



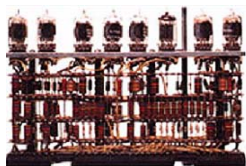
Addressing the Challenges of High Performance Computing with IBM Innovation and iDataPlex:

“Take Advantage of Cooler, Denser, and More Efficient Compute Power”

Gregg McKnight
Vice President
Distinguished Engineer
System x and BladeCenter Development
IBM Corporation
March 2009



At IBM We Are Proud Inventors . . .



Vacuum Tube Computer



VM Virtualization System 360



Relational Database



Deep Blue



Magnetic Storage



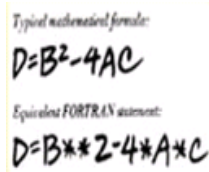
Dynamic RAM



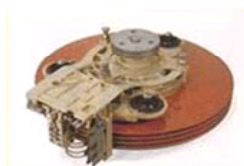
Enterprise PC



Blue Gene



FORTRAN



Winchester Disk



Copper Interconnect Wiring



Enterprise Blade Server



Fractals



RISC Architecture



Microdrive



CMOS Processors Cell Processor



Embedded DRAM

IBM Jan 14, 2009

4,186 U.S. patents in 2008...

Becoming the 1st company ever to earn more than 4,000 U.S. patents in a single year.

IBM's 2008 patent issuances are nearly triple Hewlett-Packard's

Exceeds the issuances of Microsoft, Hewlett-Packard, Oracle, Apple, EMC, Accenture and Google -- combined.

Introducing System x iDataPlex

■ An Innovative x86 Solution from IBM to address:

- Total Cost of Ownership (TCO) from Acquisition to OPEX
- Data center density, scalability, serviceability, manageability
- Individual customer requirements

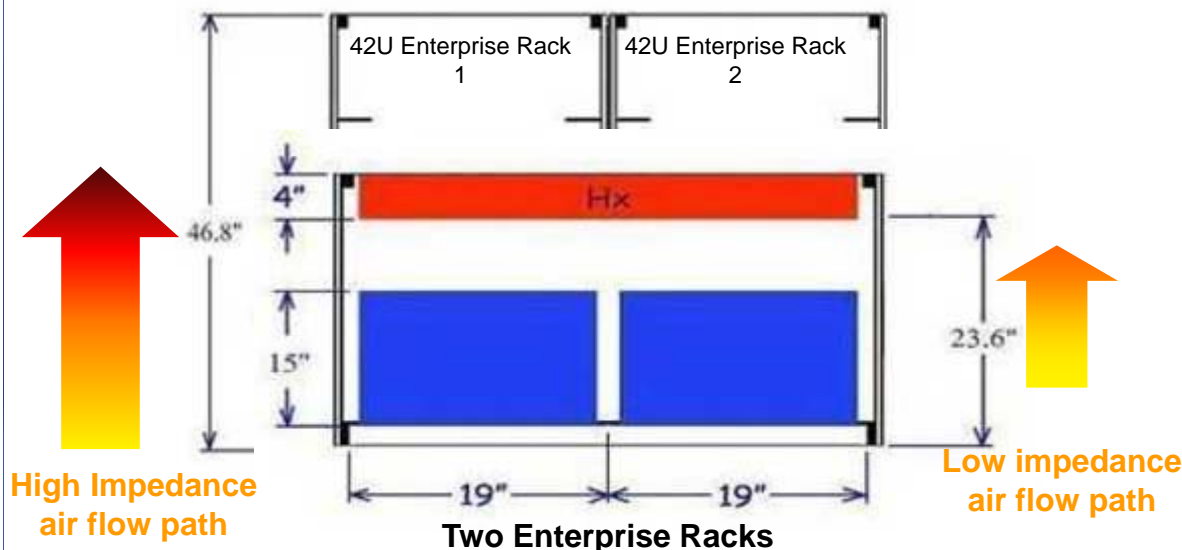


■ iDataPlex is:

- A half-depth server design
- Optimized for maximum energy and cooling efficiency
- An Industry-standards based server platform
- Designed to minimize utilization of floor space, energy and cooling
- Easily maintainable front access solution
- Custom preconfigurable for compute, storage, or I/O needs and



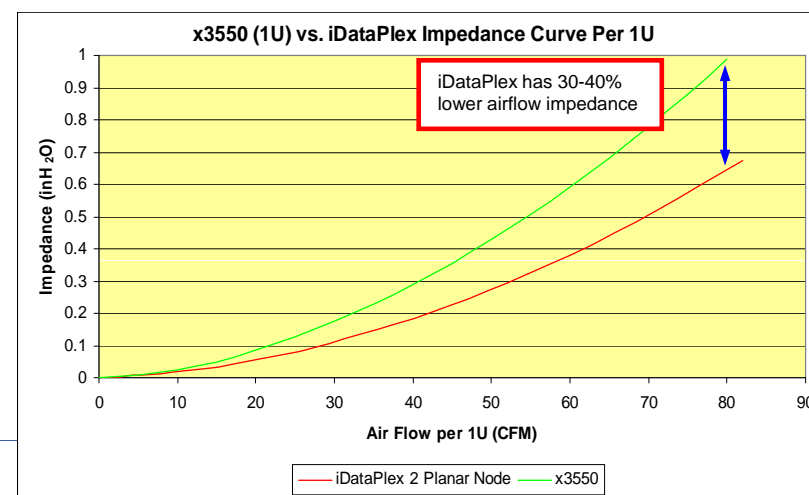
Efficiency Designed In From The Ground Up



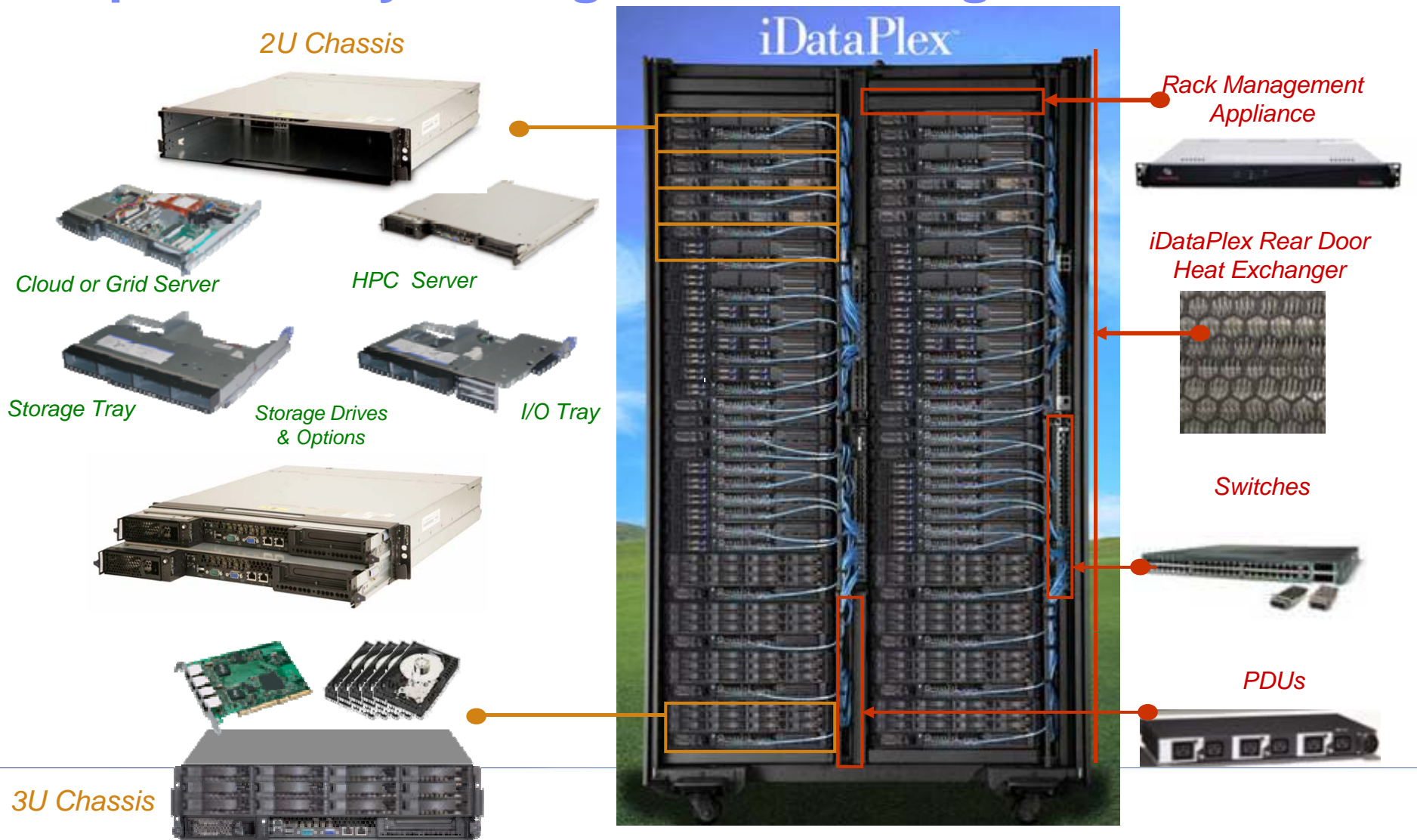
iDataPlex top-down view

Optional Rear Door Heat Exchanger

- Optimized rack more than doubles density per rack
 - 100U Rack - 84U servers and 16U for switches and PDUs
- Greater data center flexibility
 - Less floor space, cooling, infrastructure, service demands
- Air flow efficiency = fan power savings
 - Significantly lower cooling costs compared to equivalent 1RU compute power in an enterprise rack
- Optional rear door heat exchanger – ultimate in cooling savings
 - Eliminates up to 32-36KW of heat exhaust from the rack



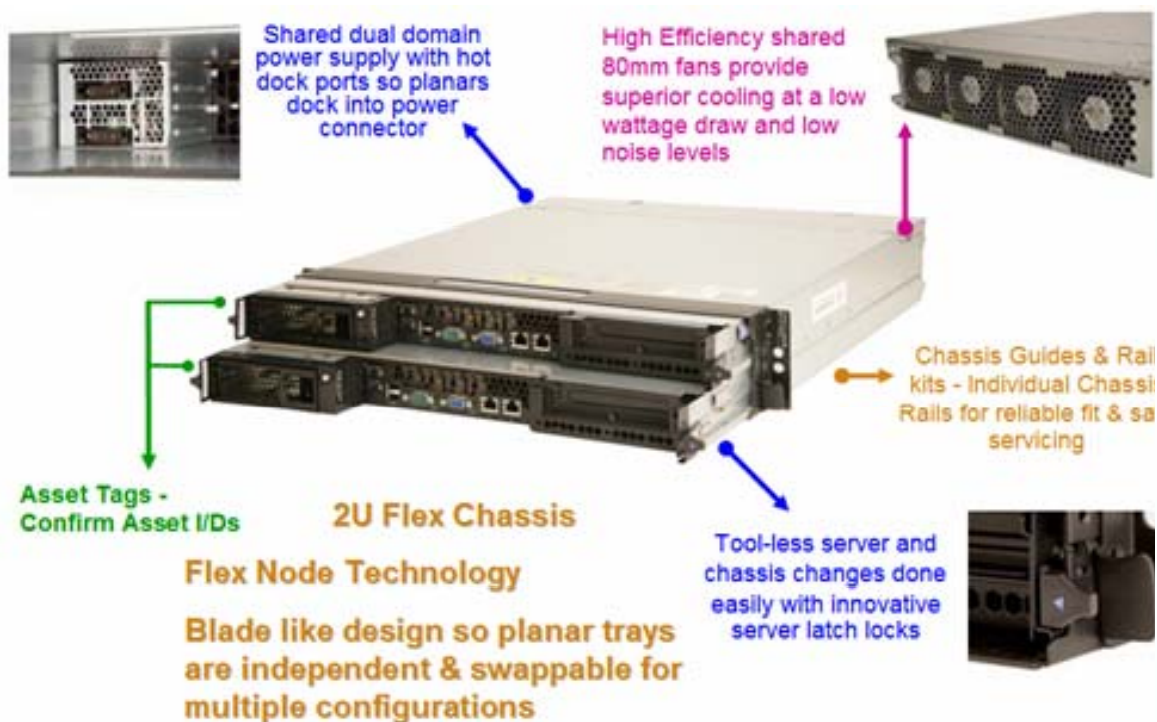
Customizable Building Block Form Factor Ships As Fully Configured and Integrated Rack



Integrated and Serviceable x86 Packaged Design

Designed for Data Center Serviceability

- All-front access eliminates accessing rear of rack
- Swappable server trays in chassis
- Blade-like design with chassis docking into power
- Chassis guides keep upper servers in place
- Rack-side pockets for cables - highly efficient cable routing



iDataPlex: Enables Aggregation of Data Center Power Feeds To Lower Infrastructure Costs



8.6KVA Feed
8.6KVA Feed



8.6KVA Feed
8.6KVA Feed



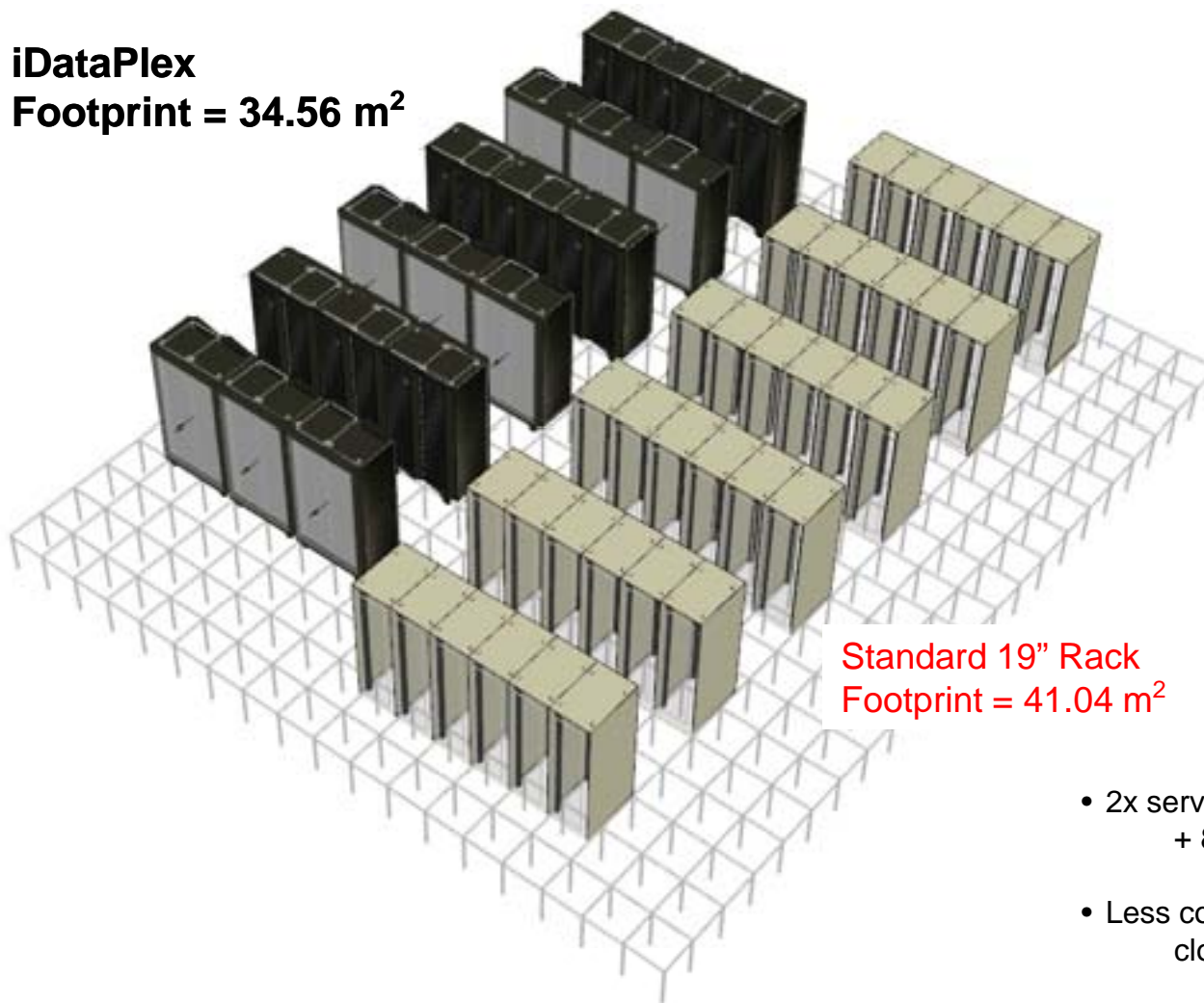
8.6KVA Feed
8.6KVA Feed
8.6KVA Feed



- Data center co-location facilities charge by the 30 Amp feed
- Each feed is priced about \$1500 – 2,000 per month per rack
- A large customer was able to save more than **\$14M TCO** for power feed costs because iDataPlex power aggregation enables a reduction in power feeds

iDataPlex: Enables Maximum Space Utilization

iDataPlex
Footprint = 34.56 m²



Standard 19" Rack
Footprint = 41.04 m²

- 2x servers in the same floor tile footprint + 8U extra per tile (vertical)
- Less cooling required due to half depth server closer aisles = more floor density
- RDHX to eliminate hot aisles, even more density

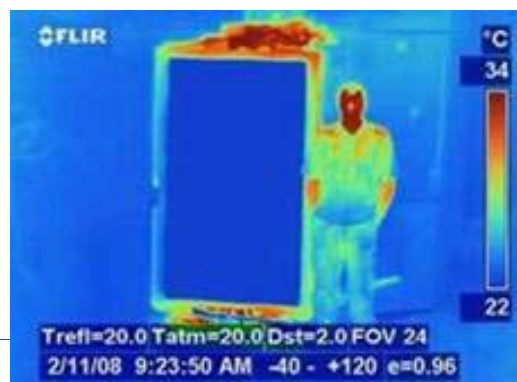
Cool Blue for Cool Savings

IBM Rear Door Heat eXchanger for iDataPlex

- 75%-95% greater efficiency than air cooling
- Completely eliminates rack heat exhaust
- No moving components or auxiliary fans
- No condensation
- Moves thermal transfer from CRAC to back of rack
- Can eliminate supplemental AC and raised floors



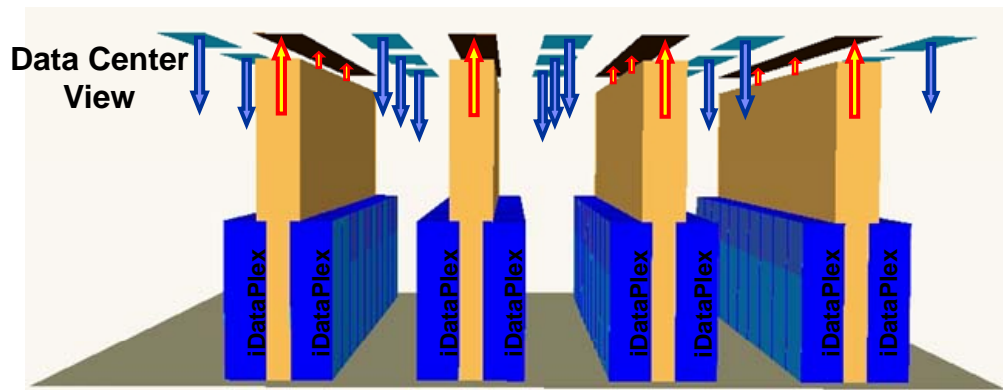
54° C – Cool Blue Off



16° C – Cool Blue On

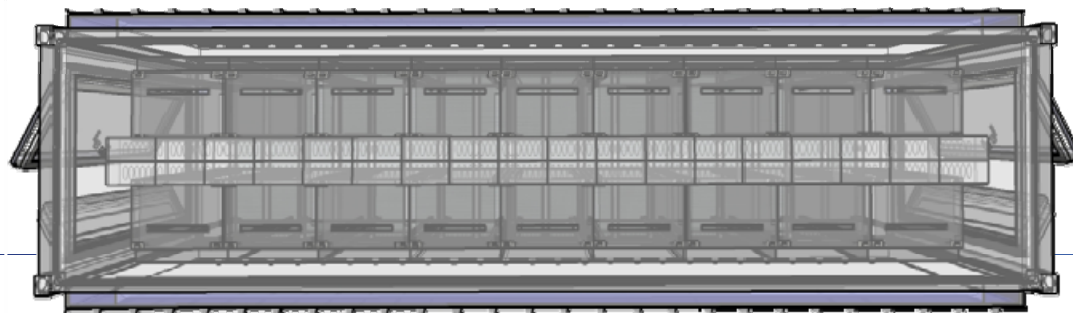
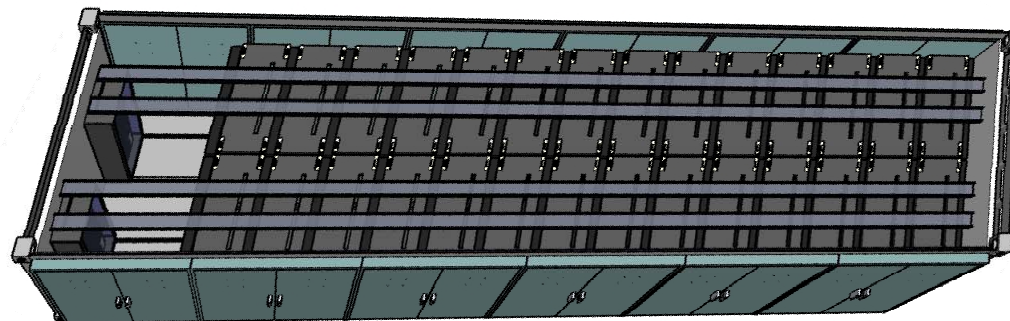


iDataPlex Enables Density Flexibility



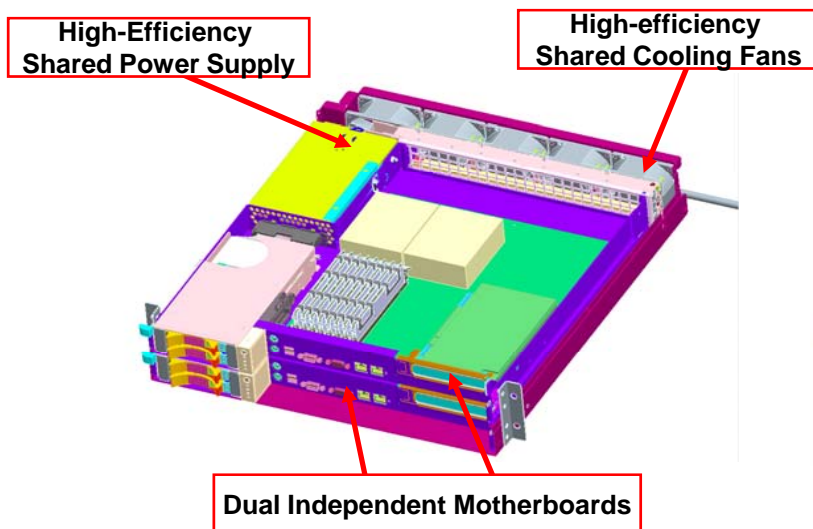
**Data Center
Ducted Hot Air Extraction**

**Side-By-Side Flow
Through Container Option
Up to 28 Racks**

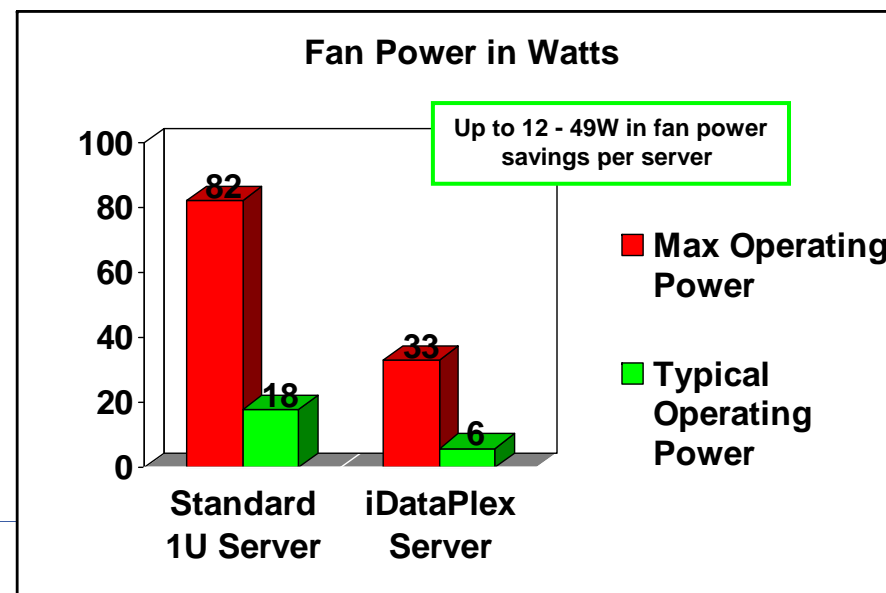


**Two Rows Against Each Wall
Container Option
18 Racks**

Chassis Innovation = Energy and Cooling Savings



- Improved Performance in Standard Air Cooled Centers
 - The iDPx 2U chassis design draws about 1/3 the typical fan power of standard 1U server
 - iDPx fans draw 2% of total power per server compared to typical 1U fans which draw 10-20% of total power
 - Compatible with standard forced air environments - no external air movement assistance required
- Cooling - Typical Rack Operating Power Savings
 - $(12W * 84\text{severs} * 24\text{hr/day} * 365\text{day/yr}) = \underline{8,830 \text{ KWh/yr}}$
- Cooling - Maximum Rack Operating Power Savings
 - $(49W * 84\text{severs} * 24\text{hr/day} * 365\text{day/yr}) = \underline{36,056 \text{ KWh/yr}}$



Current iDataPlex Server Offerings



iDataPlex dx340
Balanced Power/
Performance Dual Socket

Proc: Dual or Quad-Core Intel Xeon
FSB : 1333 MHz
Memory: 8 DIMM / 64 GB max*
Memory Speed: 533 / 667 MHz
PCIe: x8 electrical / x16 mechanical
Chipset: 5000 (Bensley)

Power – 190 – 210 Watts **



iDataPlex dx360
High-performance Dual Socket

Proc: Dual Quad-Core Intel Xeon
FSB: 1600 MHz
Memory: 16 FBDIMM / 128 GB max*
Memory Speed: 667 / 800 MHz
PCIe: x16 electrical / x16 mechanical
Chipset: L5400 (Stoakley)

Power – 180-200 Watts **



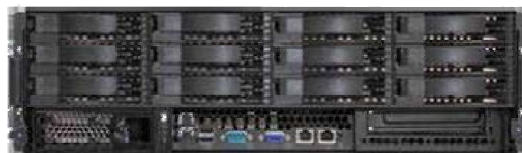
iDataPlex dx320
Power Optimized Dual Socket

Processor: Quad-Core Intel Xeon
FSB : 1333 MHz
Memory: 6 DIMM DDR2 / 24 GB max
Memory Speed: 533 MHz
PCIe: x8 electrical / x8 mechanical
Chipset: L5100 (San Clemente)

Power – 150 -170Watts **

iDataPlex 3U Storage Rich

Storage: 12 3.5" HDD (Up to 12TB)
Proc: Dual or Quad-Core Intel Xeon
Memory: 8 DIMM / 64 GB max*
Chipset: Bensley



* With 8GB DIMMs when available

** Dual L5420 Processors, 24GB Memory, 250GB Disk

iDataPlex dx360 Next Generation



The new dual-socket upcoming Intel processor server with leadership compute capacity in the iDataPlex solution

Summary

- **Highest compute density with 84 nodes, switches and PDUs fitting in a standard rack footprint with iDataPlex rack**
- **Datacenter-optimized power and cooling efficiencies for lowest operating cost**
- **Innovative iDataPlex architecture provides the ultimate configuration flexibility**
- **New tools for rapid deployment and common systems management**

Highlights

- **Wide range of future Intel processors with multiple speeds and power levels**
- **16 memory slots at speeds up to 1333MHz DDR3**
 - Up to 12TB storage per server using hot swap and simple swap hard drives in 3.5" and 2.5" sizes in SATA, SAS, and solid state formats
- **High bandwidth adaptors for 10G and Infiniband network performance**
- **Mountable in iDPx racks and enterprise racks with complete front access to enable easy maintenance and reconfiguration**
- **Shared power/cooling and blade like design minimizes acquisition costs for cluster and cloud environments**

University of Toronto gets cool with iDataPlex

IBM System x iDataPlex will be a key component of Canada's largest and most energy-efficient x86 Supercomputer that researches on the impacts of greenhouse gas-induced global warming .



- **Customer:** *University of Toronto's SciNet Consortium*
- **Industry:** *Public*
- **Focus Area:** *HPC*
- **Geography:** *Canada, North America*
- **Challenge:** Research in aerospace, astrophysics, bioinformatics, chemical physics, climate change prediction, medical imaging and the global ATLAS project, which is investigating the forces that govern the universe
- **Capability of running a wide range of software at a high level of performance**
- **Analyzing high-resolution global models**

iDataPlex Benefits

- **Capable of performing 360 trillion calculations per second**
- **Largest supercomputer outside US**
- **Extreme Infrastructure Flexibility**
- **Cooling Efficiency**



Solution Hardware:

- **7600 dx360 M2 servers**
- **BNT 8100 10 GbE Switch**
- **Rear Door Heat eXchanger**
- **POWER6 clusters**

“The University of Toronto has partnered with IBM [iDataPlex] to become one of the world's premier computational research institutions -- a collaboration that will attract researchers from around the world,”

- **Dr. Richard Peltier, Scientific Director of SciNet and director of the Centre for Global Change Science**

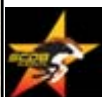
[Read SciNet Press Release](#)

iDataPlex Customer Wins - On a Roll

Using iDataPlex the Indiana University School of Informatics and Technische Universität Dresden (TUD) were awarded first place in the SC08 Cluster Challenge, for leading-edge, energy-efficient high performance computing at Super Computing



Winners of SC08 Cluster Challenge



INDIANA UNIVERSITY

iDataPlex Benefits:

- Greatest performance at lowest power
- Fully integrated in dense environment

iDataPlex Solution:

- 1 rack of 45 dx340 Servers
- BNT G8000F GbE Switch



NASA builds a new supercomputer that will help collect data from satellites that are observing both the Earth and deep space, modeling climate and weather as well as create simulations to explain cosmic phenomena



iDataPlex Benefits:

- Scale out in a cost effective manner
- Power and Cooling efficiency
- Space Fitting Constraints satisfied

iDataPlex Solution:

- 760 dx340 servers
- Mellanox Infiniband HCA
- x3560 & x3550 nodes

IBM's iDataPlex solution when combined with **performance, power and price** delivered to Morgan Stanley the best power-per-watt-per-performance equation.

Major HP Take out!



iDataPlex Benefits:

- Energy Efficiency Savings
- Planar Power Consumption < 160W
- Server Density

iDataPlex Solution:

- 3000 units dx320 Servers
- BNT G8000F GbE Switches

" IBM listened and delivered"

-Robert Dunn, Executive Director Morgan Stanley Technology

[Read the Morgan Stanley Win Client Reference](#)

Merrill Lynch exercises iDataPlex servers in its financial simulations production data centers to prove they can improve Risk Analytics testing lead time and power efficiency

Didn't even consider HP!



iDataPlex Benefits:

- Density Savings in the Data Center
- Decrease in Total Power per Rack

iDataPlex Solution:

- dx340 Servers
- BNT G8000F GbE Switch

[Read the Merrill Lynch Win Client Reference](#)

iDataPlex Summary

Efficient

- Energy efficient eco-system saves up to \$10,148 /rack/year
- Up to 40% lower system level power than 1U server solutions
- Optional - Eliminate heat with Rear Door Heat Exchanger

Flexible

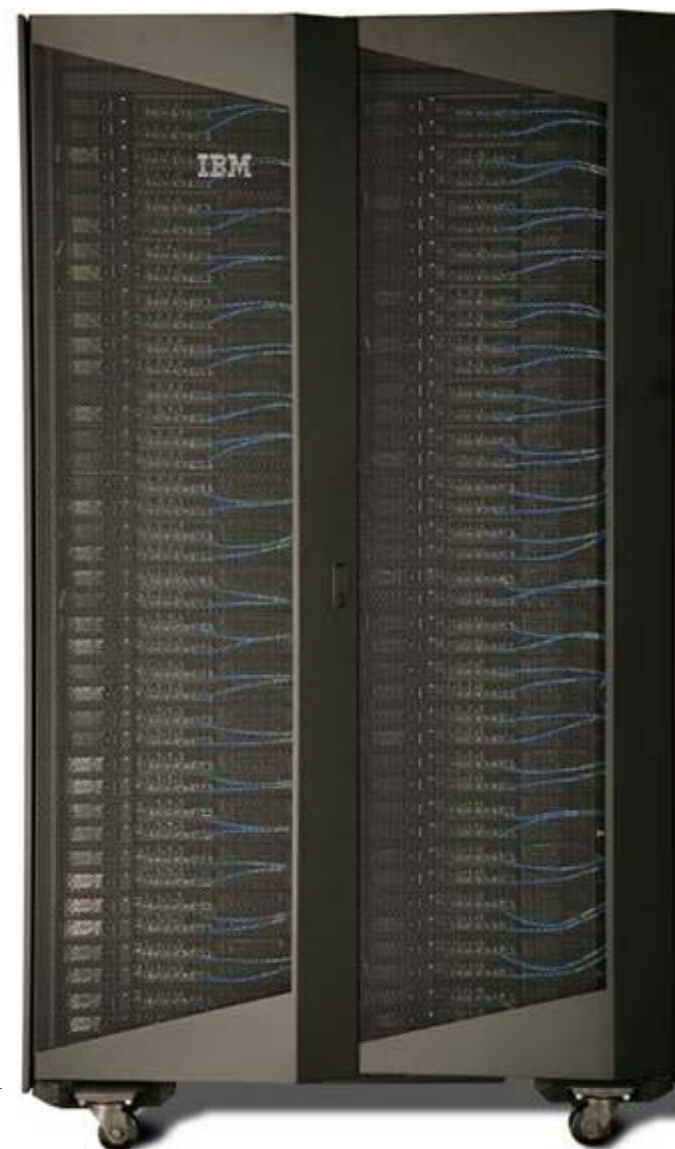
- Ultimate flexibility in node and rack configuration
- Factory integrated racks delivered to Data Center
- 3rd party options and rack support

Affordable

- Lower priced than standard 1U
- Shared infrastructure designs cost out
- Non-redundant power and cooling components lower cost

Manageable

- Blade like thinking in design
- Rack management appliance for up to three racks
- Ease in servicing from complete front access



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