capacity Metrics



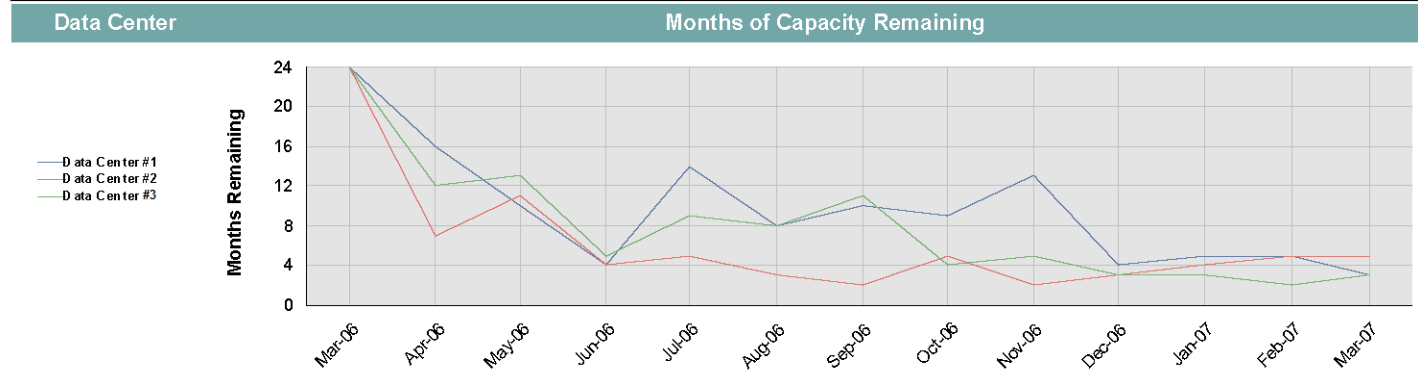
Data Center Capacity Change (February 01, 2007 - March 01, 2007)

Aperture VISTA

04/02/2007 11:21:58PM

Data Center	% Used and Change from Last Month											
	Floor Space (Raised Floor)		Rack Space (RU)		Power (Supplied)		Breaker Positions		Copper Ports (On Switches)		Fiber Ports (On Switches)	
Data Center #1	46.15%	-10.38%	41.00%	+1.00%	68.00%	+1.64%	73.33%	+8.33%	70.00%	+5.00%	47.00%	+3.50%
Data Center #2	41.67%	+5.00%	14.17%	+0.83%	48.00%	+2.75%	76.67%	+5.00%	70.00%	+5.00%	91.00%	+1.00%
Data Center #3	70.00%	+10.00%	91.20%	+0.70%	90.00%	+2.10%	25.00%	+1.67%	74.50%	+5.50%	70.33%	+5.33%

Data Center	Data Center Metrics									
	Total Available Floor Space (SqFt)		Total Racks and Cabinets		Total Servers		Total Equipment Installs		Total Available Power (kWatts)	
Data Center #1	700	+135	38	+3	160	+13	310	+25	8.000	-0.411
Data Center #2	1,750	-150	53	+4	279	+22	315	+25	10.400	-0.550
Data Center #3	300	-100	25	+2	120	+20	200	+15	1.000	-0.210



Aperture VISTA

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Note: These legends belong to the first table in this report.

■ Critical Level
■ Warning Level

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Automated Monitoring of the Data Center



US Chicago View : Floor 1 Status

Warehouse Data Center Electrical UPS Command Center

Import data center layout

THE ADVANTAGE GROUP

Home Logs & Reports Setup Help Logout

Device Layout Device List Device Search

View : Advantage Group Status

Device Summary

Critical	3
Warning	5
Unreachable	0
Maintenance	0
Normal	44
Display Only	1

STL NOC
9 Device(s)

Enviro Watch : Temperature A Low Control Limit Alarm
Temperature A is below the low control limit.

Current Mode: Monitor
Monitor Set

Prev 1 / 13 Next

Clear Event
Clear All

Control



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