

The IBM Data Center Family® - IBMs answer on today's increasing challenges on energy efficiency, modularity, scalability and cost effectiveness

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agenda

1	Today's challenges – The data center tipping point
2	The IBM Data Center Family ® Scalable Modular Data Center – Enterprise Modular Data Center – Portable Modular Data Center – High Density Zone
3	Reference of a Data Center Family Solution: KICA Leiner SMDC

Key messages



- Energy efficiency is a global issue with impact today – and will have a greater impact in the future
- Energy efficiency is a key metric to optimize IT operational efficiency
- Simple actions can yield significant cost savings
- We are deploying solutions with clients and within IBM
- We can help you determine how to get started

Facing new pressures: data centers are at a tipping point

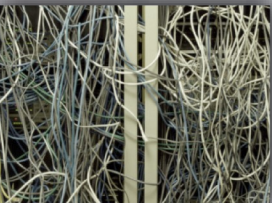
According to Gartner, “50 percent of current data centers will have insufficient power and cooling capacity to meet the demands of high-density equipment.”¹



Increased computing demand



Changing cost dynamics



Data center lifecycle mismatch

Energy usage is a common theme impacting IT capability.

1. Gartner, *Data Center Power and Cooling Challenge*, Gartner 25th Annual Data Center Conference presentation, Michael A. Bell, December 2006.

Increased computing demand—its impact on energy usage

According to Gartner, “The underlying consumption of energy in large data centers to power and cool hardware infrastructure is likely to increase steadily during the next ten years.”²



Increased computing demand

Low-cost, scalable technologies drive opportunity for new applications—server installed base is expected to increase.



Changing cost dynamics

Regulatory actions drive the need for resiliency with the Sarbanes-Oxley Act, the Health Insurance Portability and Accountability Act (HIPAA) and Basel II.



Data center lifecycle mismatch

In the next decade, server shipments will multiply by 6, while storage will multiply by 69.

—IBM/consultant studies

2. Gartner, *Data Center Power and Cooling Scenario Through 2015*, Rakesh Kumar, March 2007.

Changing cost dynamics—the impact of rising energy usage

“... If current trends continue till 2012, best-case estimates show that powering and cooling a server will cost three times as much as purchasing the hardware.”³



Increased computing demand

Per square meter, data center energy costs are 10 to 30 times those of typical office buildings.⁴



Changing cost dynamics

Reducing enterprise costs is now the #2 CIO priority in 2009.



Data center lifecycle mismatch

Global electricity prices are increasing 10-25% per year.

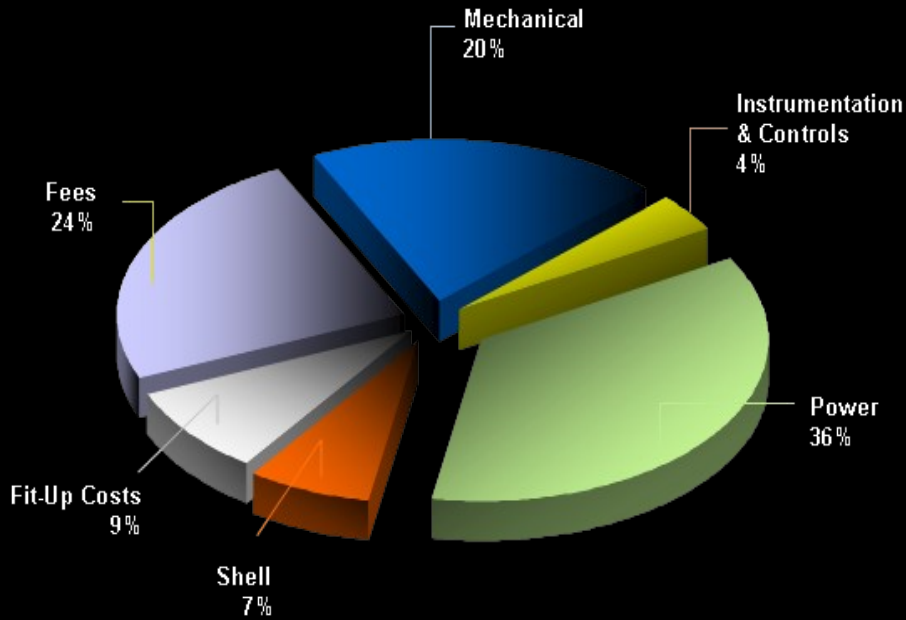
Data center operating costs are 3-5 times the capital costs over 20 years.

3. Munir Kotadia and Ella Morton, “Moore’s Law can’t stand the heat,” *ZDNetAustralia*, April 26, 2007, <http://www.zdnet.com.au/insight/hardware/soa/Moore-s-Law-can-t-stand-the-heat/0,139023759,339275034,00.htm>; The Uptime Institute, *Data Center Energy Efficiency and Productivity*, Kenneth Brill, January 2007.
4. William Tshudi, Evan Mills, Steve Greenberg, Lawrence Berkeley National Laboratory and Peter Rumsey, “Measuring and Managing Data Center Energy Use: Findings—and resulting best practices—from a study of energy use in 22 data centers,” *HPAC Engineering*, March 2006.
5. Gartner, Meeting the Challenge: the 2009 CIO agenda, December 2008
6. Energy Information Administration, 2001-2008; IBM analysis

Data Center Challenges (COST) – Design new infrastructure to be responsive to change

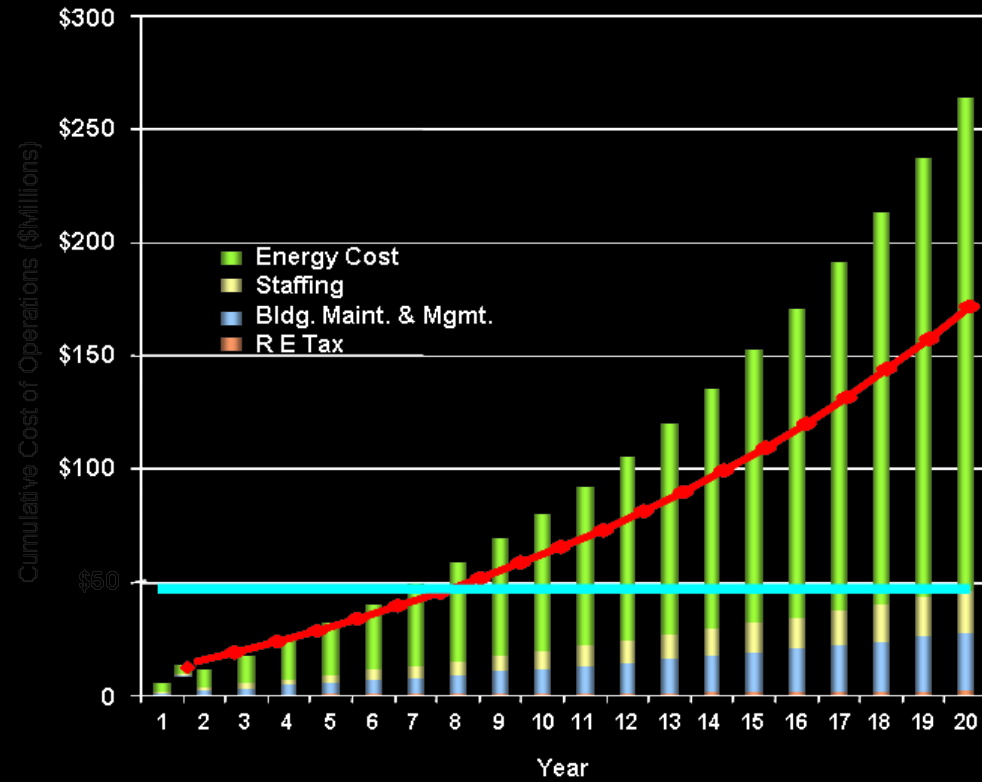
Data Center capital costs

60% costs from energy related components



Data Center operating costs

75% costs from energy use



Source: IBM Estimates

Source: IBM Estimates, \$50 Million DC

Lifecycle mismatch—the impact of rising energy usage

Eighty-seven percent of data centers were built before 2001.⁷



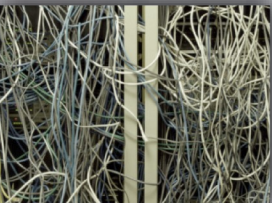
Increased computing demand

New, low-cost technologies such as blades consume 20 to 30 kilowatts (kW) of power per rack, when the average data center is designed to support 2 to 3 kW per rack.⁸



Changing cost dynamics

Twenty-nine percent of organizations surveyed said power and cooling issues have affected server purchases.⁹



Data center lifecycle mismatch

Clients identify power or cooling as the most significant problem they face.¹⁰

Fifty-seven percent of organizations surveyed indicated they planned data center consolidations in the next 12 months; 49 percent planned to build new data centers in the next 18 months.¹¹

7. Nemertes Research, *Architecting and Managing the 21st Century Data Center*, Johna Till Johnson, president and senior founding partner at the IT: Roadmap, Boston conference in 2006.

8. Based on IBM experience.

9. Ziff Davis Media, *Power Consumption and Cooling in the Data Center: A Survey*, November 2005.

10. Based on IBM experience.

11. Nemertes Research, *Architecting and Managing the 21st Century Data Center*.

Data centers are at a tipping point and energy costs and usage are the drivers



Increased IT Demand

- Server growth 6X, Storage growth 69X this decade¹
- Average power consumption per server quadrupled from 2001-2006²
- By 2011, blades will represent 26% of all server shipments³



Changing cost pressure

- Data centers energy use doubling every 5 years³
- New data center construction costs are increasing - \$30 to \$50 Million for a 2K square meter data center
- Operating costs = 3x capital costs over 20 years

Data center lifecycle mismatch



- 78% of data centers are > 7 years old⁴
- Technology densities are growing 20x this decade⁵
- 33% of managers expect data centers to last 30 years⁶

Meet Business & IT Growth

Align capital and operating costs to provide flexibility as capacity is needed

Reduce risk by providing more available and predictable data center operations

1. IBM and Consultant Studies

• 2. Gartner, The Data Center Power and Cooling Challenge, David Cappuccio, November 2007.

3. IDC Worldwide Blade Server 2008-2011 Forecast, February 2008, IDC #210229

3. Koomey, February 2007

4. Gartner Survey Suggests Extensive Data center Expansion plans on the Horizon, G00154962, mike Chuba, February 200

5. ASHRAE (find source)

6. IDC The datacenter evolution: Technologies, Designs, People and Green, Michele Bailey, 2008

Data center actions can significantly improve costs, resiliency, and flexibility to meet changing requirements



Extend the life of an existing Data Center infrastructure

- 23% average energy savings from audits
- Up to 35% less cost to adopt new technology
- 30-70% TCO savings from virtualization
- Over 30% savings from energy efficient technology



Rationalize the Data Center infrastructure across the company

- Up to 50% reduction in operational costs



Design new infrastructure to be **responsive** to change

- Defer 40-50% capital and operational costs with a modular Data Center approach
- Save up to 50% operational costs from energy efficient design

IBM has the solution to address your data center concerns

IBM can help provide:

- An energy-efficient data center solution
- A data center solution with a design/build cost approximately 15 percent lower than that of a traditional raised-floor data center solution
- Reduced daily operating costs
- Rapid data center deployment: design/build in approximately 8 to 12 weeks
- Power and cooling capacities designed for the load
- A flexible solution that can grow as your needs grow
- A secure server environment



IBM offers a comprehensive portfolio of services to help you optimize your IT facilities around the world

IBM Data Center and Facilities Strategy Services

Helping you identify your requirements, capabilities and capacities, and define your optimal “green” and high-resiliency options

IBM IT Facilities Assessment, Design and Construction Services

Providing capabilities to design and build new data centers or improve existing ones

IBM IT Facilities Consolidation and Relocation Services

Helping you take advantage of savings and redundancy through consolidation and relocation, leveraging IBM’s local presence around the globe to help minimize risk

IBM Specialized Facilities Services

Providing leadership on design and construction requirements for state-of-the-art clean rooms, intelligent/green buildings and trading floors

Design for flexibility with modular data centers

IBM's Data Center Family® solutions align to your business and cost objectives

Scalable modular data center



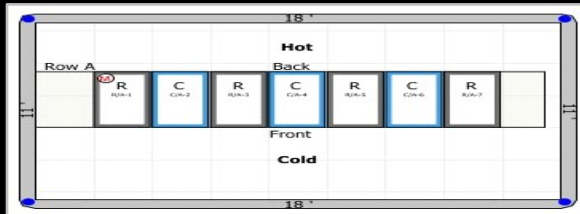
Enterprise modular data center



Portable modular data center



High density zone



- Turnkey data center for 50-250
- Standardized design in 300 up to 2500
- 20% less cost than traditional data center, multi-centers
- Designed to align with energy leadership
- 15-30% improved efficiency - 66% energy efficiency
- 25% reduction in temporary and infrastructure to support high density deployment
- 25% faster deployment than

Scalable Modular Data Center

The scalable modular data center is designed to provide conditioned power, cooling, equipment racking, security and monitoring in one comprehensive package.

APC Infrastructure and IBM Services offer a turn-key solution for small to medium environments which is fully deployed providing a highly secure and resilient Data Center infrastructure. No raised floor required.

Most of the infrastructure is within the rows of racks, helping to increase efficiency and save floor space.

SMDC Elements

Equipment Racks





- Racks for server, storage and other IT equipment
- Width: 600 mm and 750mm
- Height: 1070 mm and 1200 mm
- 19" (RoHS)
- 42 and 48 units (height)

UPS and Battery Solution

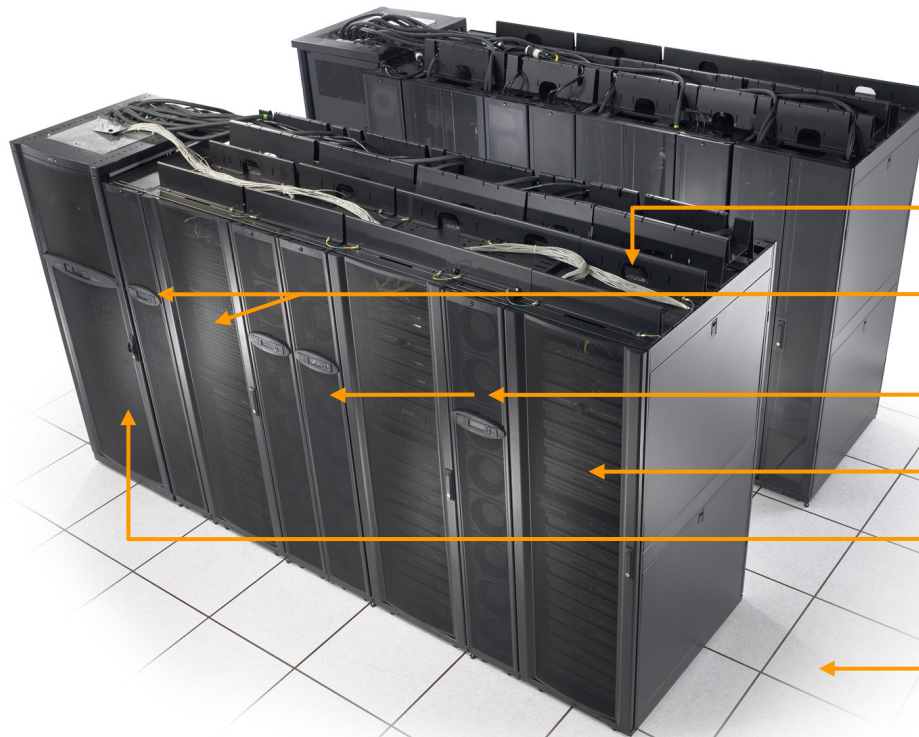
- Modular design, scalable in 10kW or 16kW steps
- Scalable during operation
- More than 90% efficiency
- Easy, fast maintenance

Cooling

- Chilled water and air cooling
- Short air flow ways
- High equipment density
- Intelligent cooling (up to 70 Kw per Rack)
- Hot aisle configuration

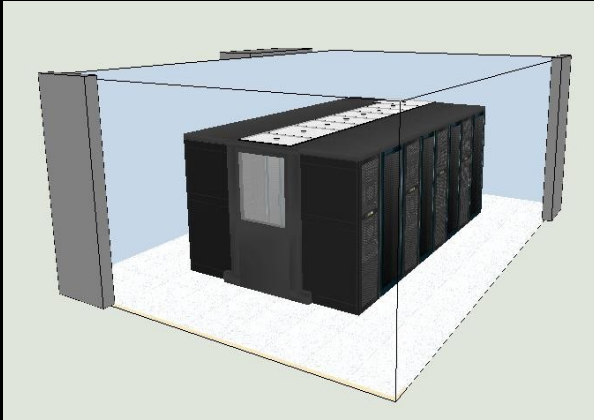
Benefits		
Cost efficiency	<ul style="list-style-type: none"> • Reduced costs for design and construction • Reduced operational costs • Highest scalability and flexibility • Up to 40 % savings in energy consumption • Helps enable rapid, cost-effective deployment in virtually any working environment 	
Energy efficiency	<ul style="list-style-type: none"> • Designed for maximum energy efficiency, including hot aisle/cold aisle configuration • Supports heat and power loads of high-density computing technologies • Optimized cooling • Holistic energy and cooling concept 	
Space efficiency	<ul style="list-style-type: none"> • Installation in almost any surrounding • No raised floor or ceiling construction • Space saving high density architecture • Easy and fast change of location 	
Time efficiency	<ul style="list-style-type: none"> • Ready to use in 8 to 12 weeks • Instantly deployable • Easy and fast scalability • Trouble-free change of location 	

With the scalable modular data center, most of the infrastructure is within the rows of racks, helping to increase efficiency and save floor space

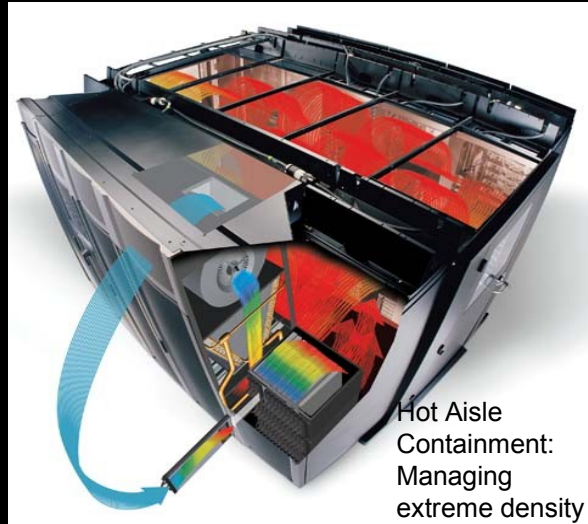


- Cabling
- Uninterruptible power supply (UPS)/batteries
- In-row cooling
- Equipment racks
- UPS power distribution/bypass
- Non-raised-floor environment

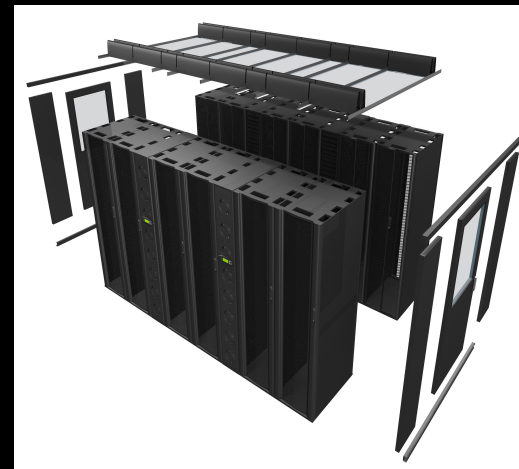
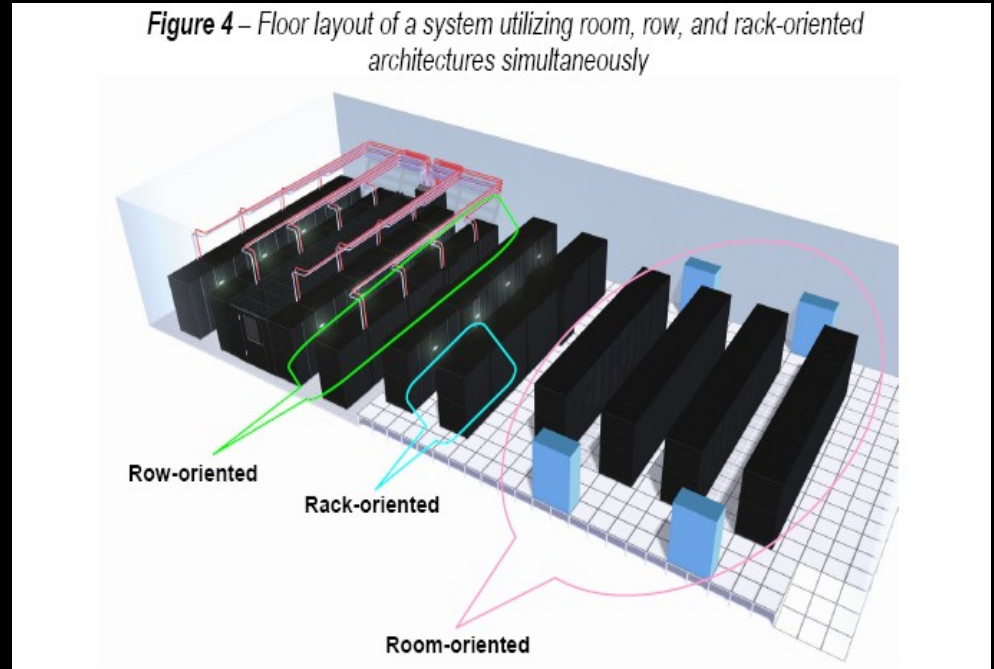
SMDC is a highly secure and resilient Container Solution



A hot aisle containment option can be utilized to prevent hot exhaust air from mixing with the cooled supply air and thereby increasing cooling capacity and efficiency.



Hot Aisle Containment: Managing extreme density



- Multiple cooling methods can be mixed in one SMDC solution
- Cooling methods are rapidly and individually deployable
 - Row-oriented
 - Rack-oriented
 - Room-oriented

Enterprise Modular Data Center

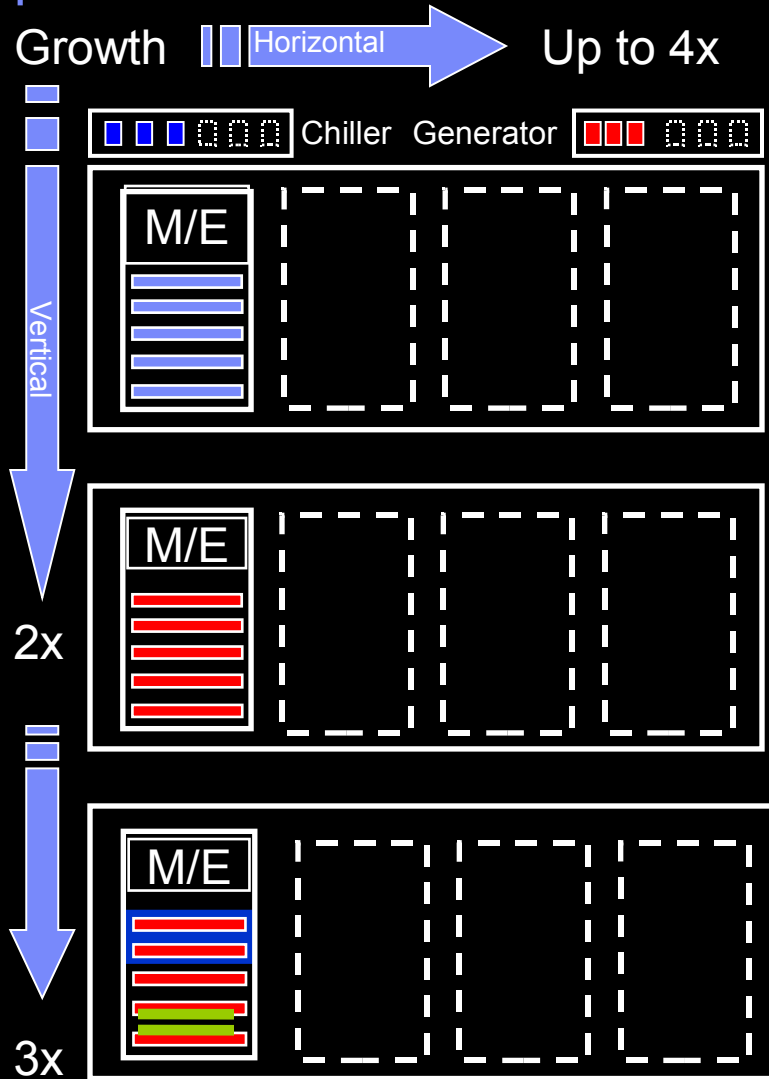
The Enterprise Modular Data Center (EMDC) is well suited for organizations who need to design and build an efficient enterprise data center that can accommodate future expansion with minimal disruption to operations, reduce capital and operational costs and ensure high availability.

IBM provides a proven, reliable and standardized data center design that allows capacity increases on demand, capital and operational cost deferral, reduction in design through build time while helping to eliminate unpredictable operations.

Benefits		
Cost Efficiency	<ul style="list-style-type: none"> • Defer capital investment and operational costs until capacity is required • Building out in a scalable modular methodology helps lower operational expenses by up to 50 percent • Building out in a modular fashion helps lower capital costs by up to 40 percent 	
Energy Efficiency	<ul style="list-style-type: none"> • Allows 12 times or greater power and cooling capacity growth within a data center • Operating at an attractive energy efficiency data center infrastructure efficiency (DCiE) of 66 percent or better. • Reduce energy consumption by "right sizing." 	
Space Efficiency	<ul style="list-style-type: none"> • Expansion without downtime to operations • Standardized, independent modular design ensures high data availability • Deployment of additional modules if required 	
Time Efficiency	<ul style="list-style-type: none"> • 25% faster deployment than custom approach 	

- Helps enable rapid, cost-effective deployment for data center expansion and new build
- Readily scales to meet changing requirements from 500m² up to 2000m²
- Provides a modular solution for chilled water, CRAC's or air handlers depending on raised floor space, modular UPS, environmental monitoring and overhead cabling
- Designed for maximum energy efficiency, PUE of 1.5-1.8
- Designed for IBM availability level 3
- The service produce reduces the time from design to commissioning by 25%

Enterprise Modular Data Center allows for flexibility in capital and operational costs to address unpredictable IT requirements



Meet unpredictable business and IT growth

- Enable 3x density growth at one-third the cost to retrofit
- Up to 12x power and cooling capacity growth

Align capital and operational cost to IT needs

- Defer up to 40% capital costs until capacity required
- Defer up to 50% operational costs as capacity is required
- 50% energy savings compared to existing data center

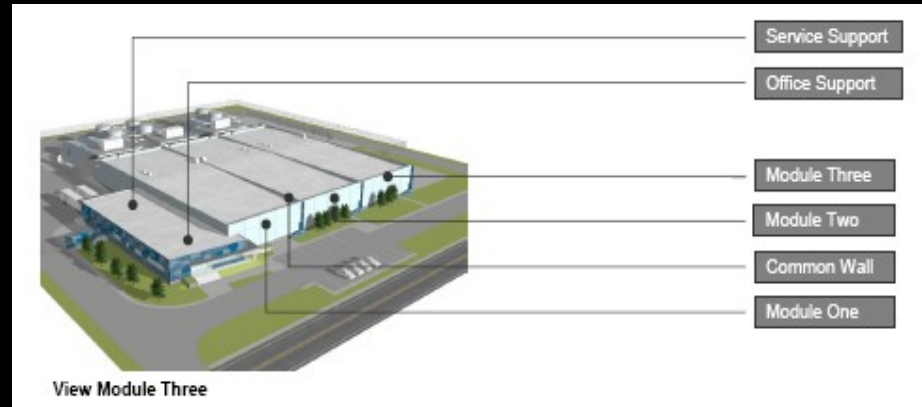
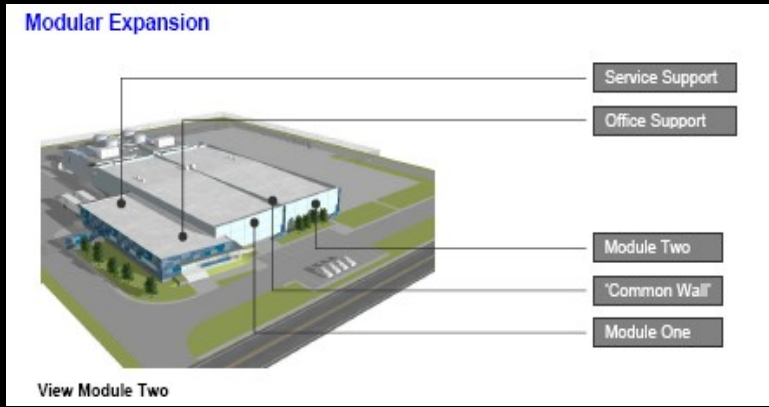
Provide available and predictable operations

- Provide expansion without downtime to operations
- Improve facilities management through standardized operating environment

Design to an "open architecture"

- Integrated leading vendor's technology capabilities
- Opportunities for OEM innovation and enhancements

The modular expansion capabilities of the Enterprise Modular Data Center

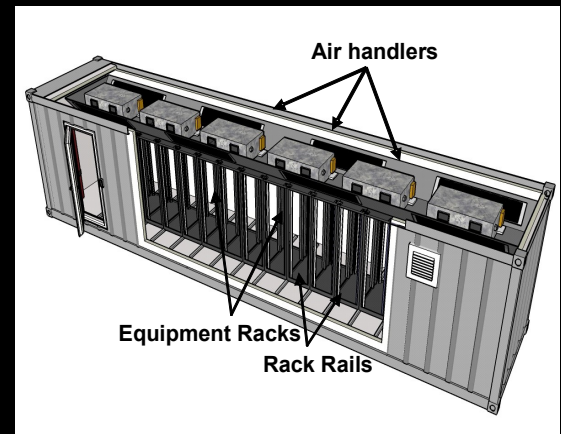


Portable Modular Data Center

Rapid deployment of a standardized, repeatable data center environment for installation in any location around the world

Solution

- Complete turn key, fully-functioning “plug and play” data center including UPS and cooling capacity
- The data center in a container-like environment is available in 20, 40, and double-wide 40 feet containers.
- Designed, built and drop-shipped in as short as 12-14 weeks
- Portable - temporary and remote data centers
- Designed for high availability, Level 3 design
- Leadership energy efficiency target of 66-77%
- Secure operational environment
- Open architecture – multi-vendor support



Benefits		
Cost efficiency	<ul style="list-style-type: none"> • Approximately 35% cheaper than trying to retrofit existing floor space • Lower TCO than new data center build 	
Energy efficiency	<ul style="list-style-type: none"> • Modular and scalable for easy growth • Designed for high density environments • Leadership energy efficiency: 77% DCiE 	
Space efficiency	<ul style="list-style-type: none"> • Up to 50% less space required • Focused on portability, remote locations • Install data center where you want and need it 	
Time efficiency	<ul style="list-style-type: none"> • Rapid deployment in 12-14 weeks from plan to start-up • Turn-key data center 	



Electrical Room

Features of the Portable Modular Data Center

Solution

Portable modular data center

Features

Complete, fully functional, stand-alone data center

Flexible infrastructure designs, not a “one-size-fits-all” approach

Quick to deploy, turnkey data center

Locate in nonstandard locations (cities, suburbs, deserts, mountains, arctic regions, etc.)

Lower TCO than new data center build

Designed for high-density technology and **open architecture** for multivendor support

Standard data center design capabilities, including high availability and energy efficiency

Uses

Remote data center

Cloud and Web 2.0

Temporary data center

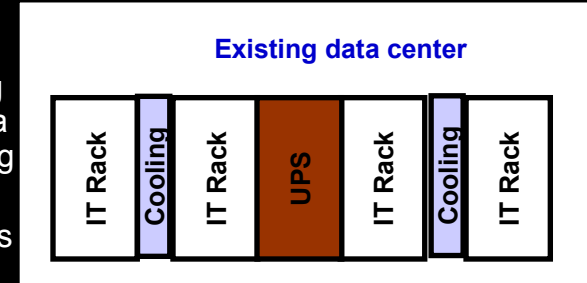
Mobile data center

High Density Zone

Solution to address your high density IT equipment needs in your existing data centers

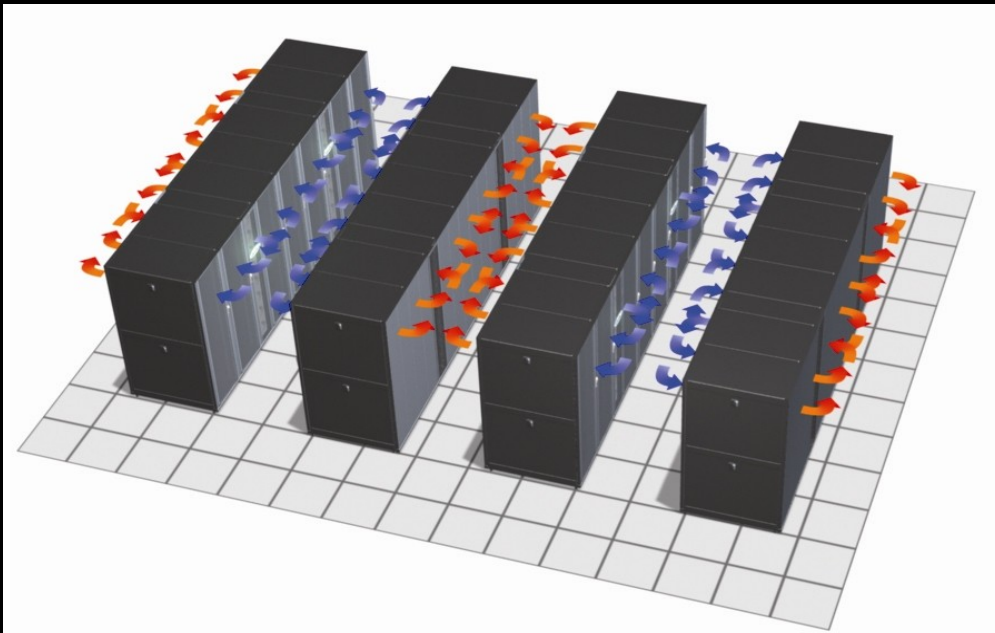
IBM's High Density Zone allows clients to support higher density servers in their existing data center while quickly implement an integrated, energy efficient solution. It provides a "plug and play", modular racking architecture which incorporates a self-contained cooling and power infrastructure solution.

High Density Zones increase the ability to meet IT growth – helping to keep the business running in the existing data center space.

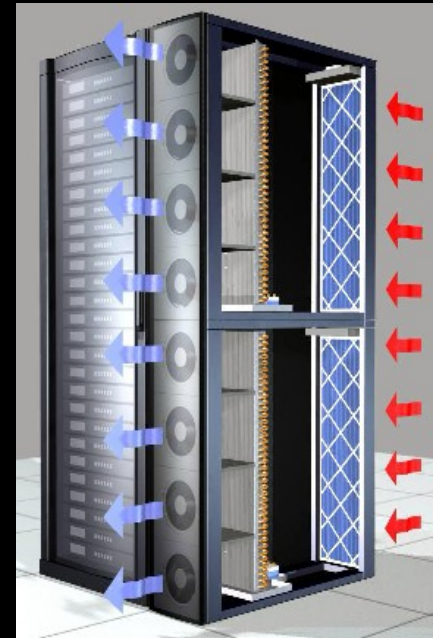


- Leverages best practices in data center design with hot aisle/cold aisle configuration for improved energy efficiency
- Provides a modular solution with standard 19" racking, close-coupled cooling, and can include power and monitoring capabilities
- Targeted to support 5 to 25 kW/rack (and greater) capacities to extend your ability to support new high density technology in existing facilities
- Close-coupled cooling provides "right-sized" cooling, directly at the heat source, to meet the real time demands of the IT hardware
- Allows for rapid implementation of high density zone solution in existing data center using existing chilled water capacity

Benefits		
Cost efficiency	<ul style="list-style-type: none"> • Approximately 35% cheaper than trying to retrofit existing floor space 	
Energy efficiency	<ul style="list-style-type: none"> • Potential to extend the life of the existing data center by supporting high heat loads in traditionally designed data centers • A flexible solution that can grow as your high density IT equipment needs grow and provide for energy efficiency (from a single rack to hundreds) 	
Space efficiency	<ul style="list-style-type: none"> • Readily scales to meet changing requirements by adding additional cabinets/cooling units/zones (from one to hundreds of cabinets) 	
Time efficiency	<ul style="list-style-type: none"> • Rapid deployment in 8 to 12 weeks • Non-disruptive implementation at the existing site for the physical infrastructure installation 	



High Density Approach



Close-coupled cooling module

Benefits of IBM's Data Center Family

Financial



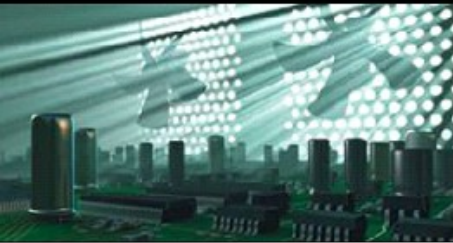
from

- Large upfront capital costs
- Squeeze on IT budgets
- Constraints on IT growth

to

- Align capital and operational costs to IT needs
- Operational cost savings from more efficient data center design
- Meet unpredictable business and IT growth

Operational



- Highly dense server systems
- Need to plan for capacity upgrades
- Aging data centers

- Non-disruptive implementation in existing centers
- Provide expansion without downtime to operations
- Extend the life of existing data centers

Environmental

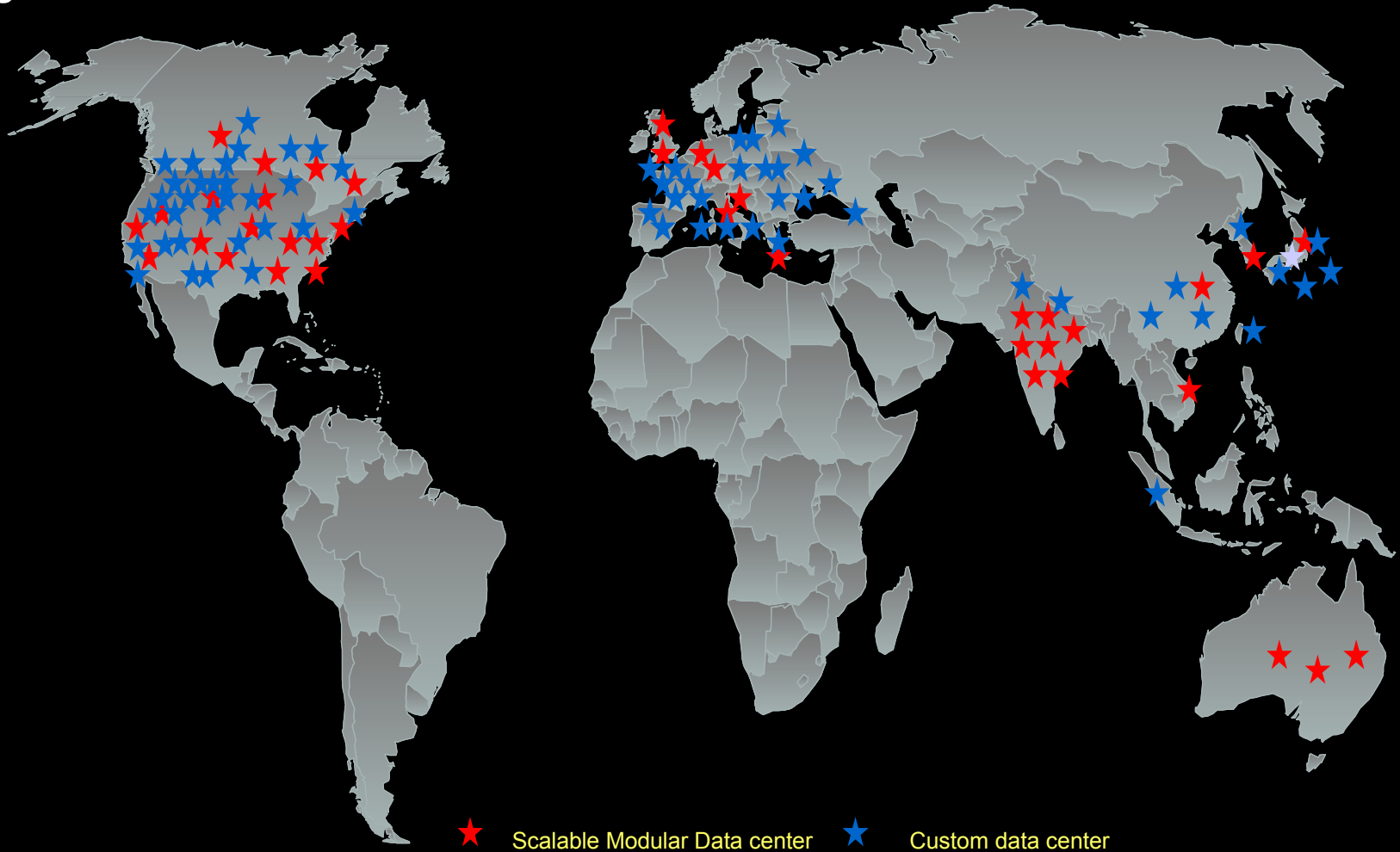


- Corporate social responsibility
- Limited „green“ public image
- Improve employee moral

- Energy conservation from initial design to on-going operations
- Improved „green“ public image
- Link CSR and personal value

IBM's global experience in data center design

Over 100 implementations of custom and standardized design in the past 2-3 years



Design for flexibility for small and mid-size data centers

One of Europe's businesses goes "green" with scalable modular data center

Client requirements

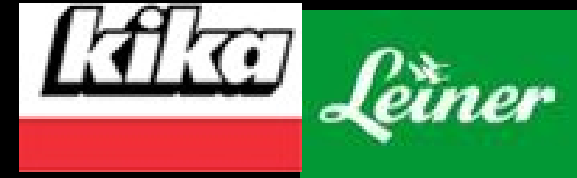
- Expansion across Europe and Middle East
- Aging data center threatens growth
- Need rapidly deployable and green data center

Solution

- IBM Scalable Modular Data Center solution with InfraStruXure® architecture from APC
- Standardized on IBM BladeCenter®
- Uses "green" design concepts

Benefits

- Supports corporate sustainability ("Green Line")
- Up to 40% reduce electric power consumption
- 24% less energy from new servers



“In IBM we have an IT partner who meets our ideal expectations for sustainable business”

- Dr. Herbert Koch, manager of the kika/Leiner group

Critical questions about your IT environment

- **Are you using or planning to move to blade server technologies? If yes, are they or will they be installed in a secure, monitored, conditioned environment? Is this or will this environment be designed specifically to support the high heat densities and power requirements of the blade servers?**
- **Are you installing servers and blade servers in a data center designed for mainframe technologies? How inefficient is your existing data center and how much energy cost is being wasted?**
- **Will your IT requirements grow within the next year, two years, three years and beyond? Does your current IT environment allow for data center infrastructure growth (scalability) as your needs grow?**
- **Does your current data center or IT environment allow for quick, easy maintenance of the data center infrastructure through a modular design?**
- **Do you need to quickly design and build a data center environment?**

Leverage IBM's experience to help

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