Systems and Technology Group

BladeCenter & System x Demo Days

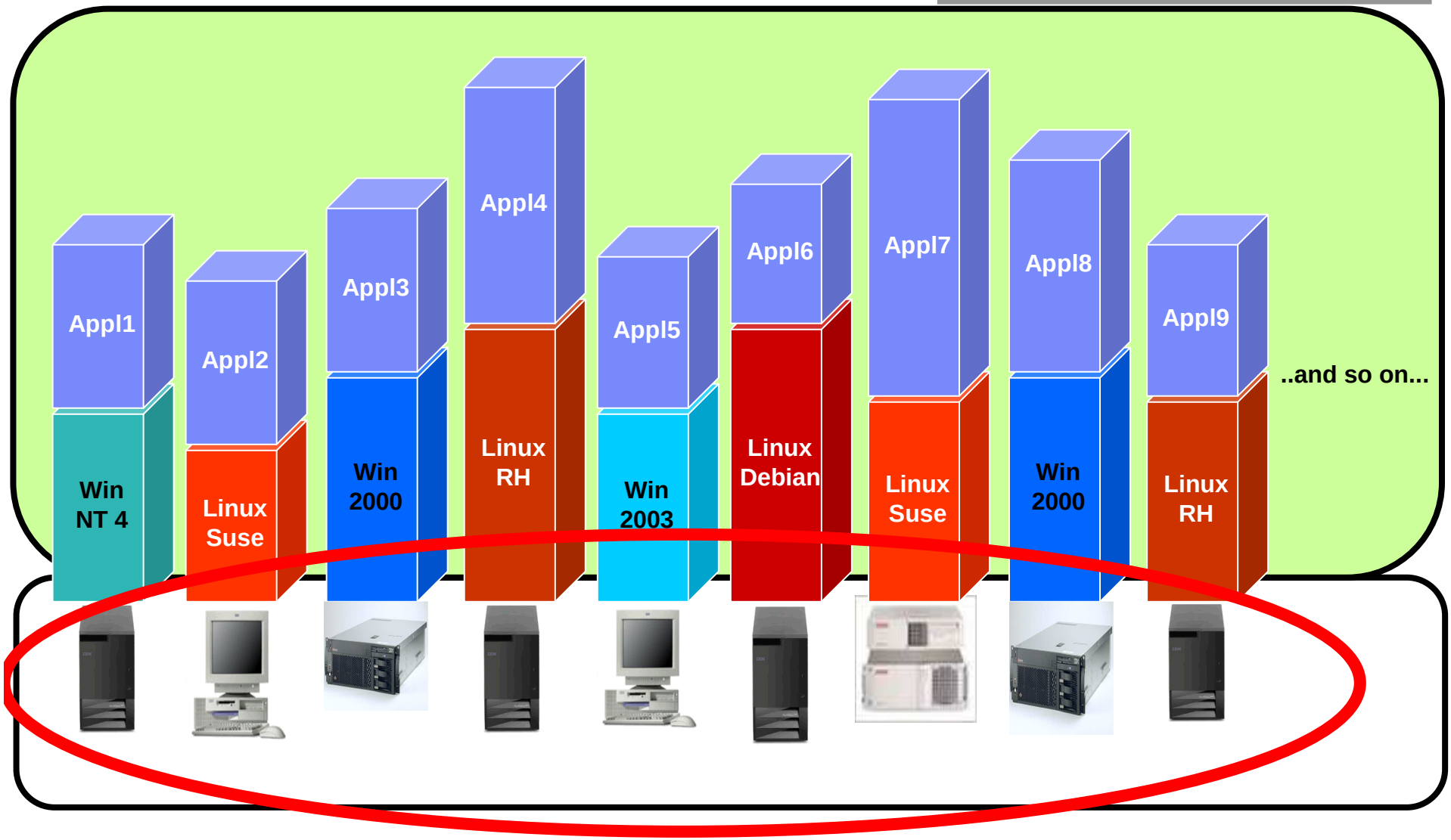
- 2009 v.3 -

Alessandro Malosio
System x Technical Sales Support Team

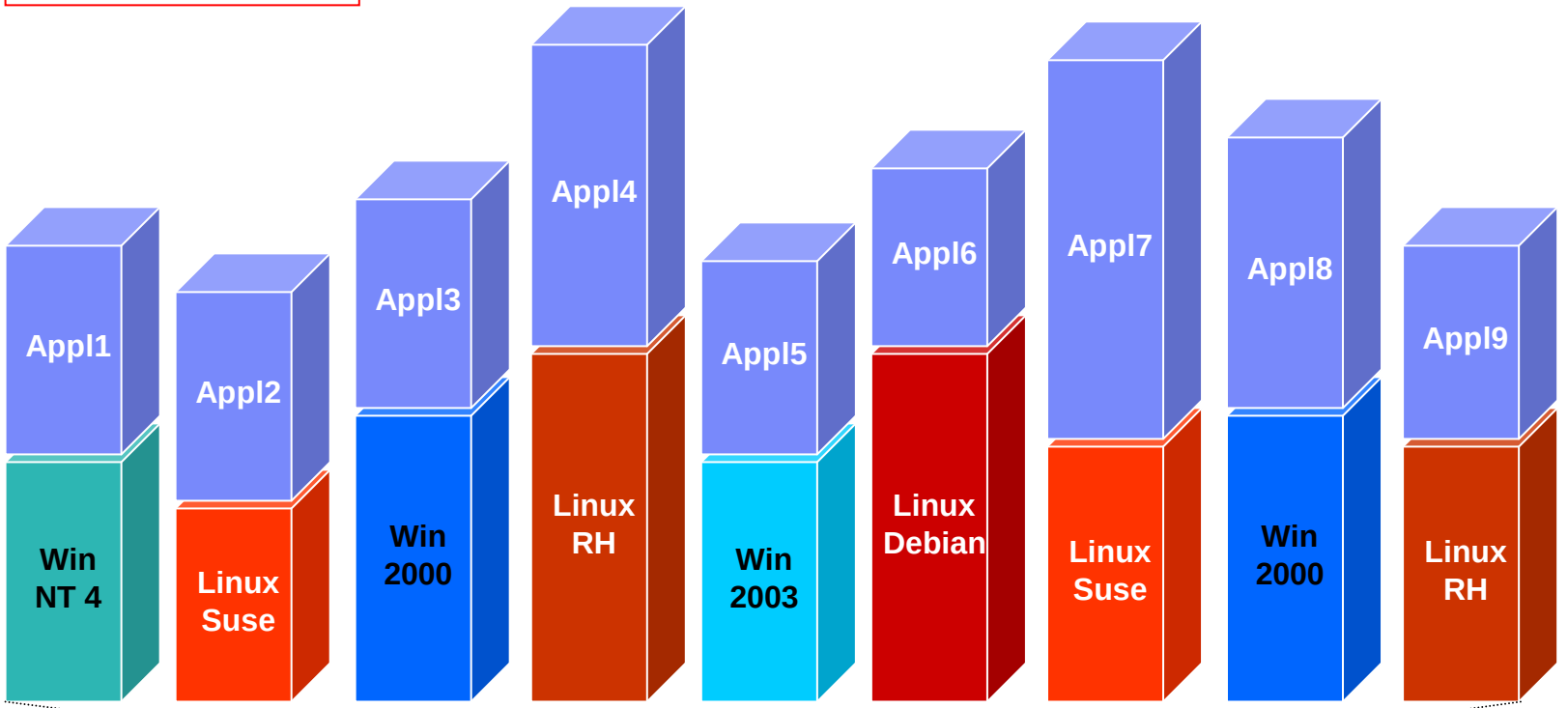
Agenda

- BladeCenter solution
- System Management & Cool Blue strategy
- System x “high end” servers

Common x86 landscape

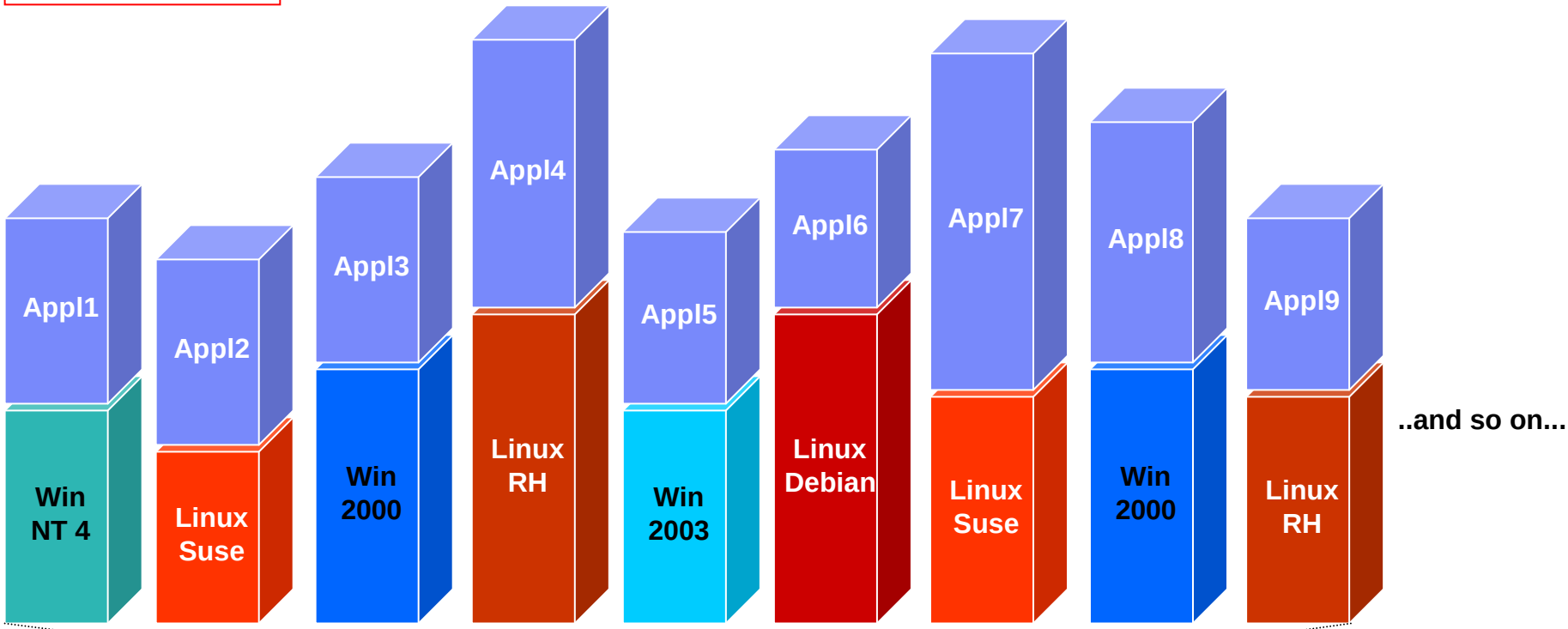


TRADITIONAL

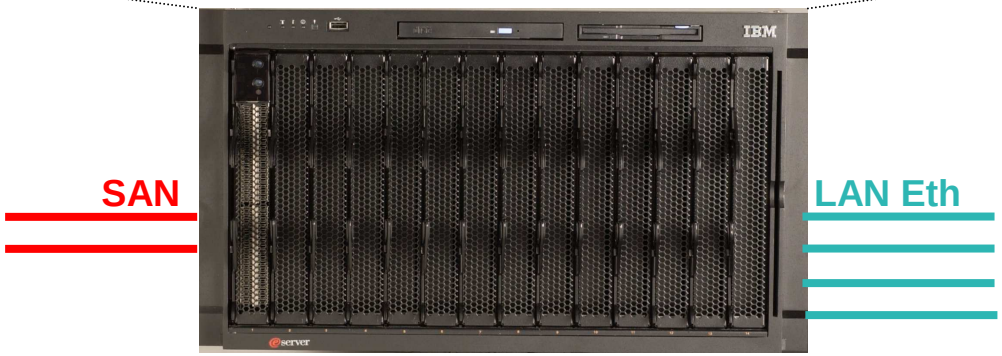


Rack Optimized servers

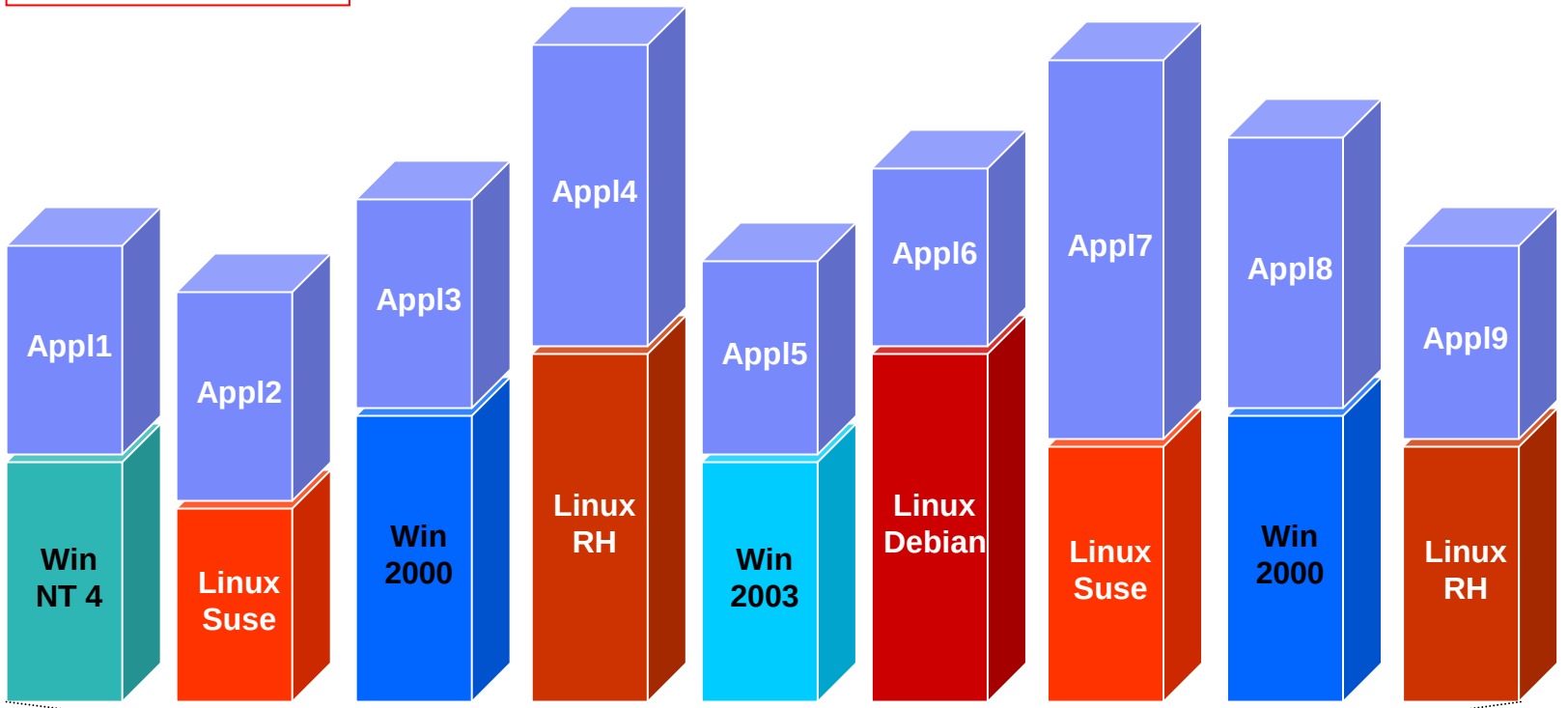
EVOLUTION



BladeCenter



REVOLUTION



..and so on...

SW partitioning (i.e.VMware - Xen)

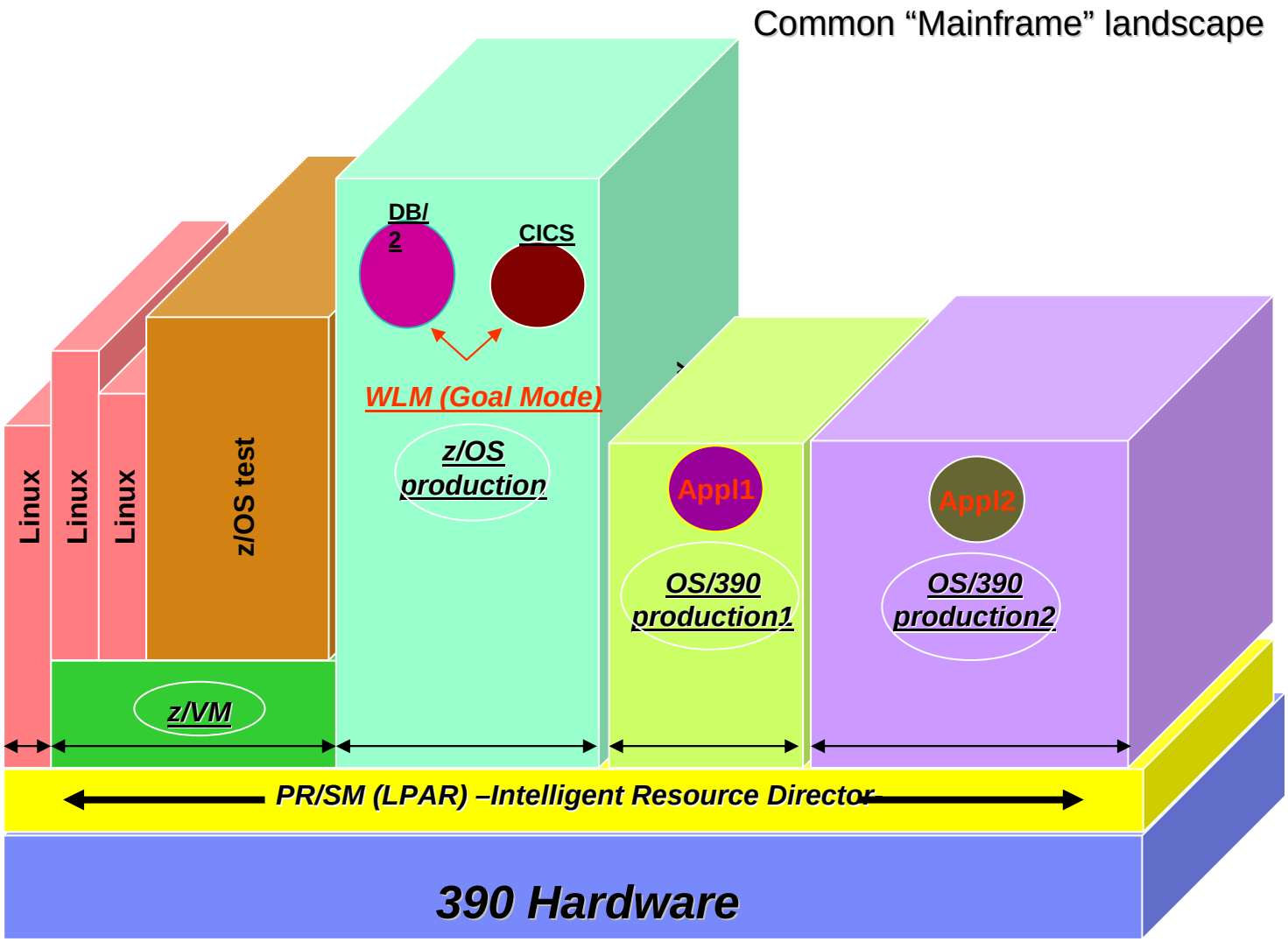
x4 architecture servers

System x
3850M2
3950M2

SAN

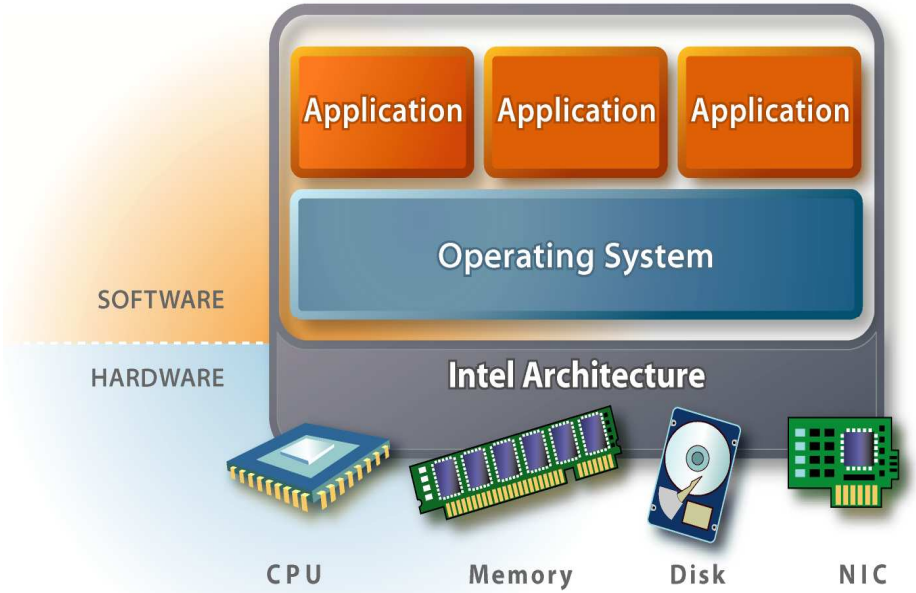
LAN Eth

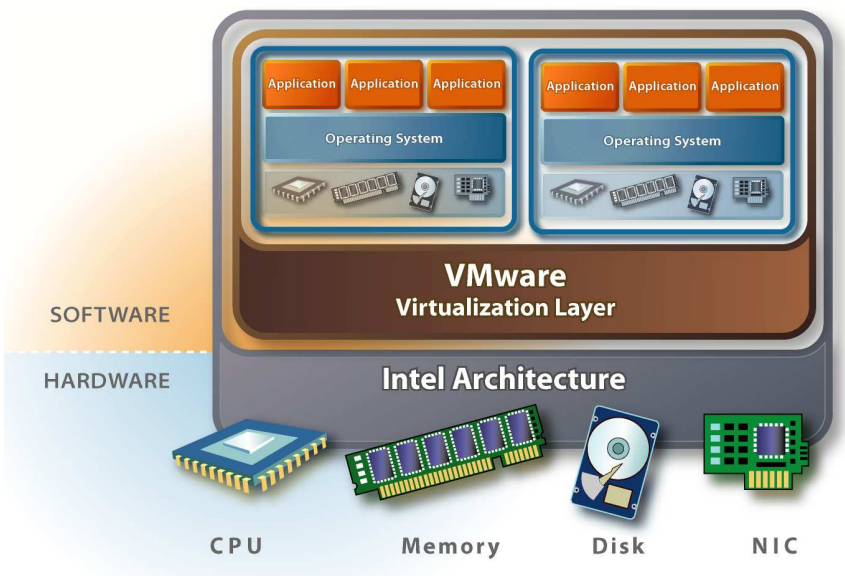
Virtualization concept..



.x86 virtualization: VMware ESX Architecture

"standard" computer vs ESX architecture





- **Virtualization layer maps virtual hardware to real hardware.**
- **Can multiplex several virtual hardware to single real HW.**
- **High Performance – map directly on hardware.**
- **Run multiple operating systems concurrently**
- **Fault, performance, security isolation**
- **Encapsulation**
- **Hardware-independent**

What's New with VMware Infrastructure

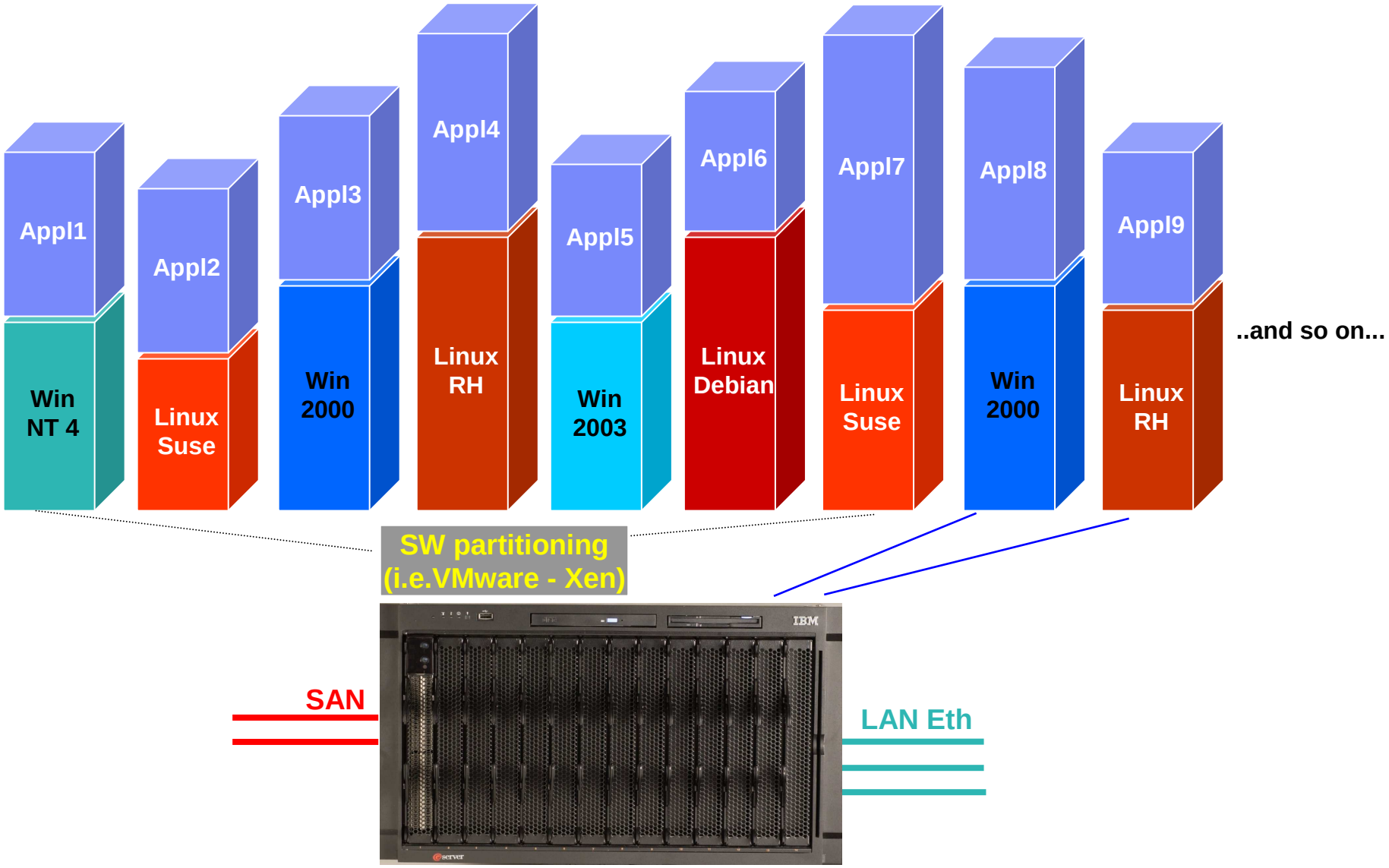
- ESX Server 3.5 and ESX Server 3i v3.5 -

- ESX Server 3i
- VMware Update Manager
- VMware Storage VMotion (only CLI, on same host)
- VMware Site Recovery Manager (G.A. Q1-08)
- VMware Distributed Power Management (Experimental)
- ESX Server Performance Optimizations
- ESX Server Scalability Enhancements (max 128GB for each host; max 64GB for each V.M.)
- Expanded Storage and Networking Choices (10GbE, IB, local SATA)

•Announced at VMworld 2007
•Planned availability date Q4 2007

http://www.vmware.com/products/vi/whatsnew.html

EVOLUTION + **REVOLUTION** = **INNOVATION**



Agenda

- **BladeCenter solution**
- **System Management & Cool Blue strategy**
- **System x “high end” servers**

What's a "BladeCenter" ? and what's a "Blade"?

A "server on a card" - each "Blade" has its own:

- ➔processor
- ➔ethernet
- ➔memory
- ➔optional storage
- ➔etc.

IBM Blade ready for insertion into the BladeCenter

The chassis provides shared:

- ➔management console (KVM)
- ➔power supply
- ➔cooling
- ➔network switches
- ➔CD-ROM drive
- ➔diskette drive
- ➔etc.

IBM BladeCenter chassis - 7U rackable

YOU CAN ALWAYS COUNT ON FAMILY. ESPECIALLY THIS ONE.

THE IBM BladeCenter FAMILY





IBM BladeCenter S
- 6 blades, 7U
- Extra internal storage room
- Ideal for SMB server consolidation

IBM BladeCenter E
- 14 blades, 7U
- Mainstream applications
- Ideal for data centers and remote sites

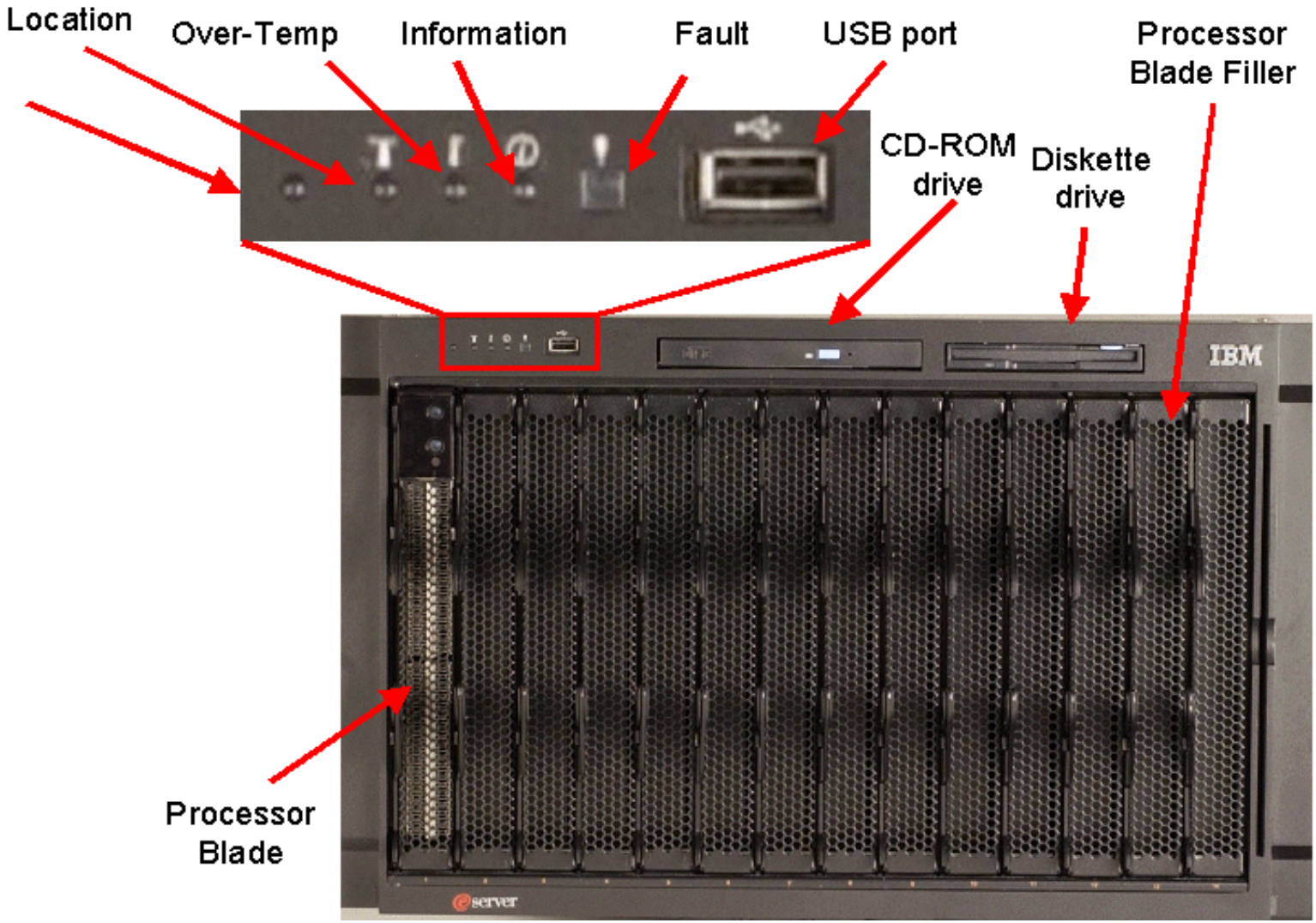
IBM BladeCenter H
- 14 blades, 9U
- Ideal for extreme I/O, data-intense environments
- Excellent platform for virtualization or high perf requirements

IBM BladeCenter T
- 8 blades, 8U
- NEBS characteristics
- Ruggedized chassis
- Ideal for telco, military, medical-imaging applications

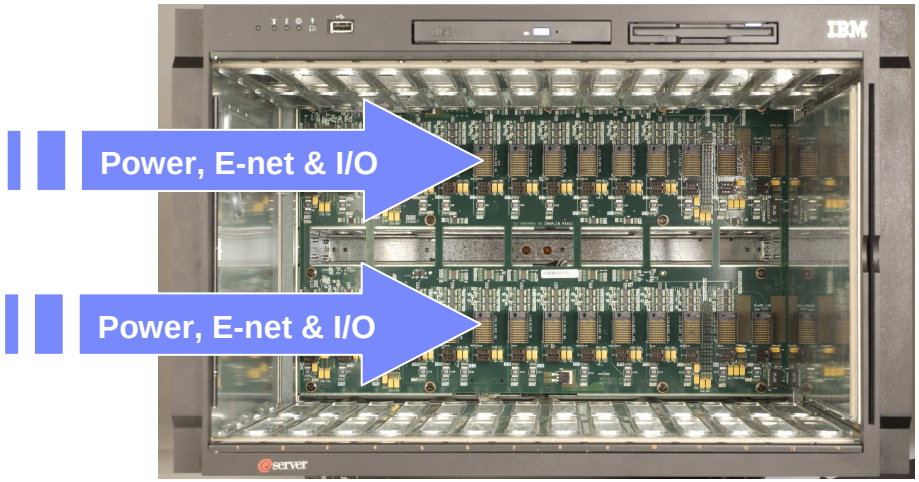
IBM BladeCenter HT
- 12 blades, 12U
- NEBS characteristics
- Ideal for services, control and transport planes
- Ruggedized chassis

Common Blades, Common Switches


Blade Center Chassis - front view



BladeCenter technology advantage: *dual midplane*

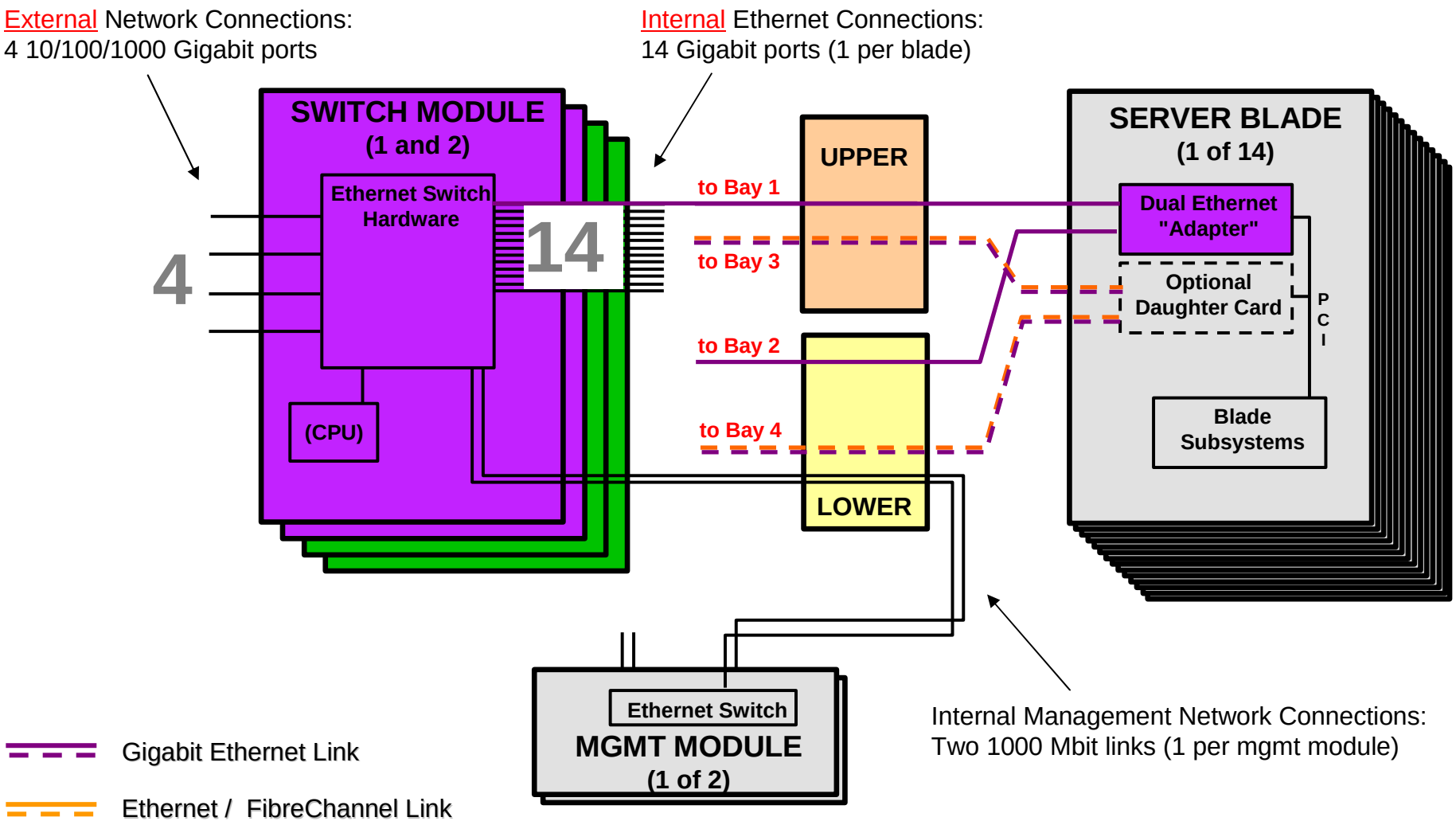


- At least two connections from each blade server to the midplane
- Dual communication paths to the *passive* midplane for Ethernet, Fibre Channel, KVM, Power, and Management signals
- Chassis can be configured with dual Ethernet, Fibre Channel Modules providing two active paths to your external network
- Multiple paths from blade to chassis components helps to protect you from potential failed connectors or traces

BladeCenter E chassis – rear view

- **Gigabit Ethernet Switches**
  - Portfolio of switches (Cisco, BNT)
  - Lower cost via Integration
  - Functions range from Layer 2 thru Layer 7
- **Fibre Channel Switches (FC Fabric)**
  - Portfolio of Switches (Qlogic, Brocade, MCdata)
  - Potentially lower cost via integration
  - Full support of FC-SW-2 standards
- **Power Subsystem**
  - Upgradeable as required
    - 2000 or 2300 W/each; (2300W avail from 31mar2009)
  - Redundant and load balancing for high availability
- **Calibrated, Vectored Cooling™**
  - Highly fault tolerant
  - Allow maximum processor speeds
- **BladeCenter Management Modules**
  - Full remote video redirection
  - Out-of-band / lights out systems management
  - Concurrent Serial connectivity

Internal Switch Connectivity - Ethernet



BladeCenter Ethernet Components

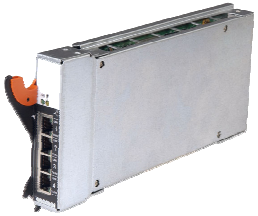
Cisco Systems® Intelligent Gigabit Ethernet Switch Module

Cisco Systems® (Fiber) Intelligent Gigabit Ethernet Switch Module

BNT® Layer 2/3 (Fiber) Gigabit Ethernet Switch Module

BNT® Layer 2-3 Gigabit Ethernet Switch Module

BNT® Layer 2-7 Gigabit Ethernet Switch Module



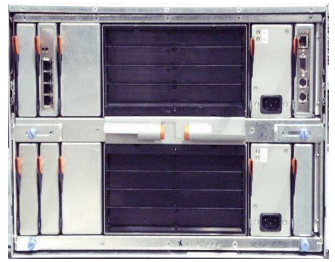
Server Connectivity Module for IBM BladeCenter

BNT® Layer 2/3 10GbE Uplink Switch Module

- (1) 10 Gb MM Fiber Ports
- (2) 10 Gb Copper Ports

Intelligent Copper Pass-thru

BladeCenter Telco

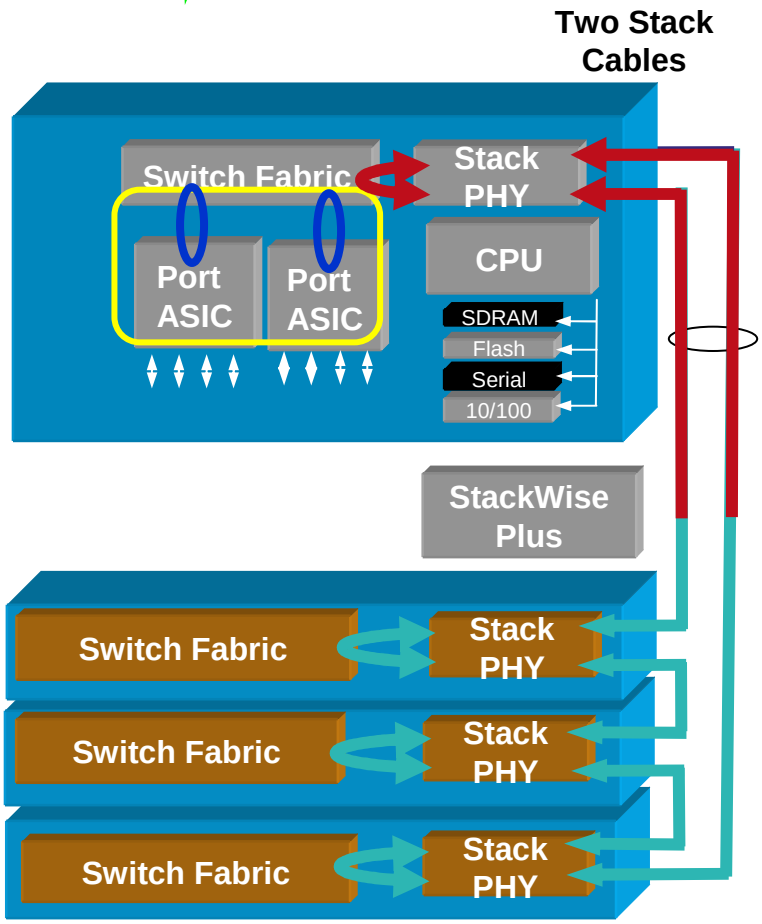


BladeCenter

BladeCenter H

Cisco Catalyst 3012/3110

- Integrates Cisco Catalyst networking technology into BladeCenter – under 'Catalyst' umbrella
- Three (3) new Cisco Switch Modules
  - 1Gb Switch without Stacking (***3012***)
  - 1 Gb Switch with Stacking (***3110g***)
  - 10Gb Uplink Switch with Stacking (***3110x***)
- Software Keys
  - Base Services - layer 2, static routing, RIP – included with all 3 switches
  - IP Services - Layer 2/3, OSPF, BGP (optional for 3110)
  - Advanced IP Services - IPv6 (optional for 3110)
- First to market with next generation switch technology
- First blade solution in industry with embedded Cisco switch stacking: ***Virtual Blade Switch*** technology (VBS)



BNT® 1/10 GB ETHERNET SWITCH

- **Designed for IBM BladeCenter form factor**
- **Full Layer 2 Switching and Layer 3 Routing - Stackable**
- **Ports**
  - **22x 1G copper RJ-45**
    - **6x 1G RJ45 External uplinks**
    - **14x 1G Internal server links**
    - 2x Internal MM ports
  - **3x 10G ports**
    - **3 SFP+ uplink ports (SR/LR)**
- **Line rate performance with no packet drop**
- **Power**
  - **Meets IBM BladeCenter requirements: less than 45W**

BladeCenter SAN Components

QLogic® 10 and 20 ports 4Gb Fibre Channel Switch Module

- NB: be aware, 10-port upgrade now only available from Qlogic support

McDATA® 10 and 20 ports 4Gb Fibre Channel Switch Module

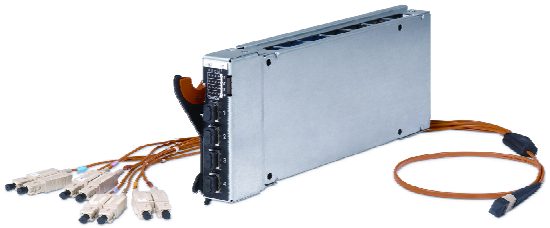
Brocade® 10 and 20 ports 4Gb SAN Switch Modules

Cisco® 10 and 20 ports 4Gb Fibre Channel Switch Module

- SANOS
- Utilizes Cisco SFPs (also IBM p/n)

QLogic® Intelligent Pass-thru Module

- 6 external shared connections - 4Gb I/O
- NPIV technology (N_Port_ID Virtualization)
- Presents multiple N-Ports to the fabric
- Needs external switch NPIV capable



Optical Pass-thru Module

- Supplier: IBM
- Provides unswitched / unblocked optical connection
- Up to 14-optical connections to external SAN (requires breakout cable option)
- Max 2Gb bandwidth

BladeCenter SAN Components - new

QLogic®
20 ports 8Gb Fibre Channel
Switch Module
(P/N 44X1905)

- 20-port 8 Gb Fibre Channel Switch with 14 internal/midplane ports for server connectivity and six external/SFP enabled ports for target or fabric connectivity
- 14 internal copper SERDES connections to the blade servers with F-port 2 Gb and 4 Gb autodetect speed types
- Six external client-accessible F/FL/E, 2, 4, and 8 Gb autodetect SFP ports

QLogic®
8Gb Intelligent Pass-thru Module
(P/N 44X1907)

- 6 external shared connections - 4Gb I/O
- NPIV technology (N_Port_ID Virtualization)
- Presents multiple N-Ports to the fabric
- Needs external switch NPIV capable
- Eliminates E_Port Switch to switch incompatibility

BladeCenter H Tour

A Look At The Front

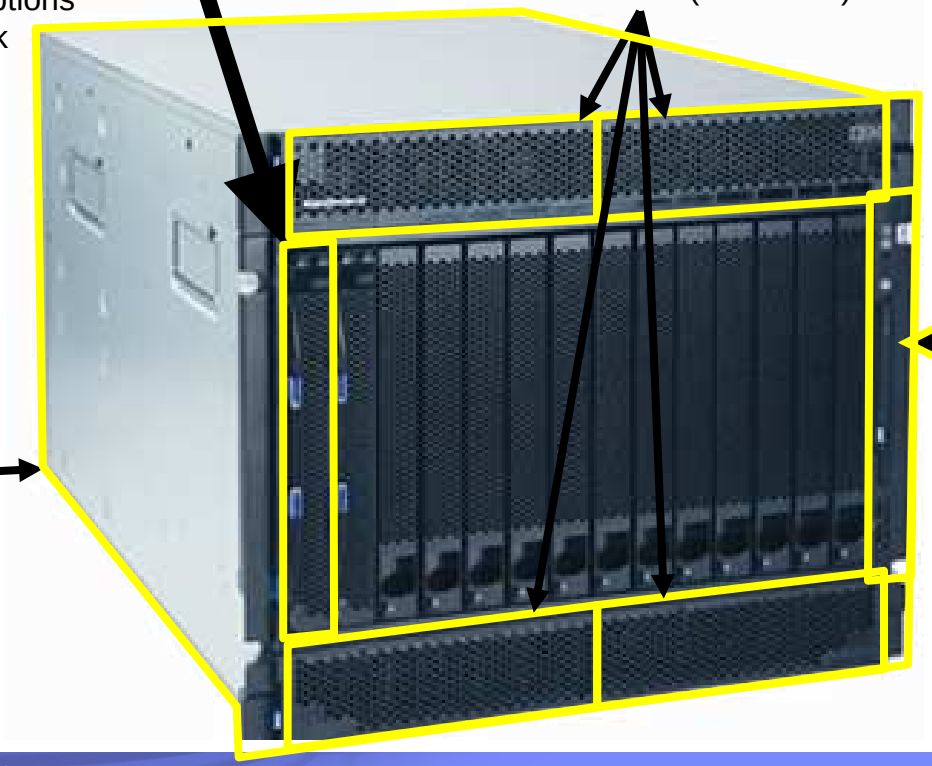
Server Blades

- Same Blades
- Same I/O Feature Cards
- Same Server Blade Features
- Same Dual Slot PCI adapter 'sidecar'

- BC-H and new Blades add:
  - Additional Blade Power/Thermal Capacity
  - Additional High Speed I/O Options
    - – PCI-Express x8 chipset link
    - – 4 4x Switch Module links

Power Modules (2 or 4)

- Hot Swap, Redundant
- 200-240V 50/60Hz AC (worldwide)



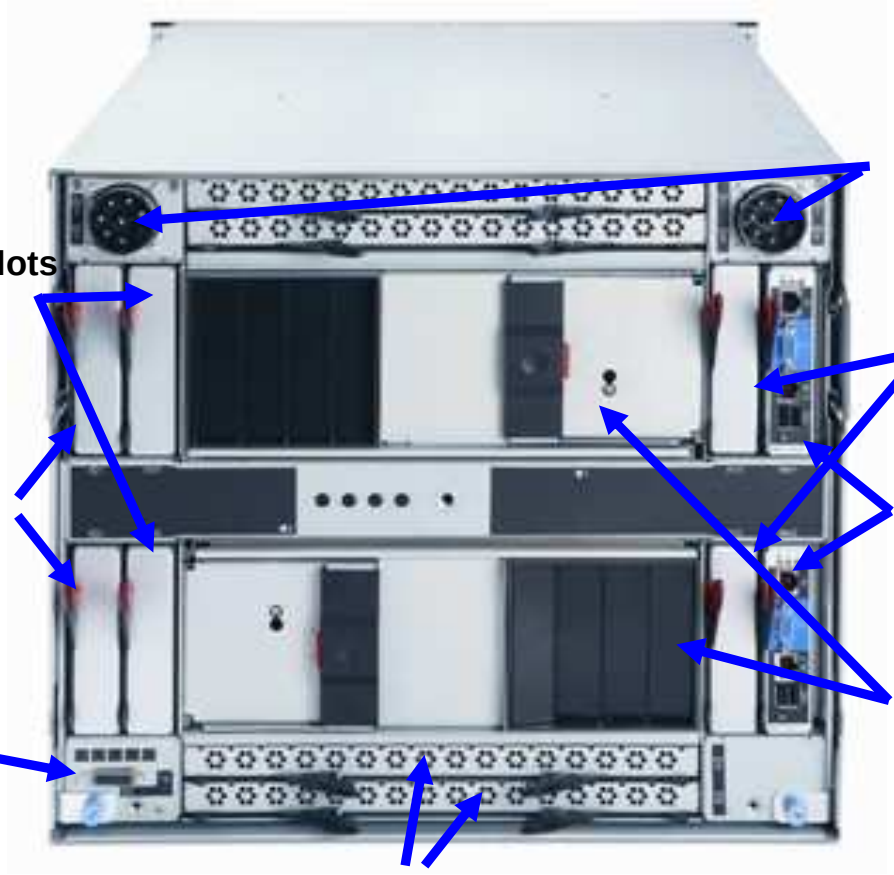
Op Panel & Media

- Chassis level LEDs-
  - Power, Alert, Info
  - Chassis 'Locate'
- 2 USB Ports
- Removable storage media
  - DVD

BC-H Chassis

- 18 inch rack mount
- Front to rear airflow
- Front/rear service
- Rear cabling
  - 14 Server Bays
  - 9U high, 28" deep

BladeCenter H Tour
What is Where?



Consolidated Redundant Power Inputs (2)

Dedicated Bridge Module Slots (up to 4)

Switch Module Bays 3 & 4 –OR- Bridge Slots

Switch Module Bays 1 & 2 (dedicated Ethernet)

Advanced Manage Modules

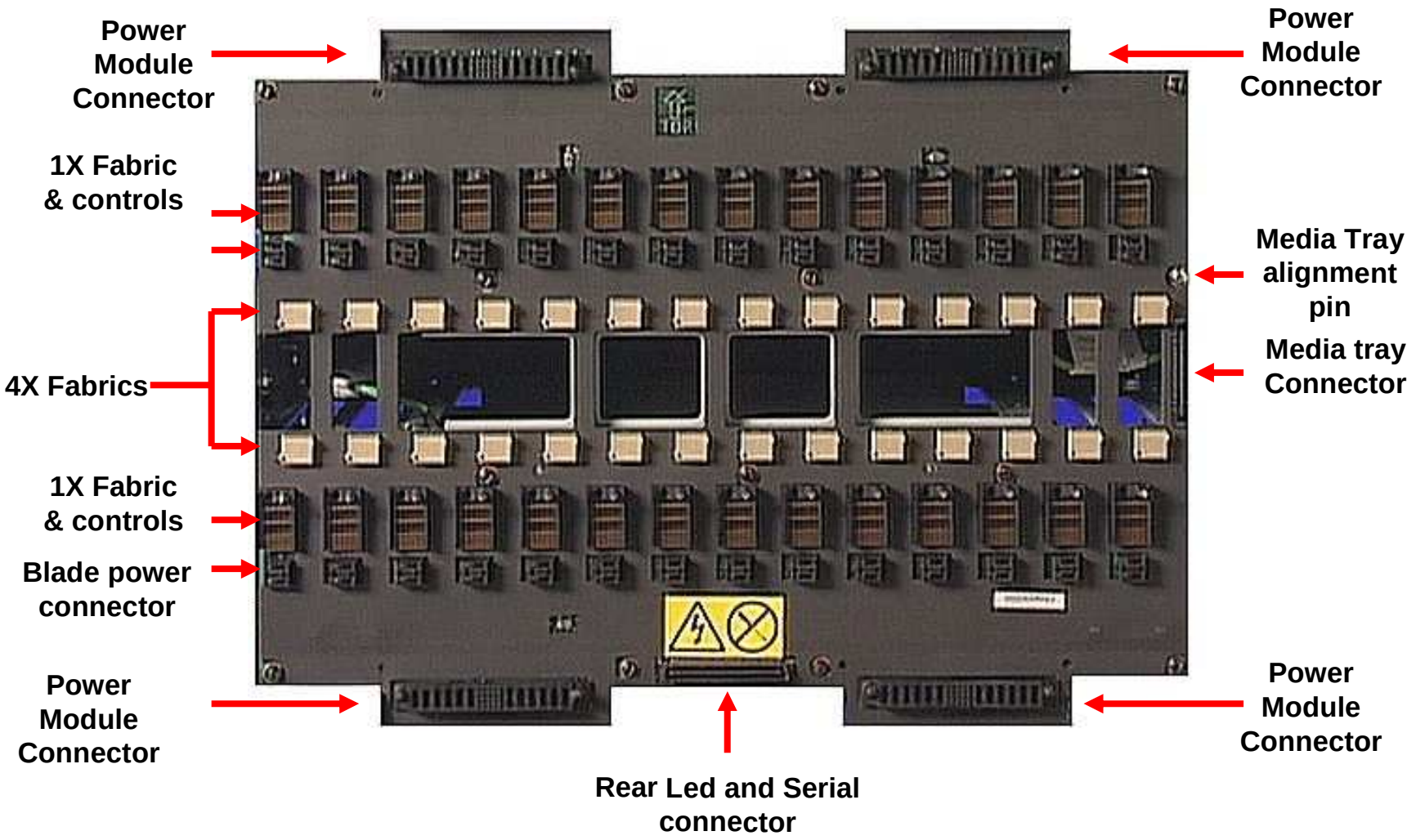
Blowers (2)

Aggregated Serial Connector

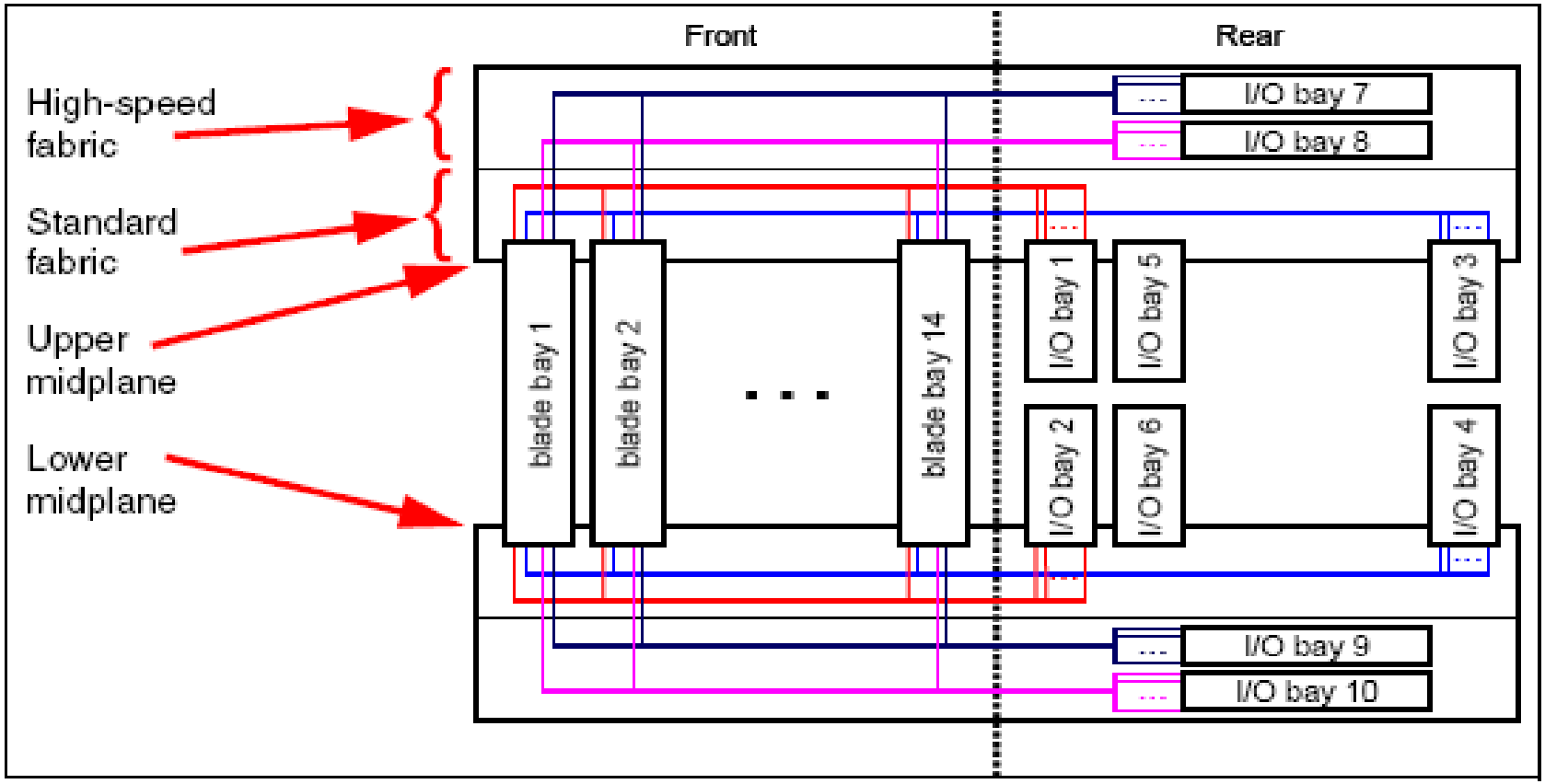
Light path diagnostic panel

High Speed Switch Module Bays (4)

IBM BladeCenter H
Midplane Internal Detail



IBM BladeCenter H – connection paths



BladeCenter H – High Speed Network

- **Support for high speed switches**
  - **4X InfiniBand,**
  - **10G Ethernet**
- **Support for high speed DC's on blades**
  - **4 high-speed fabrics**
  - **Still have access to legacy fabrics**

InfiniBand on BladeCenter H

..first announced component of

Virtual Fabric Architecture

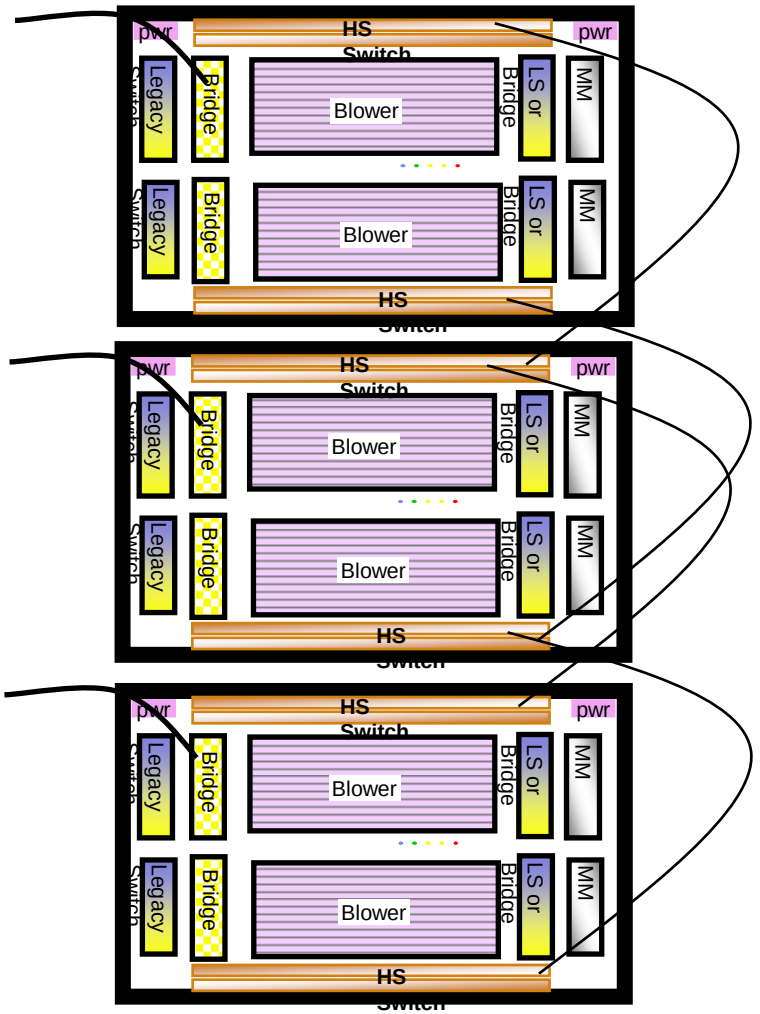
- **IBM and Cisco jointly developed a 4X (10Gb) InfiniBand solution for BladeCenter H**
  - Daughter Cards: Provide dual 4X connectivity to high speed switch modules - use PCI-Express (PCIe) connection on next generation Blades (e.g., JS21, HS21)
  - InfiniBand Switch Module: (14) 4X ports interfacing to blades (with daughter card) and (2) 4X and (2) 12X (30Gb) ports to network
- **Virtualized I/O via VFrame (Cisco) software**
- **Ship Support: July 25**

What can BladeCenter H be used for?

Installation of a 4X IB card and 4X switch allows blades to be added to high speed IB fabric. 80G per switch of bandwidth.

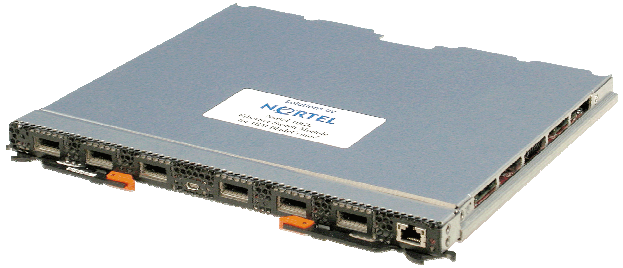
Customers can build a complete 4X IB fabric using only internal BladeCenter switches. Allows for redundancy, and high bandwidth.

For the ultimate virtualized solution the bridges inside the chassis can be used to deliver traditional ethernet and fibre connections at the rack level.



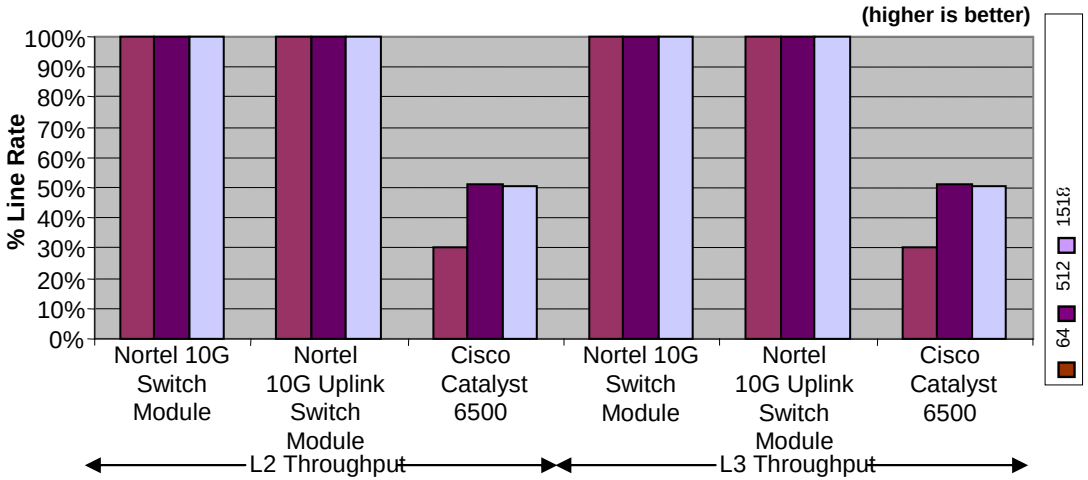
Introducing the BladeCenter BNT 10G Ethernet Switch

Unsurpassed 10G Throughput

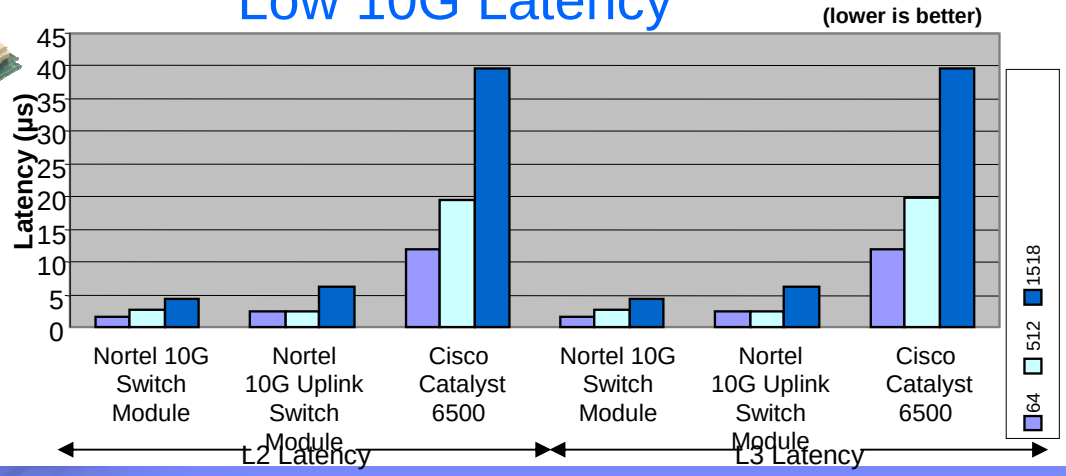


- **IBM and BNT have jointly developed a 10G Ethernet switch**
  - n.14 internal 10GbE ports
  - n.6 external 10 Gb XFP (SR or LR) interfaces
- **IBM and NetXen are jointly developing a 10Gb Ethernet expansion card for HS21, LS21, LS41, JS21.**
  - n.2 SERDES 10Gb interface
  - PCIe connection to the Blade

- Delivers Extreme Bandwidth and throughput for NGN apps such as IPTV, VoD, Security, using the fully non-blocking architecture of the Nortel 10GB Ethernet Switch Module**.**
- Improve efficiency and resource sharing through increased 10GbE port availability and advanced virtualization capabilities

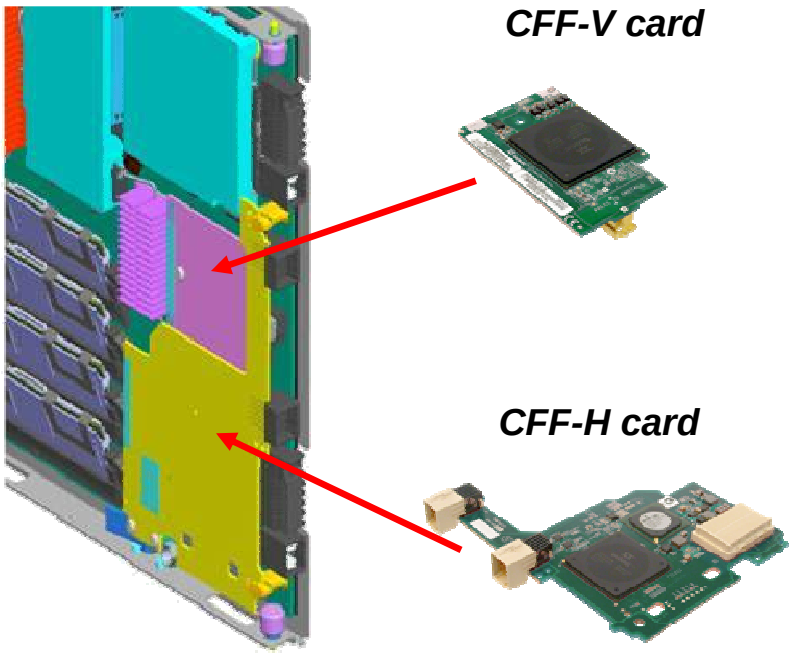


Low 10G Latency



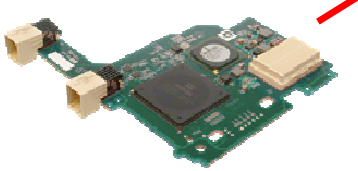
MSIM - The Evolution of I/O Connectivity (1st)

- **Virtualization, multi-core, and clustering are all driving additional port requirements per blade**
- **BladeCenter H has inherent hardware capability for eight I/O paths per blade**
- **Multi-Switch Interconnect Module provides a means for exploiting existing 8 paths to each blade (HS21, LS21, JS21)**
- **MSIM fits into the high speed switch slots in BladeCenter H**
- **Supports standard BladeCenter switch portfolio**



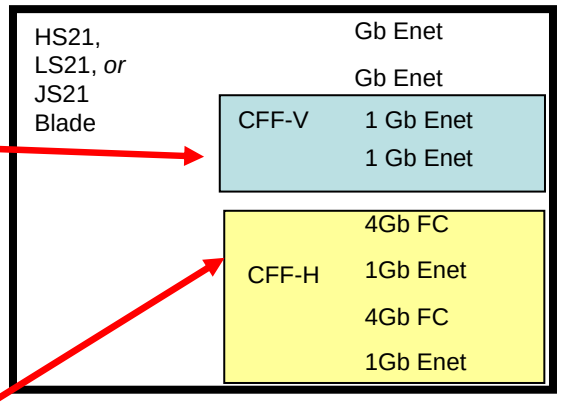
MSIM - The Evolution of I/O Connectivity *(2nd)*

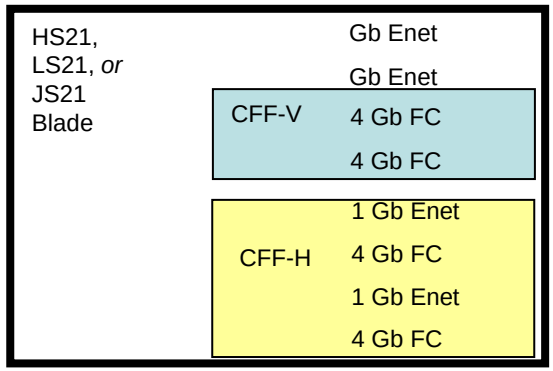
6 1G Ethernet
2 4G Fibre Channel

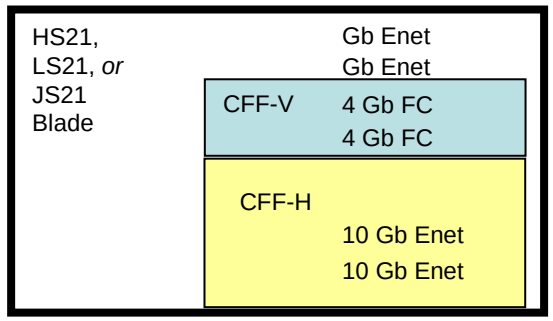


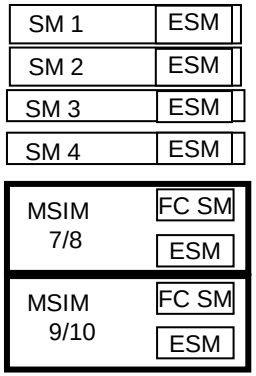
4 1G Ethernet
4 4G Fibre Channel

2 1G Ethernet
2 4G Fibre Channel
2 10G Ethernet Channel

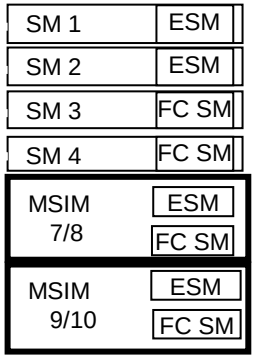




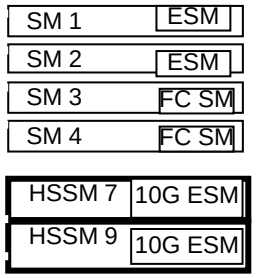




Base NICs
(1) 39Y9310 Gb Enet CFFV
(1) 39Y9306 Combo CFFH
(1) 39Y9314 MSIM

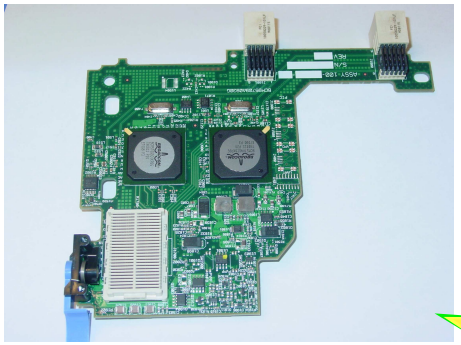


Base NICs
(1) 41Y8527 4Gb FC CFFV
(1) 39Y9306 Combo CFFH
(1) 39Y9314 MSIM



Base NICs
(1) 41Y8527 4Gb FC CFFV
(1) 39Y9271 10Gb Enet CFFH

2/4 Port Ethernet Expansion Card (CFFh)



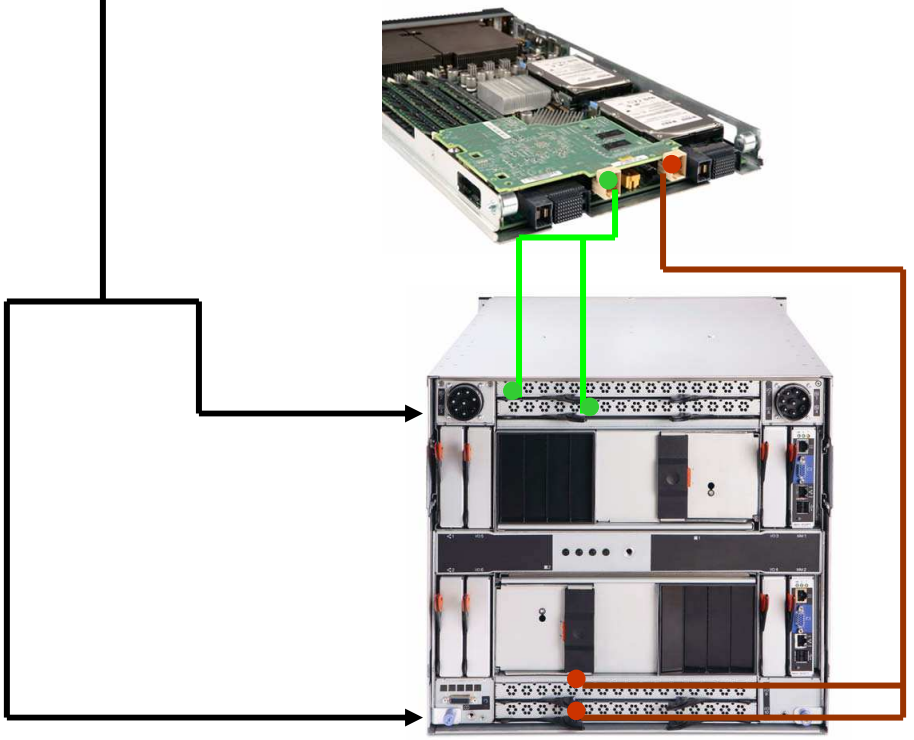
NEW!

Ann:12/08/08
GA: 29/08/08

p/n: 44W4479

Meets customer needs of additional IO Bays on BC-H

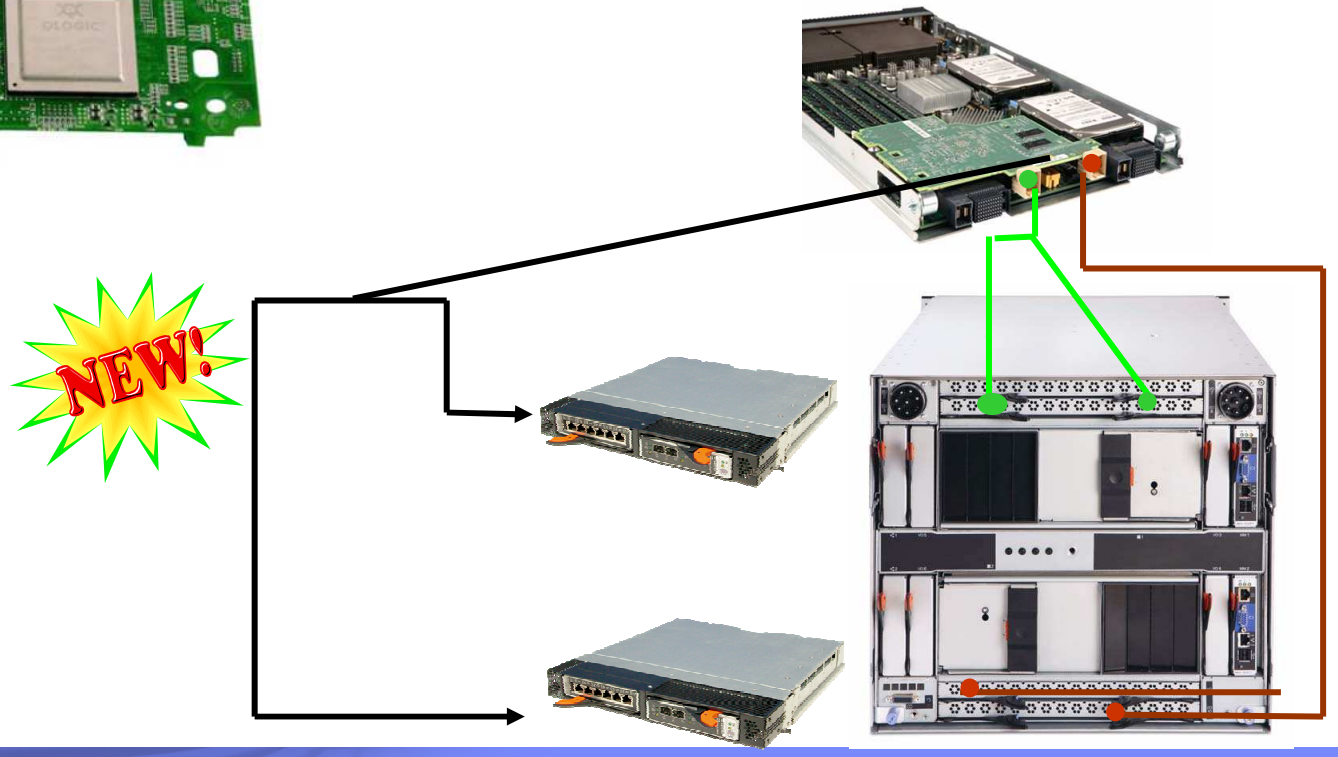
Enables IO Bays 7,8,9&10 in BladeCenter H/HT for:
- Additional switch module slots available.
- Increased Bandwidth for Virtualization
- Up to 8 Ethernet port combinations possible



Dual Port 8Gb Fibre Channel & Dual Port 1Gb Ethernet PCIe Expansion Card

Enable 8Gb FC & extra Eth on BC-H + MSIM

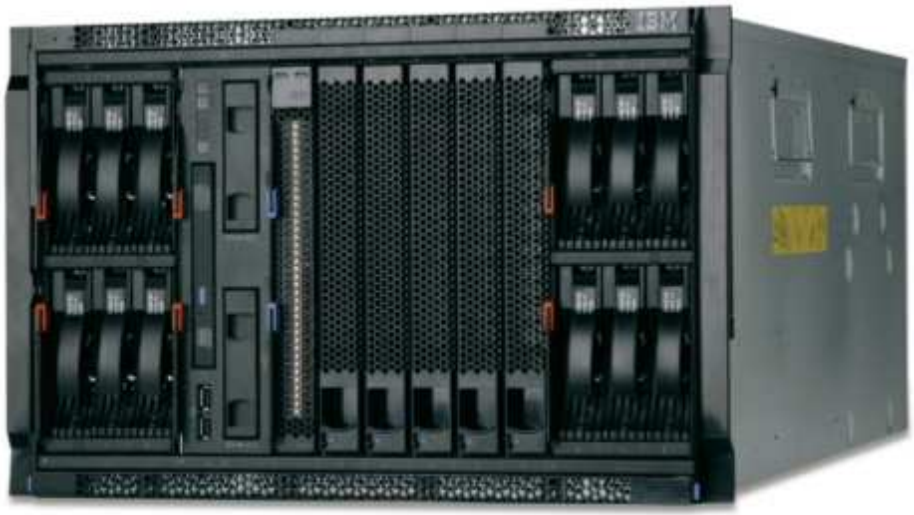
- Features a highly desirable combination adapter that enables two 8Gb Ethernet ports, along with two 1Gb Ethernet ports
- Supported blade platforms include HS21, HS21xm, LS21, LS41, LS42, HS12
- Uses QLogic 2532 ASIC and Broadcom 5709S ASIC



Ann:6/1/2009
GA: 30/1/2009

p/n: 44X1940

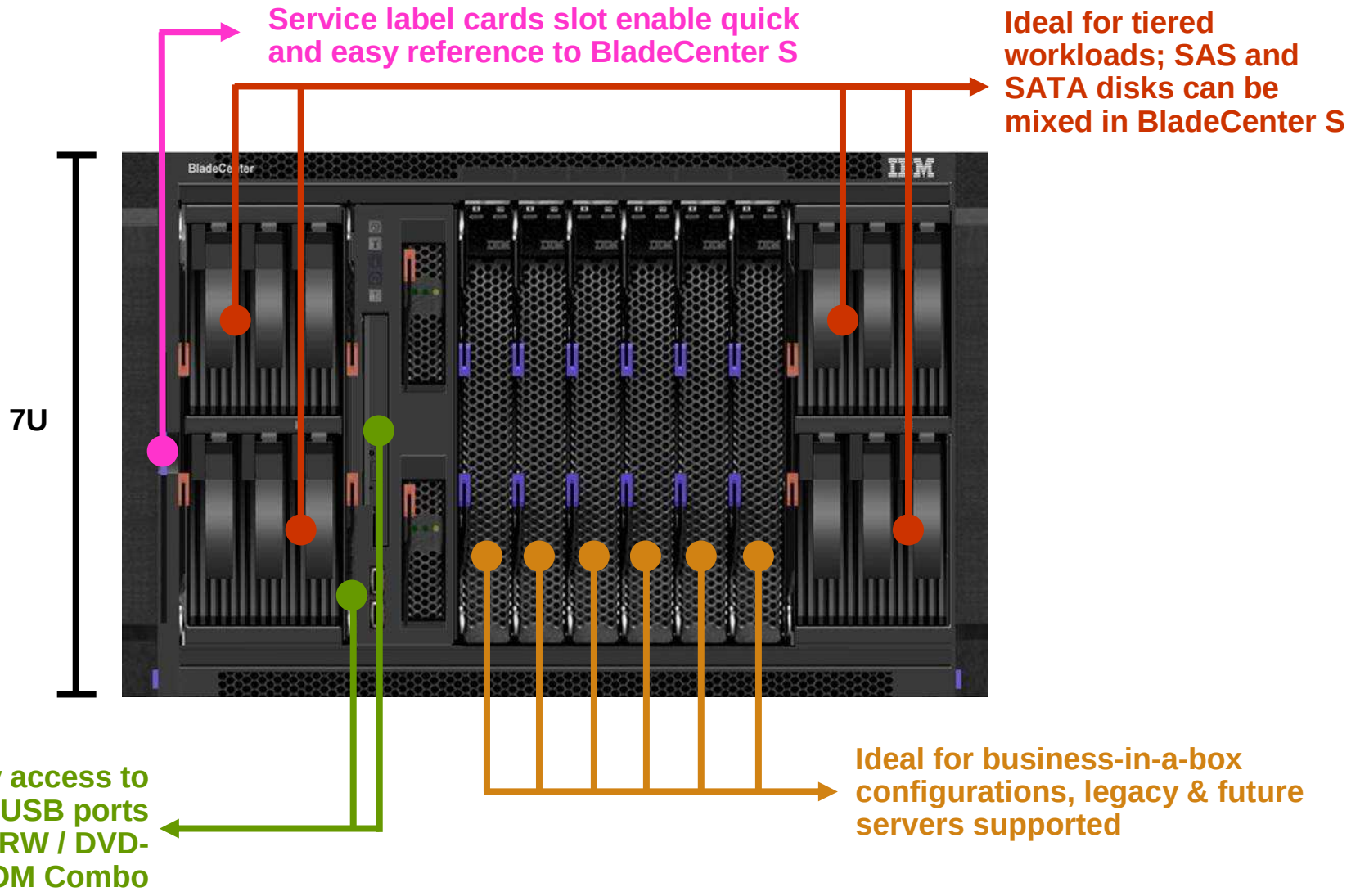
Introducing BladeCenter S



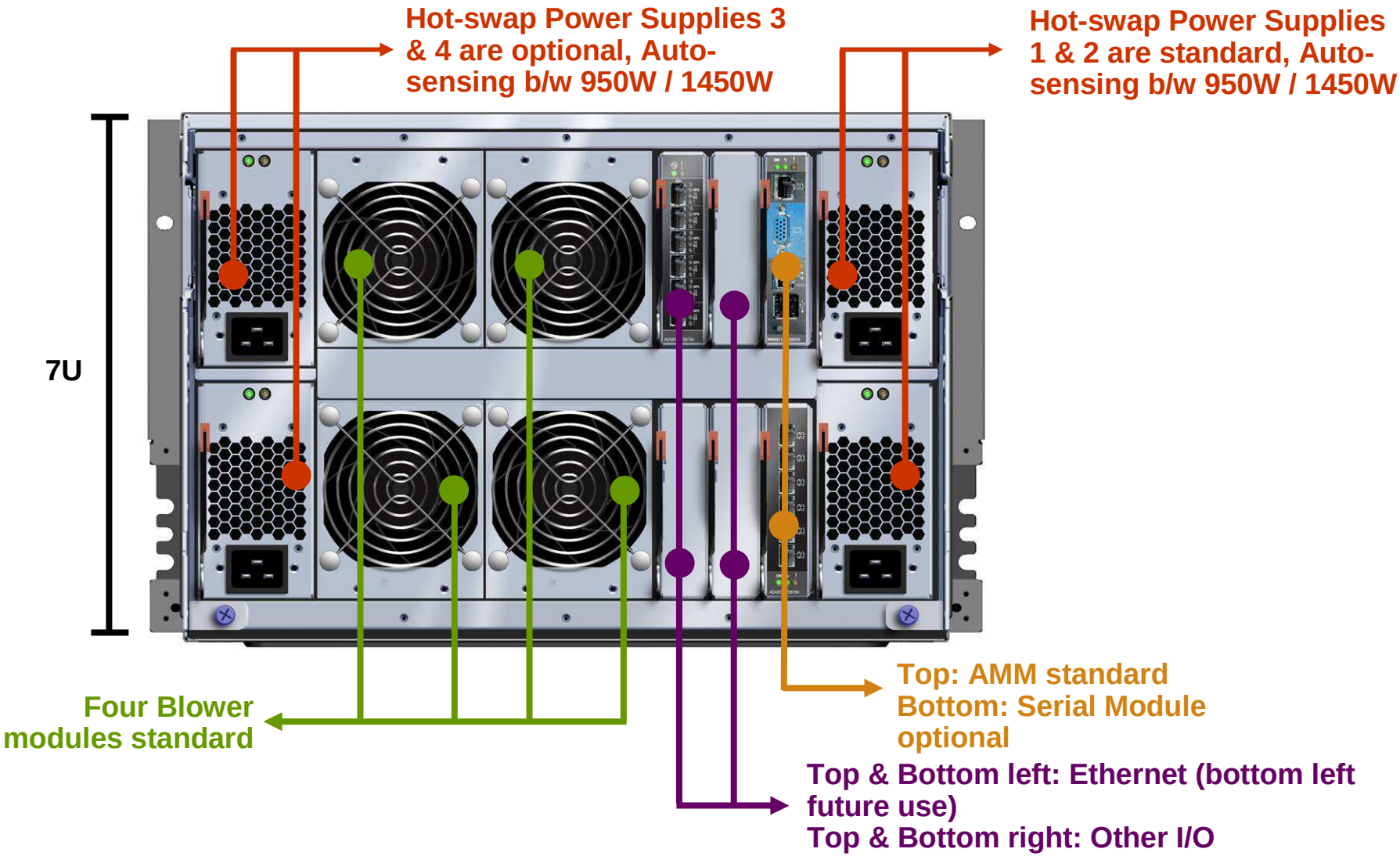
1. First BladeCenter chassis focused on distributed LE & SME markets
2. First BladeCenter chassis to incorporate integrated shared storage
3. Significant focus on improving usability and customer experience
4. Attractive alternative to racks and high availability towers
5. Greatly improved BladeCenter platform for small office environment

By tailoring BladeCenter S for distributed LE & SME, IBM is calling the same highly successful play that stormed BladeCenter into dominant market share in the Data Center

BladeCenter S Product Summary

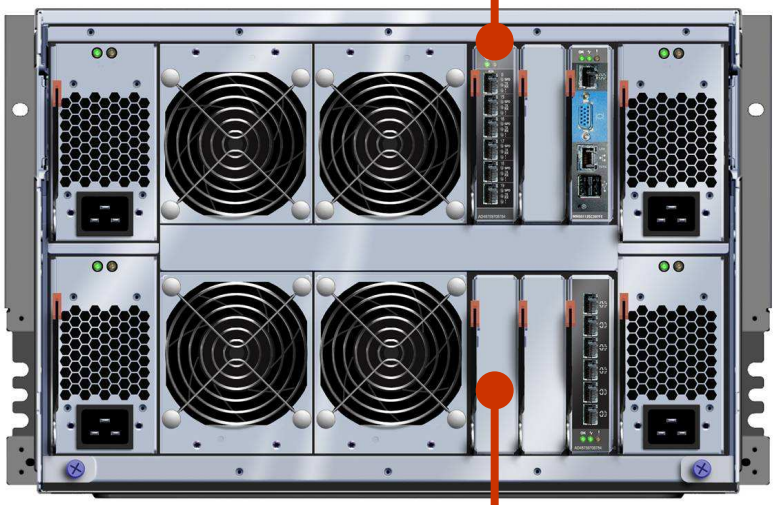


BladeCenter S Product Summary



Interoperability

I/O Bays 1 and 2



I/O Bay 1: For Ethernet switch

This switch bay is wired to both Ethernet ports of the 6 blade slots

This bay accepts the following switches:

Part #	Description
32R1783	BNT 10Gb Uplink Ethernet Switch Module
32R1860	BNT Layer 2/3 Copper GbE Switch Module
32R1861	BNT Layer 2/3 Fibre GbE Switch Module
39Y9324	Server Connectivity Module
39Y9320	IBM BladeCenter Copper Pass-thru Module
39Y9316	IBM BladeCenter Optical Pass-thru Module (Ethernet only)
32R1859	BNT Networks Layer 2-7 Gigabit Ethernet Switch Module

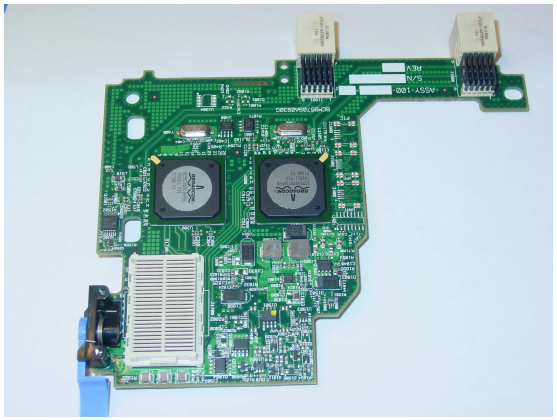
I/O Bay 2:

Redundant Ethernet switch

with 4 port 1Gb CFFh exp card (44W4479)

2/4 Port Ethernet Expansion Card (CFFh)

Meets Customer needs for IO redundancy on BC-S

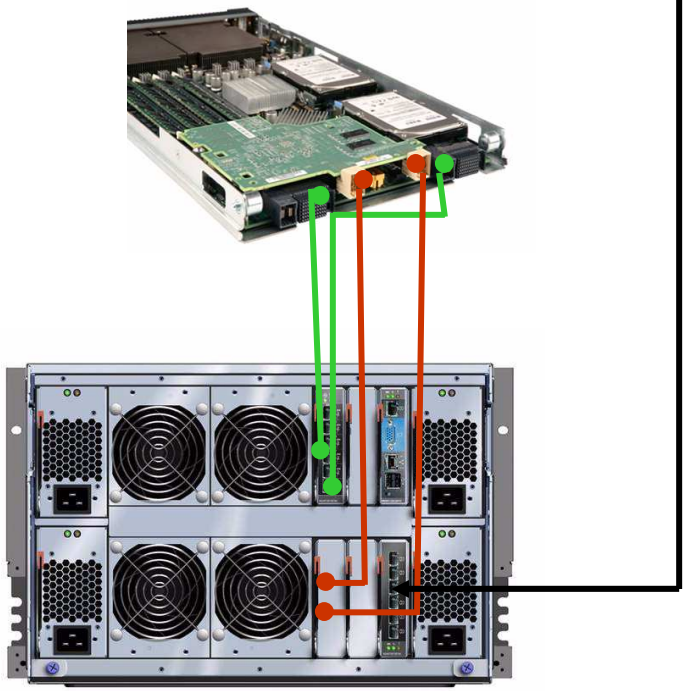


Ann:12/08/08
GA: 29/08/08

p/n:44W4479

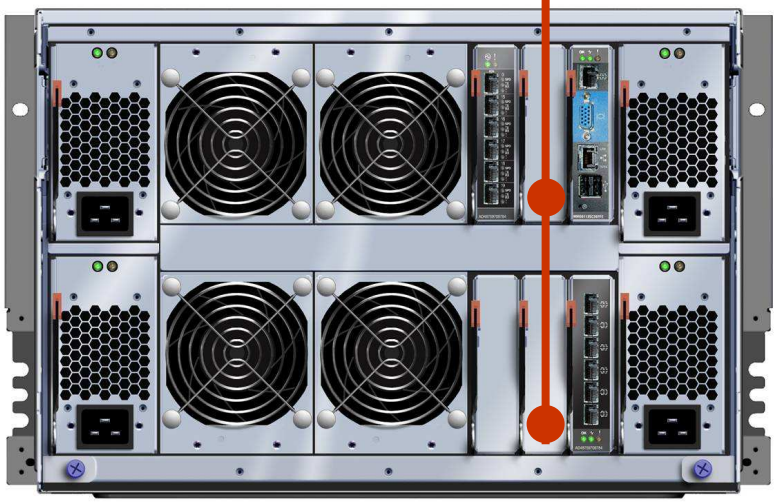
Enables 2nd Ethernet switch in BladeCenter S for:

- Switch Module level failure tolerance and redundancy
- Increased Ethernet bandwidth for Virtualization workloads
- Up to 6 Ethernet port combinations possible



Interoperability

I/O Bays 3 and 4



SAS RAID Controller Module

Ann: 09/09/08

GA: 24/10/08

- Redundant configuration (dual RAID Controller, dual-switch and dual-BBU)
- RAID 0, 1, 0+1 & 5
- Supports two disk storage modules (DSM) with up to 12 x 3.5in SAS drives
- Need of Eth switch for internal communication

I/O Bay 3 & I/O Bay 4:
For Ethernet, Fibre Channel, or SAS
Must be of same type, mixing is not supported

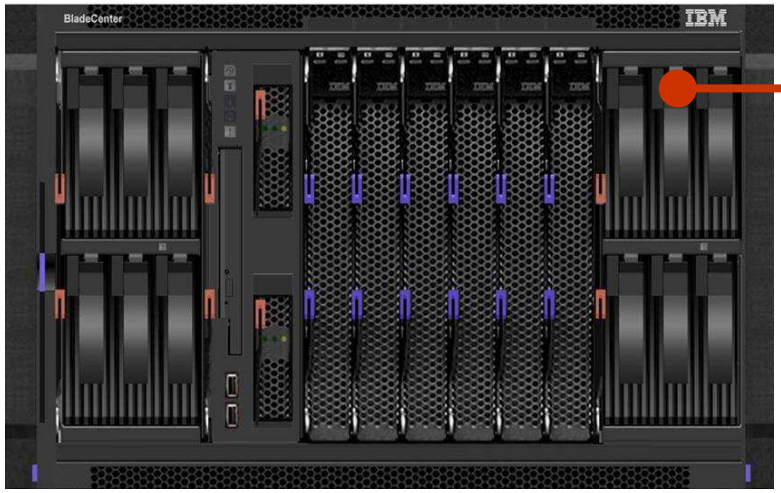
If DSS is installed then SAS Connectivity Module or SAS RAID Controller is/are required.

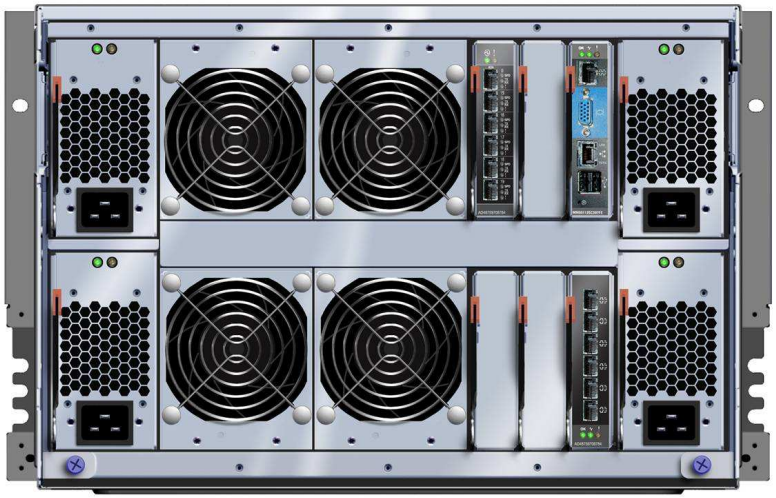
The following are accepted:

Part #	SAS RAID controller
43W3584	IBM BladeCenter S SAS RAID Controller Module
Part #	SAS switch
39Y9195	IBM BladeCenter SAS Connectivity Module
Part #	Ethernet switches
32R1783	BNT 10Gb Uplink Ethernet Switch Module
32R1860	BNT Layer 2/3 Copper GbE Switch Module
32R1861	BNT Layer 2/3 Fibre GbE Switch Module
39Y9324	Server Connectivity Module
39Y9320	IBM BladeCenter Copper Pass-thru Module
39Y9316	IBM BladeCenter Optical Pass-thru Module (Ethernet only)
32R1859	BNT Networks Layer 2-7 Gigabit Ethernet Switch Module
Part #	Fibre Channel switches
32R1813	Brocade 10-port 4Gb SAN Switch Module
39Y9284	Cisco Systems 4Gb 10-port Fibre Channel Switch Module
43W6724	QLogic 10-port 4Gb SAN Switch Module
43W6723	QLogic Intelligent Pass-Thru Module
39Y9316	IBM BladeCenter Optical Pass-thru Module

Interoperability

DSM





NEW!

DSM 1 & DSM 2:
Any SAS or SATA disk or combination is valid (note: no intermix with RAIDed switch, only SAS disks allowed).

SAS Switch is required if DSM are populated with disks.

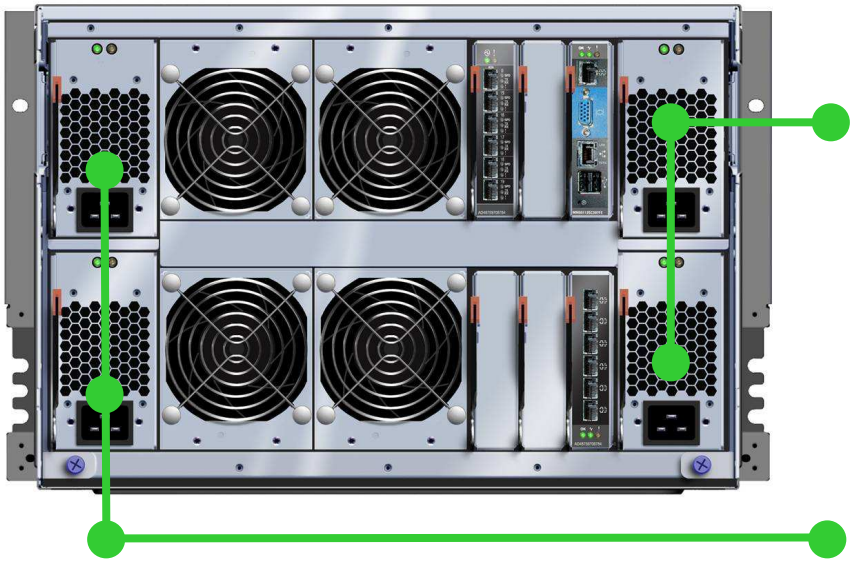
Power Supply 3 & 4 are required if DSM 2 is installed.

The following disks are supported:

Part #	HDDs
40K1043	**73GB 15K SAS**
40K1044	**146GB 15K SAS**
43X0802	**300GB 15K SAS**
42D0519	**450GB 15K SAS**
42D0546	**750GB 7.2K SAS**
42D0547	**1 TB 7.2K NL SAS**
39M4530	**500GB SATA**
43W7576	**750GB SATA**

Ann: 2 dic 2008
Avail: 27 feb 2009

When to use the Optional Power Supplies 3 & 4

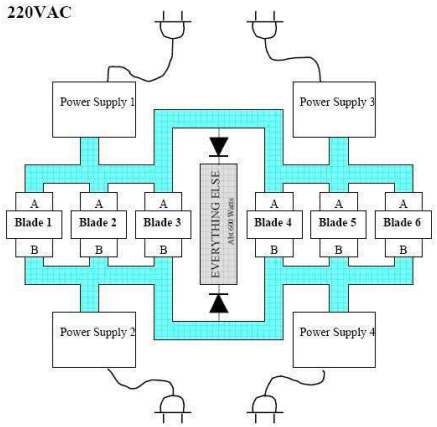


Standard Power Supplies supply provide power for:

- All blade servers,depending from electric load
- nr.1 Disk Storage Module with disks

Optional Power Supplies 3 & 4 needed to power all slots:

- When blades are power demanding
- nr.2 Disk Storage Modules installed (with disks)



- Need 4 separate AC circuits, wired to 4 separate "breakers"
- Each circuit receptacle must be within 6 ft of the chassis
- Each power cord is a standard 6 ft length
- each supply 1450W capable
- total pwr limited to 2900W per Power Domain

BladeCenter S and the NEW O.E.K.

- **Ideal way to deploy BladeCenter S into office environments**
- **Includes Acoustical Module built into the back**
- **Optional Air Filter on the front**
- **Locking door for security**
- **Mobile with rollers**
- **33% (4U) extra room to grow**

Incredibly Quiet
Dust Filter
Up to 9TB
Shippable WW

Perfect workgroup solution foundation

BladeCenter Server Portfolio

HS12

New Function, new price point

HS21

HS21XM

General-purpose enterprise

Virtualization

HS22

"No Compromise"

Enterprise Blade

LS22

High-performance

LS42

Scalable, enterprise performance

JS12 / 22

Power6

JS23 / 43

Power 6+

QS22

High-performance

T2BC

Themis

UltraSPARC

Announcing… HS22 !

Versatile, easy to use blade optimized for performance, power and cooling

What is announcing…

- New 2-socket, 30mm blade based on Intel's Xeon 5500 processor
- Next workhorse server for IBM BladeCenter
- Follow-on to both HS21 and HS21 XM

Announcement importance…

- Delivers a robust set of features that does many things exceptionally well:
  - 2 processor sockets supporting all of Intel's latest server processor SKUs
  - 2 hot-swap internal storage bays supporting both SAS and solid state
  - 12 memory DIMMs
  - *PLUS MORE…* (embedded hypervisor, battery-backed cache, etc.)
- Time-to-market with Intel

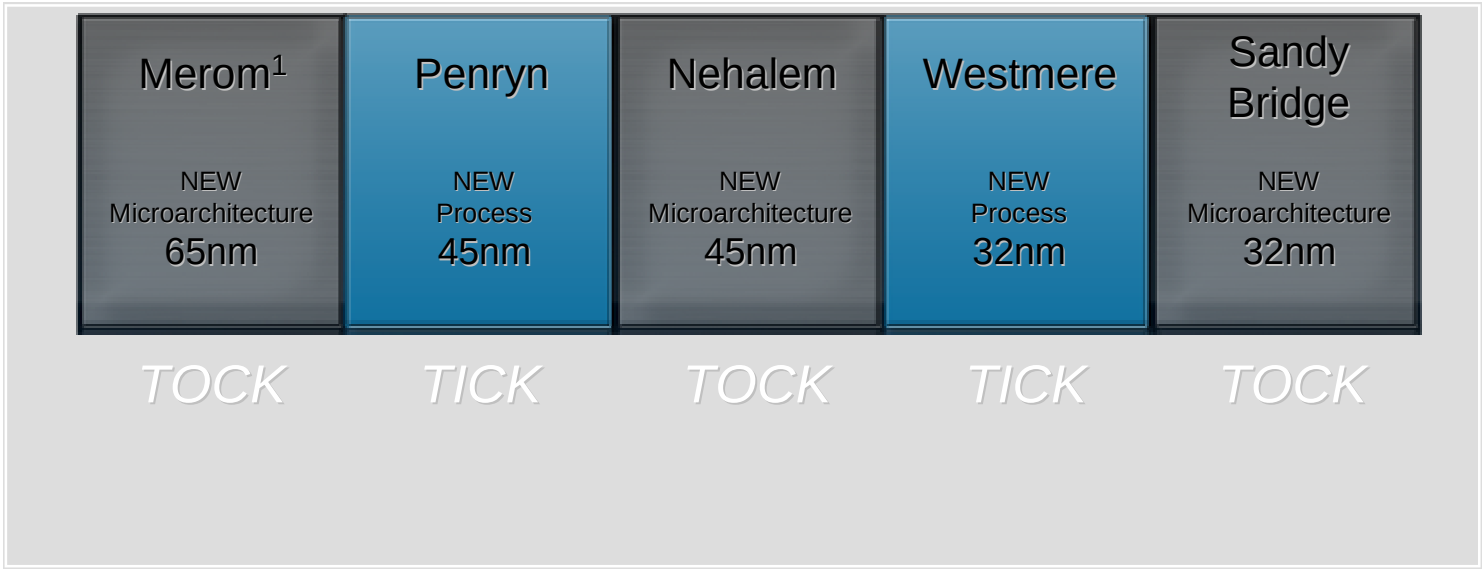
NEW!

HS22

Announce & Availability:

31 March 2009

Intel “Tick-Tock” Development Model



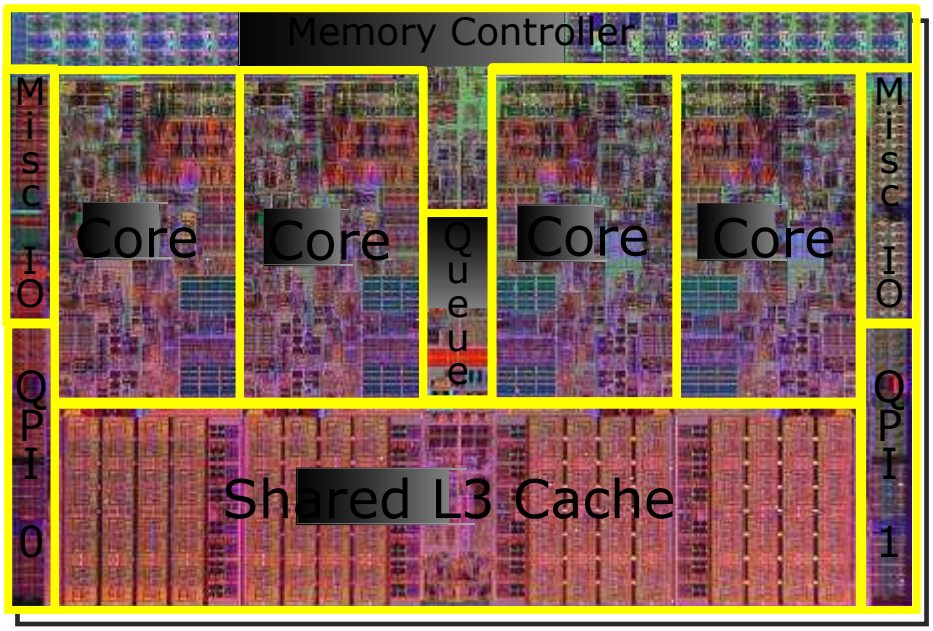
[1]Intel® Core™ microarchitecture (formerly Merom)
45nm next generation Intel® Core™ microarchitecture (Penryn)
Intel® Core™ Microarchitecture (Nehalem)
Intel® Microarchitecture (Westmere)
Intel® Microarchitecture (Sandy Bridge)

65

Nehalem EP Overview

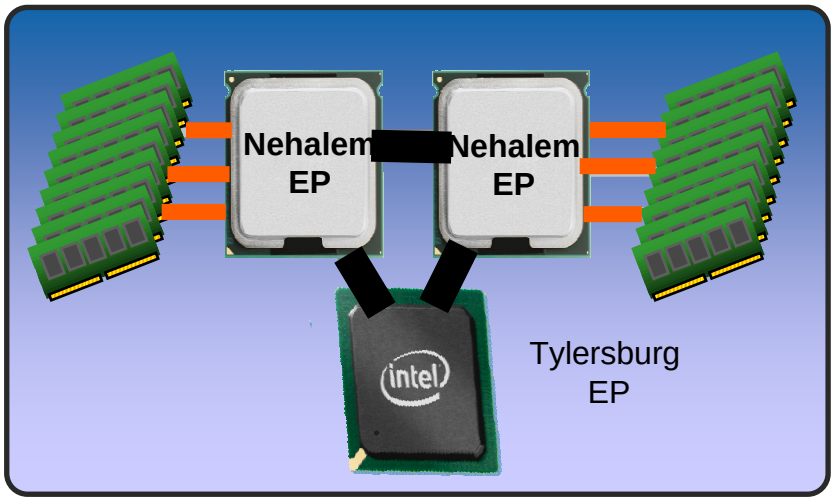
- Micro-architecture enhancements (Core i7)
- 45nm Manufacturing Process
- Integrated three channel DDR3 memory controller
- 2 Quick path interconnect links
- Single die quad core
- Shared 8MB L3 cache
- Return of SMT (hyperthreading)
- High core frequencies (up to 2.93GHz for server)
- Significant (>2x) improvement in SpecFP and STREAM (>3x) benchmarks

- **Announcing March 30th**



Intel® Xeon™ 5500 Platform Architecture

- **Integrated Memory Controller**
  - **3 DDR3 channels per socket**
  - **Massive memory** *bandwidth*
  - **Memory Bandwidth scales with # of processors**
  - **Very** *low memory latency*
- **Intel® QuickPath Interconnect (Intel® QPI)**
  - **New point-to-point interconnect**
  - **Socket to socket connections**
  - **Socket to chipset connections**
  - **Build** *scalable* **solutions**

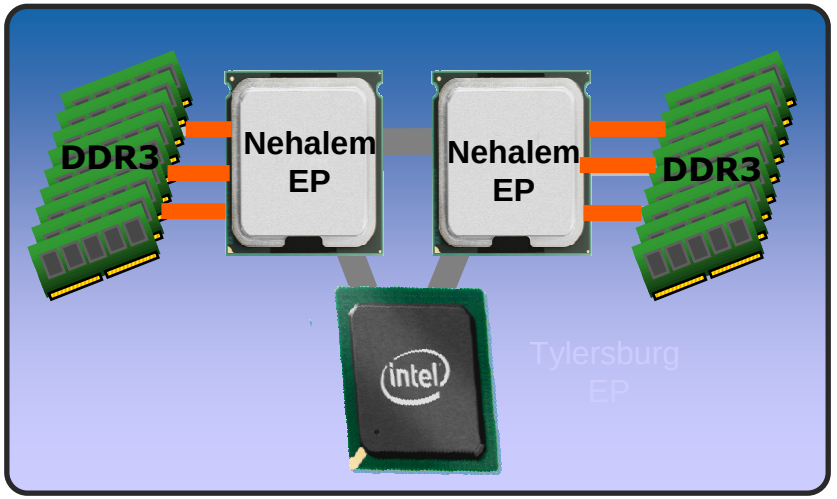


Significant performance leap from new platform

Intel® Core™ microarchitecture (Nehalem-EP)
Intel® Next Generation Server Processor Technology (Tylersburg-EP)

Integrated Memory Controller (IMC)

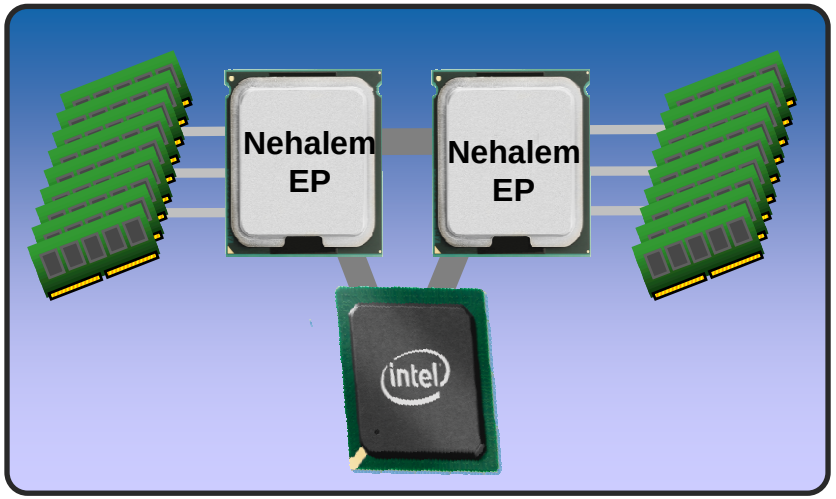
- **Memory controller optimized per market segment**
- **Initial Intel® Xeon™ 5500 Microarchitecture products**
  - **Native DDR3 IMC**
  - **Up to 3 channels per socket**
  - **Massive** *memory bandwidth*
  - **Designed for** *low latency*
  - **Support RDIMM and UDIMM**
  - **RAS Features**
- **Future products**
  - *Scalability*
    - **Vary # of memory channels**
    - **Increase memory speeds**
    - **Buffered and Non-Buffered solutions**
  - **Market specific needs**
    - **Higher memory capacity**
    - **Integrated graphics**

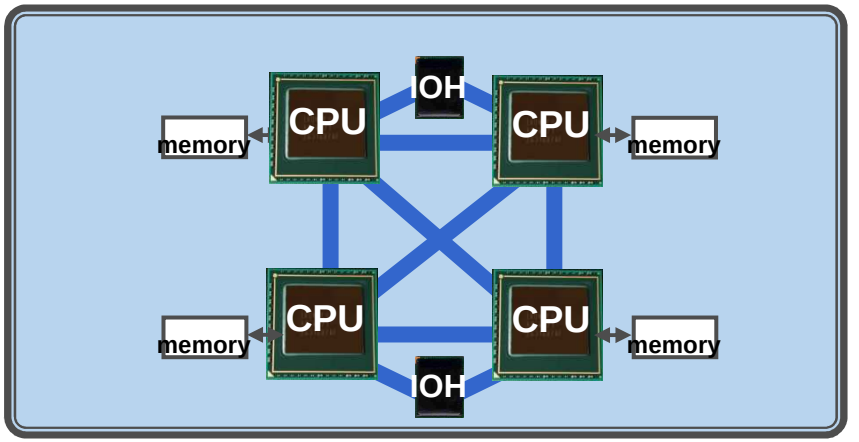


Significant performance through new IMC

Intel® QuickPath Interconnect

- **Intel® Xeon™ 5500 Microarchitecture introduces new Intel® QuickPath Interconnect (Intel® QPI)**
- ***High bandwidth*, *low latency* point to point interconnect**
- **Up to 6.4 GT/sec initially**
  - **6.4 GT/sec -> 12.8 GB/sec**
  - **Bi-directional link -> 25.6 GB/sec per link**
  - **Future implementations at even higher speeds**
- **Highly *scalable* for systems with varying # of sockets**

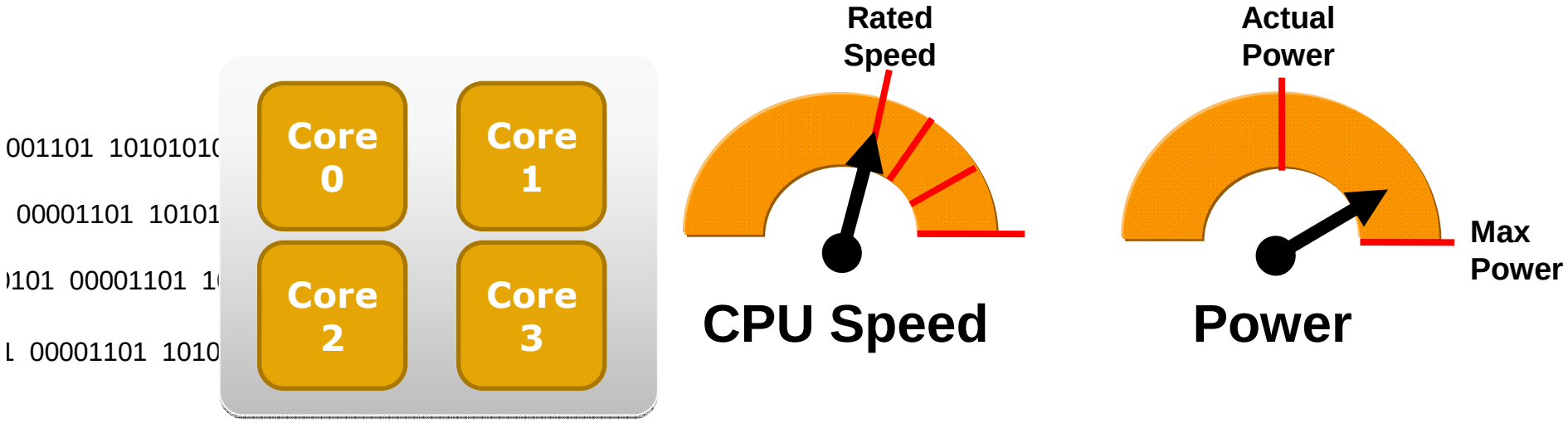




Nehalem EP Features

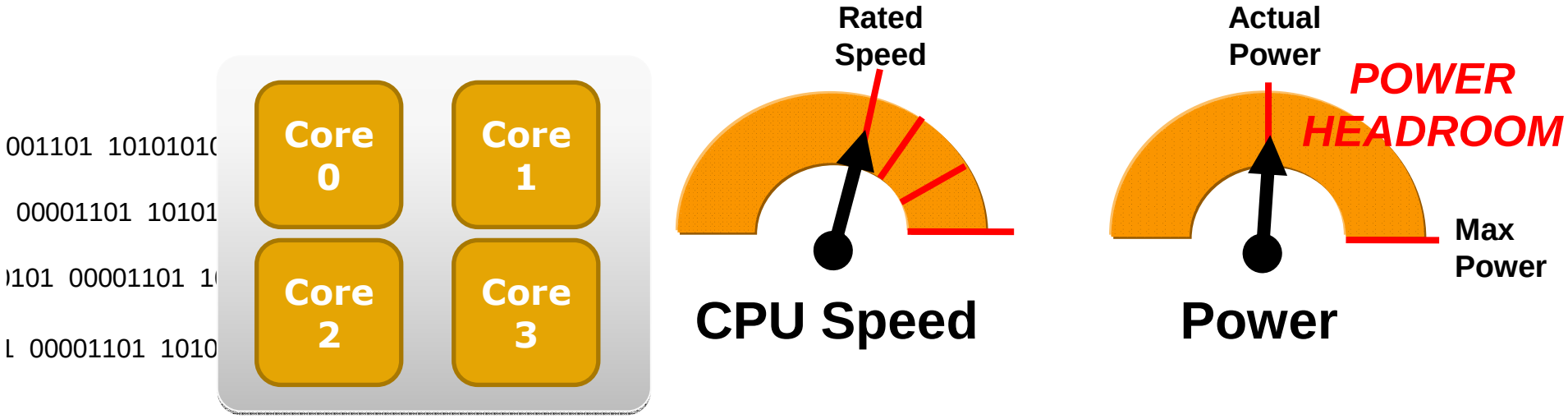
- Turbo Boost
  - Allows you to turn off cores inside the processor and then increase the clock speed on the remaining cores
  - Also allows for short term increases in overall clock speed providing power and cooling is available (without turning off cores)

Intel Nehalem EP Turbo Mode Overview



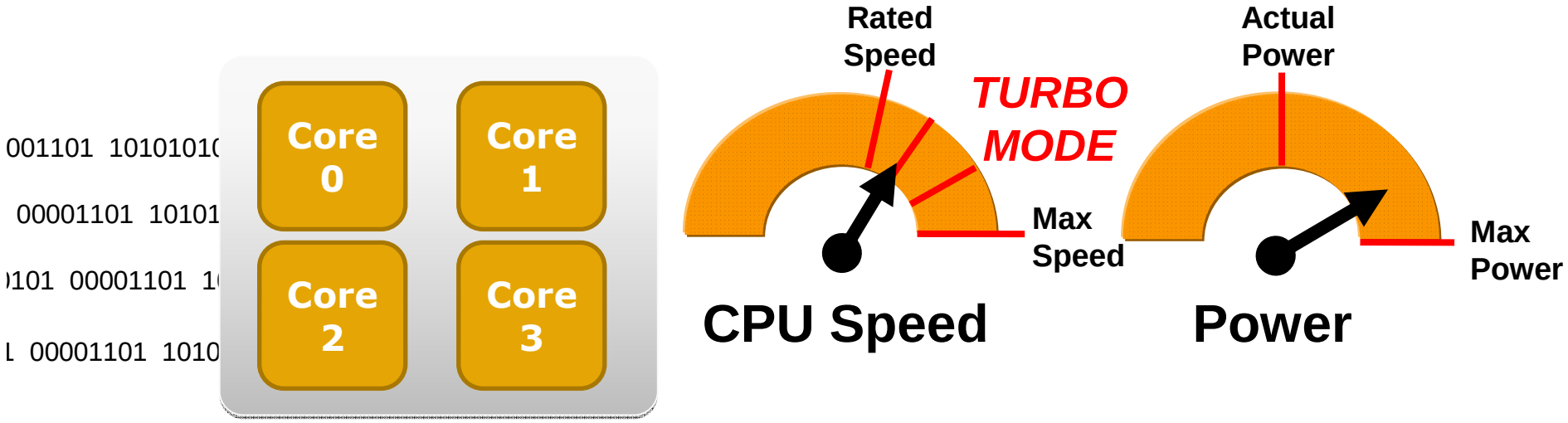
- CPUs typically operate at a fixed max frequency regardless of the workload
- For the most demanding workloads, the CPU operates closer to its max power limit

Intel Nehalem EP Turbo Mode Overview



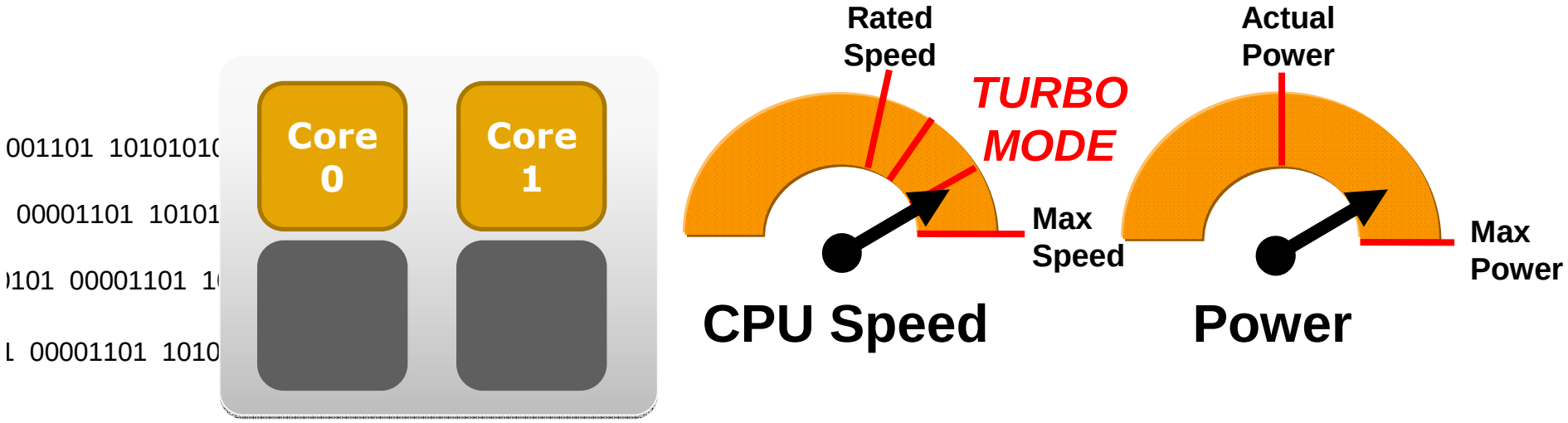
- However, most applications allow the CPU to operate below max power
- Power headroom may also be available if cores are idle

Intel Nehalem EP Turbo Mode Overview



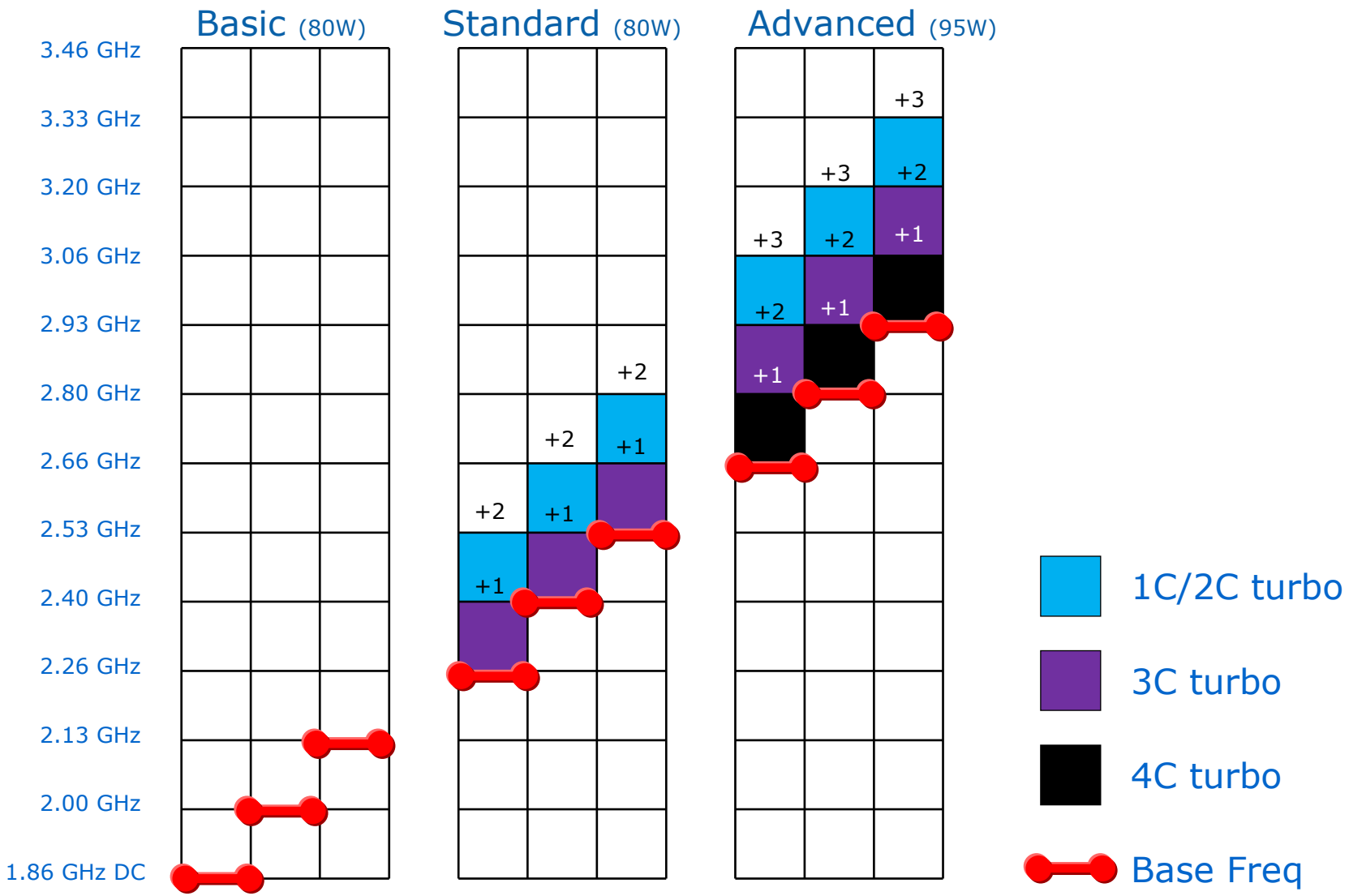
- Turbo Mode speeds up the CPU to utilize any available power headroom

Intel Nehalem EP Turbo Mode Overview

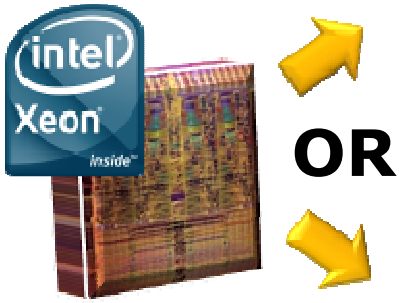


- Turbo Mode speeds up the CPU to utilize any available power headroom
- With fewer cores active and more headroom, the CPU can reach even higher frequencies

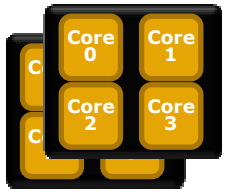
Intel Nehalem EP Turbo Mode Overview



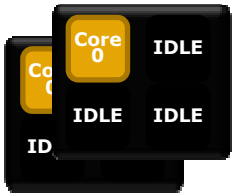
Intel® Turbo Boost Technology



OR



16
(2 socket/ HT on)



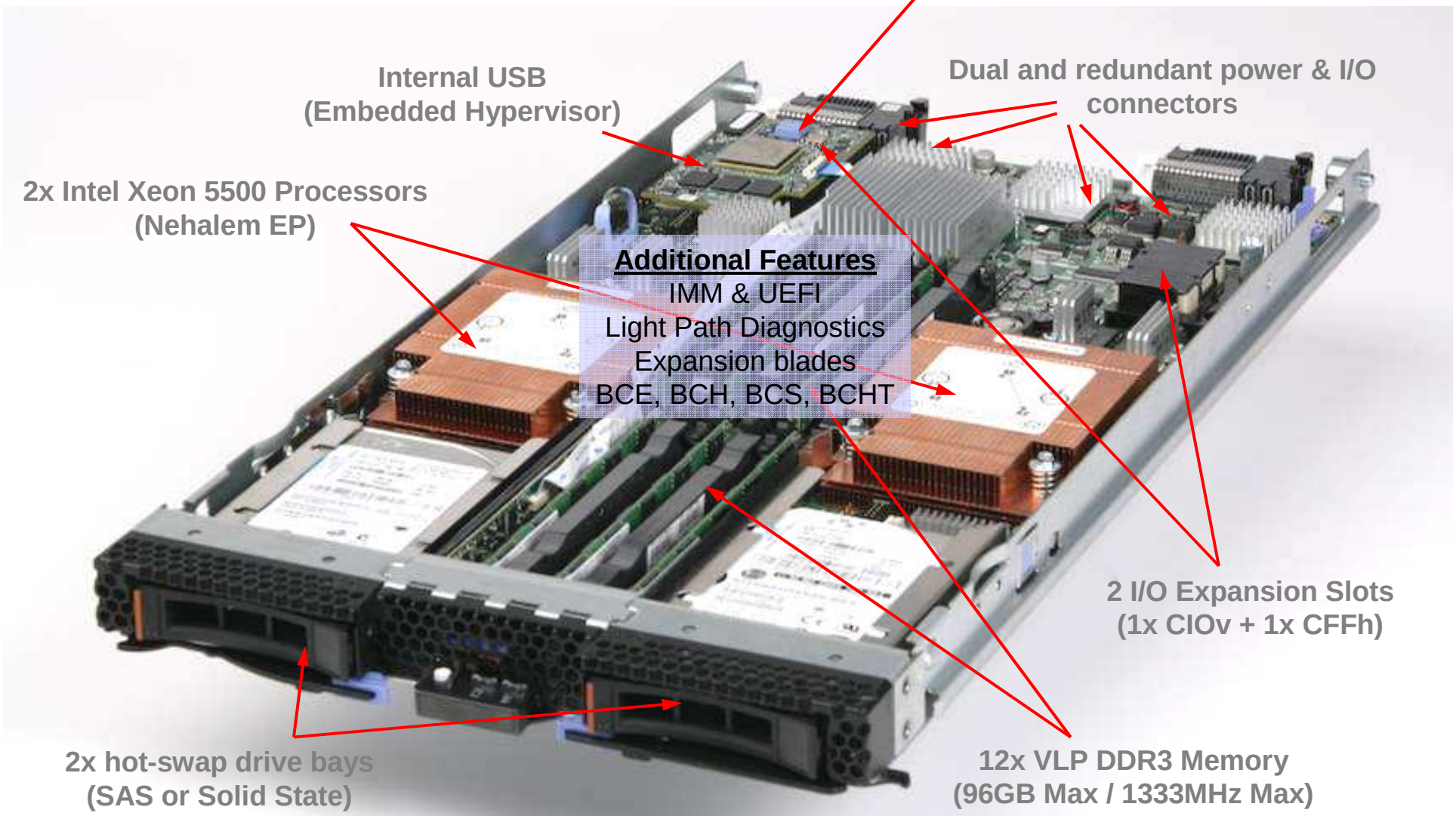
2
(2 socket /HT off)

Cores / Threads	TURBO Freq / BASE Freq	Benefit
16 (2 socket/ HT on)	3.20 GHz / 2.93 GHz	up to **6%**† for ***16*** concurrent software threads
2 (2 socket /HT off)	3.33 GHz / 2.93 GHz	up to **10%**†† for ***2*** software threads

Improves application responsiveness
Delivers higher processor frequency on demand

† Source: Intel Internal measurements Nov 2008., based on SPECjvm*2005. See backup for additional details
†† Source: Intel Internal measurements Nov 2008., based on SPECjbb*2005. See backup for additional details.

HS22 Hardware Overview

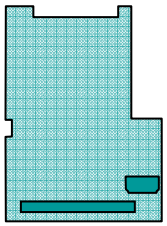


HS22 Blade Feature Comparison

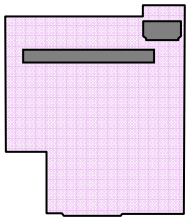
	HS21	HS21 XM	HS22
MTM	**8853**	**7995**	7870
Chipset	**Blackford ICH9**	**Blackford ICH9**	Tylersburg ICH10
Processor	**Woodcrest DC / Clovertown QC Wolfdale DC / Harpertown QC**	**Woodcrest DC / Clovertown QC Wolfdale DC / Harpertown QC**	Nehalem EP DC / QC 60W, 80W, 95W
Memory	**4x FB DIMM up to 4GB**	**8x FB DIMM up to 4GB**	12x VLP DDR3 up to 8GB
Storage	**2x fixed SFF SAS or 2x fixed SSD**	**1x fixed SFF SAS or 1x fixed double-layer SSD**	**2x** hot-swap **SFF SAS, SATA or 2x** hot-swap **SSD**
Internal RAID	**LSI 1064**	**LSI 1064**	**LSI 1064** Optional LSI 1078 RAID w/BBC
Embedded USB	**None**	**Modular USB Flash**	Standard **USB Flash**
Ethernet	**2x Broadcom 5708S chips (2x 1GbE w/TOE)**	**2x Broadcom 5708S chips (2x 1GbE w/TOE)**	1x 5709S chip **(2x 1GbE w/TOE)**
I/O Support	**1 PCI-X and 1 PCI-E x8 SFF, CFFv, CFFh**	**1 PCI-X and 1 PCI-E x8 SFF, CFFv, CFFh**	1 PCI-E x1 and 1 PCI-E x16 CIOv, **CFFh**
Video	**ATI RN-50**	**ATI RN-50**	Matrox G200e in IMM
TPM	**None**	**None**	TPM 1.2
Boot Firmware	**BIOS**	**BIOS**	UEFI
Chassis Support	**BCE, BCH, BCS, BCT, BCHT MM, aMM**	**BCE, BCH, BCS, BCT, BCHT MM, aMM**	BCE**, BCH, BCS aMM**
Management	**BMC**	**BMC**	IMM

HS22 I/O Expansion Daughter Cards

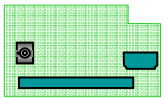
Low Speed Daughter Cards



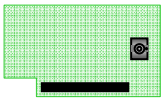
Std DC



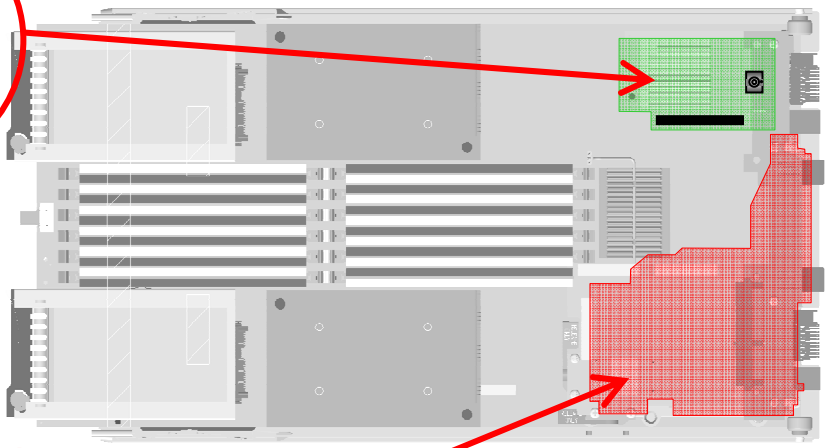
SFF DC



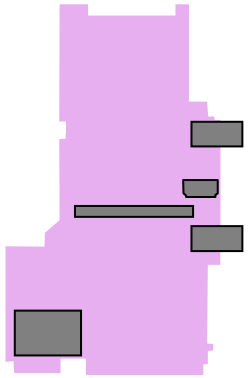
CFFv (PCIx)



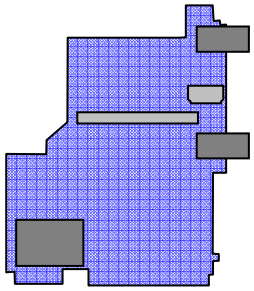
CIOv (PCIe)



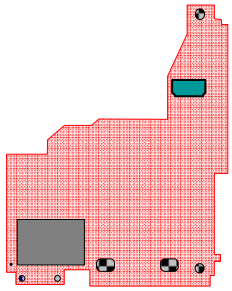
High Speed Daughter Cards



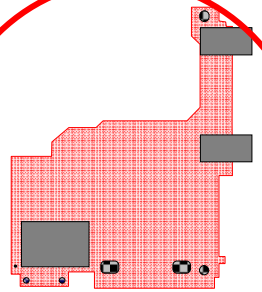
LFF HSDC



SFF HSDC



SvFF



CFFh

HS22 I/O Expansion Daughter Cards

- Two Daughter card formats
  - CFFh
  - CIOv

- CFFh
  - All current cards supported
  - PCIExpansion connector enhanced to allow x16 cards
  - PCIExpress x1 added to connector for future cards

- CIOv
  - Dual Gigabit Ethernet Expansion Card – (44W4475)
  - 4Gb Fibre Channel– (46M6065)
  - SAS Connectivity Card – (43W4068)

Note: new form factor replaces CFFv

Unified Extensible Firmware Interface (UEFI)

More functionality, better user interface, easier management for users

- More functionality
  - Adapter vendors can add more features in their options (e.g., IPv6)
  - Modular designs allows faster updates as new features are introduced
  - More adaptors can be installed and used simultaneously
  - Fully backwards compatible with legacy BIOS
- Better user interface
  - Replaces ctrl key sequences with a more intuitive human interface
  - Moves adaptor and iSCSI configuration into F1 setup
  - Creates event logs that are more easily decipherable
- Easier management
  - Eliminates “beep” codes; all errors can now be covered by Lightpath
  - Reduces the number of error messages and eliminates out-dated errors
  - UEFI settings can be managed both in-band and out of band

UEFI OS Support	
Windows 2008	**Today**
SLES 11	**2Q09**
RHEL 6	**1Q10**

Prior operating system versions will operate in legacy BIOS mode

Common across all new IBM x86 servers!

New SAS 2.5” SFF HDD

- **New 73/146GB 15K 6Gbps SAS 2.5” SFF HDDs**
  - **6Gbps ready – requires new adapter support to provide 6Gbps capability**
  - **Announce: 10 mar 09 Availability: 31 mar 09**
    - **Supported on HS12, HS22 (only ”Slim H/S”) and new 3550M2/3650M2**
      - **(42D0672) 73GB Slim-Hot Swap HDD**
    - **Supported on HS12, HS22 (only ”Slim H/S”) new 3550M2/3650M2 and ”Legacy” 2.5” platforms**
      - **(42D0677) 146GB Slim Hot Swap HDD**
      - **(42D0667) 146GB Non Hot Swap HDD**
      - **(42D0652) 146GB Hot Swap HDD**

- **New 146/300GB 10K 6Gbps SAS 2.5” SFF HDDs**
  - **6Gbps ready – requires new adapter support to provide 6Gbps capability**
  - **Announce: 10 mar 09 Availability: 31 mar 09**
    - **Supported on HS12, HS22 (only ”Slim H/S”) and new 3550M2/3650M2**
      - **(42D0632) 146GB Slim Hot Swap HDD**
    - **Supported on HS12, HS22 (only ”Slim H/S”) new 3550M2/3650M2 and ”Legacy” 2.5” platforms**
      - **(42D0637) 300GB Slim Hot Swap HDD**
      - **(42D0627) 300GB Non Hot Swap HDD**
      - **(42D0612) 300GB Hot Swap HDD**

BladeCenter HS21 - *Maximum Density*

- DP Intel **Dual Core Woodcrest / Quad core Clovertown / Harpertown**
- **1066/1333** MHz Front Side Bus

- 4 Fully Buffered DIMMs in 30mm blade (up to **8 DIMMs** -32GB RAM with MIO expansion unit)

- 2 Gb Eth ports, TOE enabled (5708)

- 2 SFF **SAS** HDDs with RAID 0, 1 on base blade (36/73/ **146 GB** - 10Krpm or **73GB-15Krpm**)

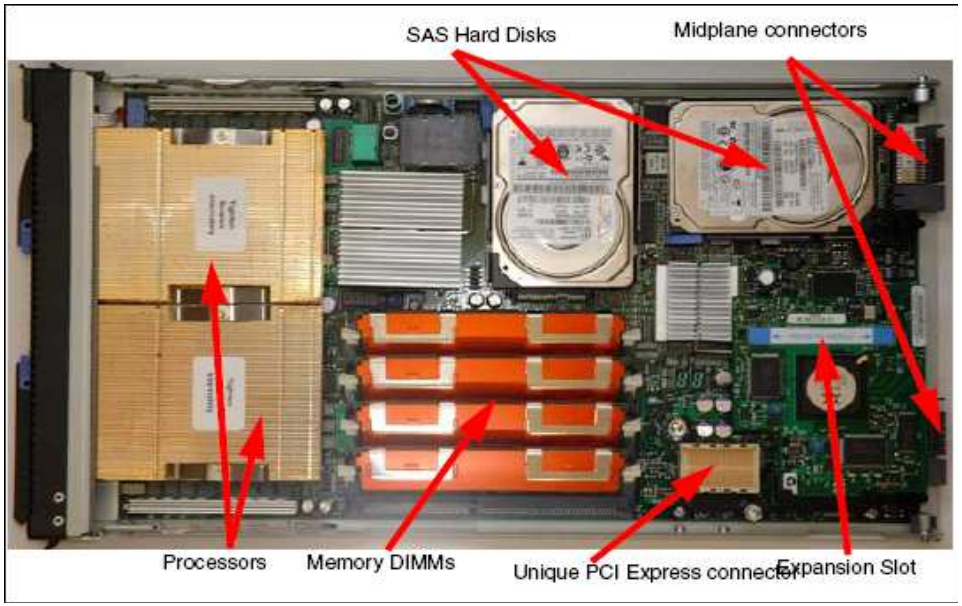
- Support for SIO expansion unit: 3 HS SAS HDD, 2 I/O Exp Cards, RAID 1E, optional RAID 5 with ServRAID and battery backed cache

- Support for legacy Exp Cards

- Support for new **High Speed Cards**

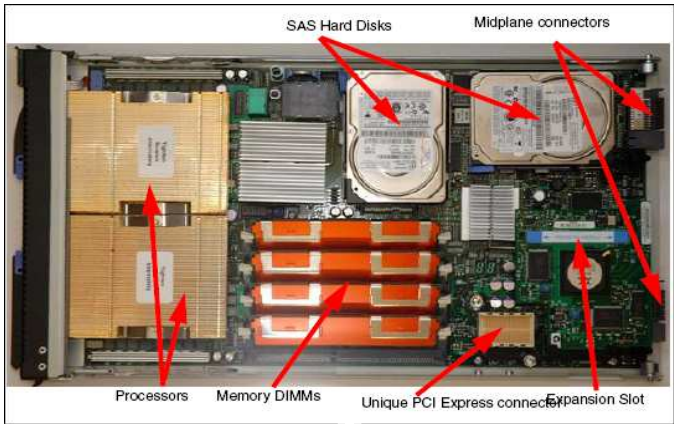
- **cKVM** and cMedia feature card support (w. option)

- Support for IBM Director, RDM, ServerGuide, UpdateXpress, and Toolkit support

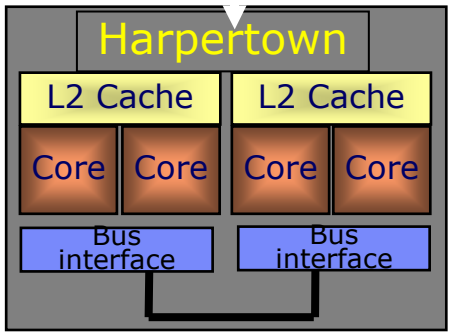


HS21 Dual / Quad-Core blades

- **Intel Xeon Processor L5310 / L5320 (quad-core Xeon processor "Clovertown")**
  - **1.60 GHz; 1066MHz FSB; 4MB*2 - L2 Cache; 50w**
  - **1.86 GHz; 1066MHz FSB; 4MB*2 - L2 Cache; 50w**
- **Intel Xeon Processor x5355**
  - **2.66 Ghz; 1333Mhz FSB; 4MB*2 – L2 Cache; 120w**
- **Intel Xeon Processor L5335** (on HS21XM)
  - **2.00 Ghz; 1333Mhz FSB; 4MB*2 – L2 Cache; 50w**
- **Intel Xeon Processor X5365** (on HS21)
  - **3.00 Ghz; 1333Mhz FSB; 4MB*2 – L2 Cache; 120w**



- Intel Quad-Core Xeon Processor "Harpertown" (45nm- y/e 2007)
  - E5405: 2.00GHz - 1333MHz - 12MB L2 Cache - 80w
  - E5420: 2.50GHz - 1333MHz - 12MB L2 Cache - 80w
  - E5430: 2.66GHz - 1333MHz - 12MB L2 Cache - 80w
  - E5440: 2.83GHz - 1333MHz - 12MB L2 Cache - 80w
  - E5450: 3.00GHz - 1333MHz - 12MB L2 Cache - 80w
  - X5460: 3.16GHz - 1333MHz - 12MB L2 Cache - 120w (only on "HS21")



NEW!

- Intel Quad-Core Xeon Processor "Harpertown LV" (45nm)
  - L5420: 2.50GHz - 1333MHz - 12MB L2 Cache - **50w**
- Intel Dual-Core Xeon Processor "Wolfdale LV" (45nm)
  - L5240: 3.0GHz - 1333MHz - 6MB L2 Cache - **40w**

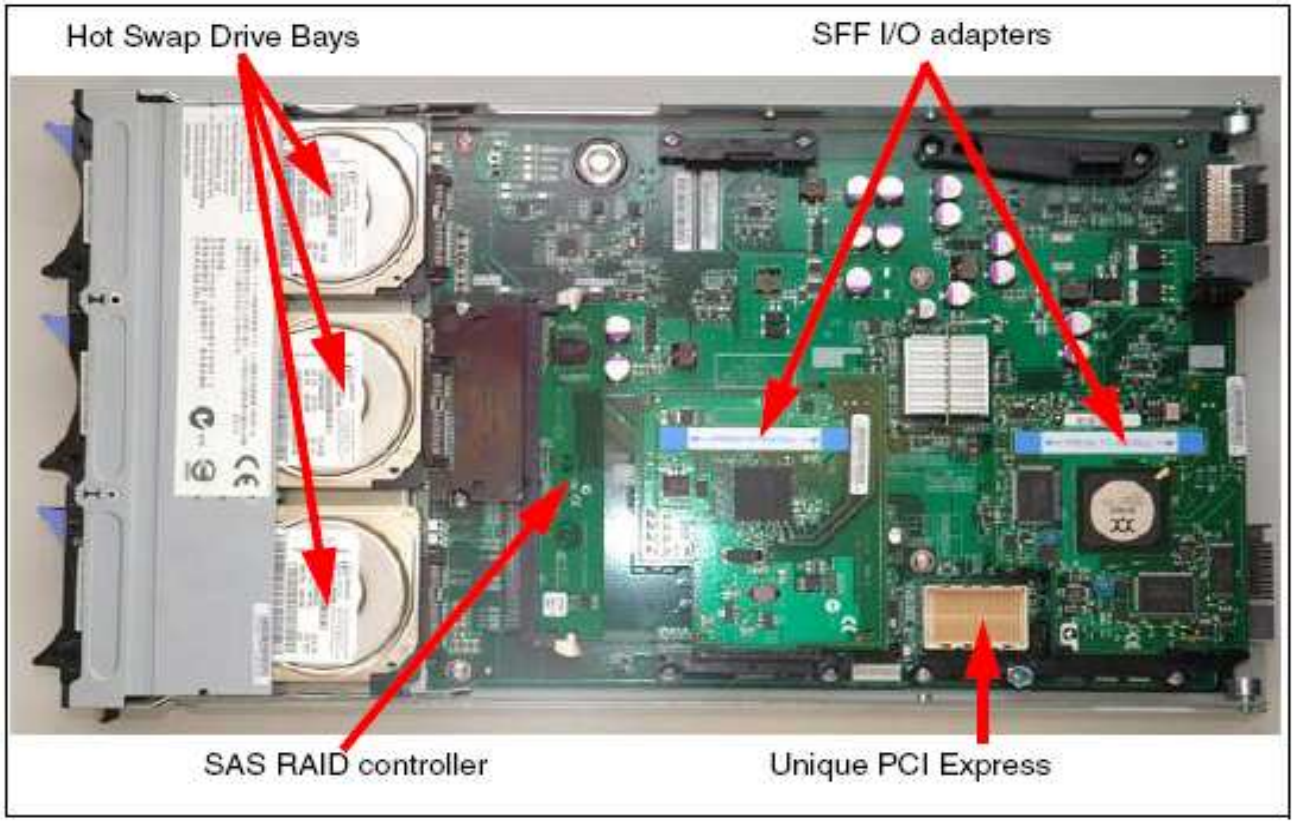
Announced:
25 Mar 2008

13 May 2008

BladeCenter HS21 + the MIO (Memory - I/O expansion unit)

- Start with the feature packed 30mm base and add a 30mm Memory and I/O Expansion Blade
  - 4 additional DIMM slots
  - 2 additional NICs
  - 1 additional PCI-E slot
  - 1 additional PCI-X slot
- **Combined** they create the 60MM higher function offering
  - 8 FB DIMMs (up to 16GB of memory per blade)
  - 2 Non Hot Swap SAS HDD
  - 4 NICs - 2 TOE enabled
  - Supported in all IBM Chassis with 65W processors (follows same rules as base 30mm blade)
- General Availability for the MIO: Sept. 06

the SIO (Storage - I/O expansion unit)

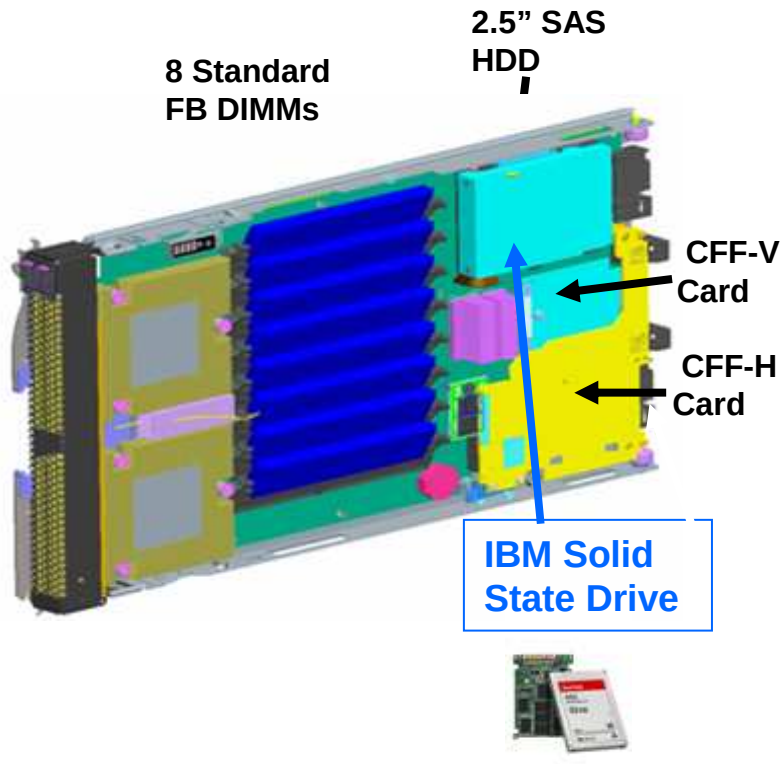


- **Three hot swap SAS 2.5” drives**
- **ServeRAID – 8k provide RAID 5 capability and 256MB cache.**
- **Additional PCI-E + PCI-X slot (or 2 legacy PCI-X slots)**

IBM BladeCenter HS21 XM

A Closer Look

- **8 FB DIMMs: up to 32GB of memory per blade**
- **SAS HDD (36, 73, 146GB)**
- **Diskless ready:**
  - **iSCSI and SAN boot for all OS**
  - **Support for SolidStateDrives or Modular Flash Device 4GB**
- **Dual-Core (up to 3.33Ghz 80w –x5260) and Quad-Core processors**
- **2 NICs - Broadcom 5708S (TOE enabled)**
- **Supports Concurrent KVM Card (cKVM)**
- **Supports PEU2 and SIO Expansion Units**
- **Support for the new MSIM Combo Form Factor (CFF) card to double port count per blade**



NEW!

Features

- **15.8GB SSD**
- **15.8GB Dual SSD (mirrorable)**
- **31.4GB SSD**
- **50 GB SATA 2.5" NHS SFF High IOPS SSD (avail. from 31 mar 2009)**
- **SATA drive / SAS interface**

New High IOPS SSD

IBM Solid State Drive

- **50 GB SATA 3.5" HS High IOPS SSD (43W7698)**
- **50 GB SATA 2.5" SFF NHS High IOPS SSD (43W7706)**
- **50 GB SATA 2.5" SFF Slim-HS High IOPS SSD (43W7714)**
- **50 GB SATA 2.5" SFF HS High IOPS SSD (43W7722)**

Ann:10/03/09
GA: 31/03/09

NEW!

Blade servers supported include:

•HS21 (8853)
•LS22 (7901)
•LS42 (7902)
•HS21 XM (7995)
•HS12 (8014)

SATA compliance enables the IBM 50 GB SATA 2.5-inch HS SSD and 3.5-inch HS SSD to attach to **System x supported systems.**

•x3850M2/x3950M2 (7233,7241)
•x3755 (8877,7163)
•x3655 (7943)
•x3650 (7979)
•x3650 (7980)
•x3550 (7978)
•x3500 (7977)
•x3455 (7940,7941)
•x3400 (7973,7974,4192,4193)
•x3250M2 (4190,4191,4194)
•x3200 (4367,4368)

PERFORMANCE

50 GB performance characteristics include:

•Formatted capacity: Up to 50,000 MB
•Drive to host interface that supports 1.5 Gb/s burst rate
•Internal transfer read rate: Up to 80 MB/s
•Internal transfer write rate : Up to 50 MB/s
•Combination 67% Read/33% Write transaction processing rate: up to 2600 IOPS
• Energy saving with as little as 2.1 W of power consumption per drive

This drive is ideal for delivering high performance IOPS and thereby relieving storage bottlenecks.

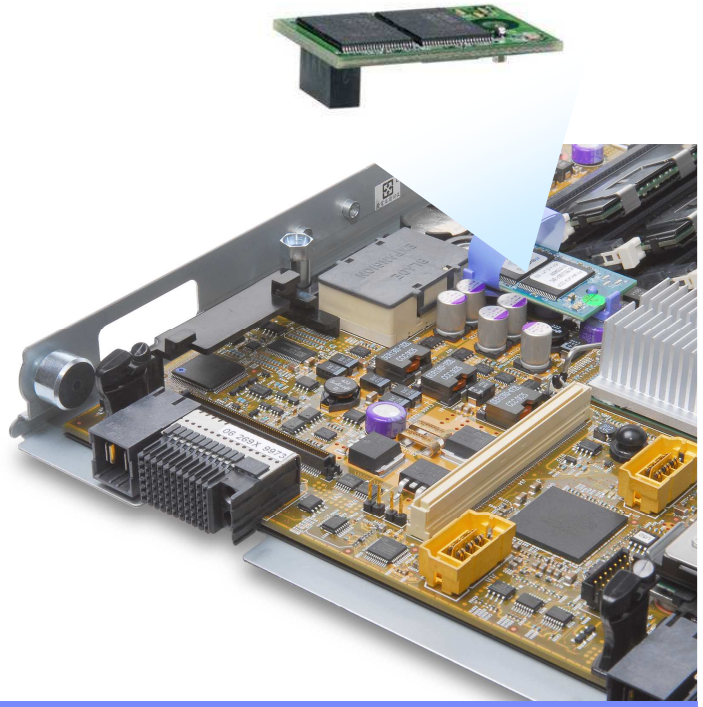
HS21 XM – VMware 3i Preload

NEW!

MTM	GAV	CPU Speed	CPU Power	FSB	CPU Cache	CPUs Std	Memory Std	DIMM Slots	HDDs	Blade Width	Additional
7995-HVx	7995-HVY	2 x 3.0GHz (E5450)	80W	1333MHz	12MB	2	2 x 2GB	8	4GB Modular Flash Drive	30mm	VMwarel3i Preload

- Dedicated model of HS21 XM (7995-HVY)
  - Contains embedded hypervisor on 4GB Modular Flash Drive

IBM Modular Flash Drive



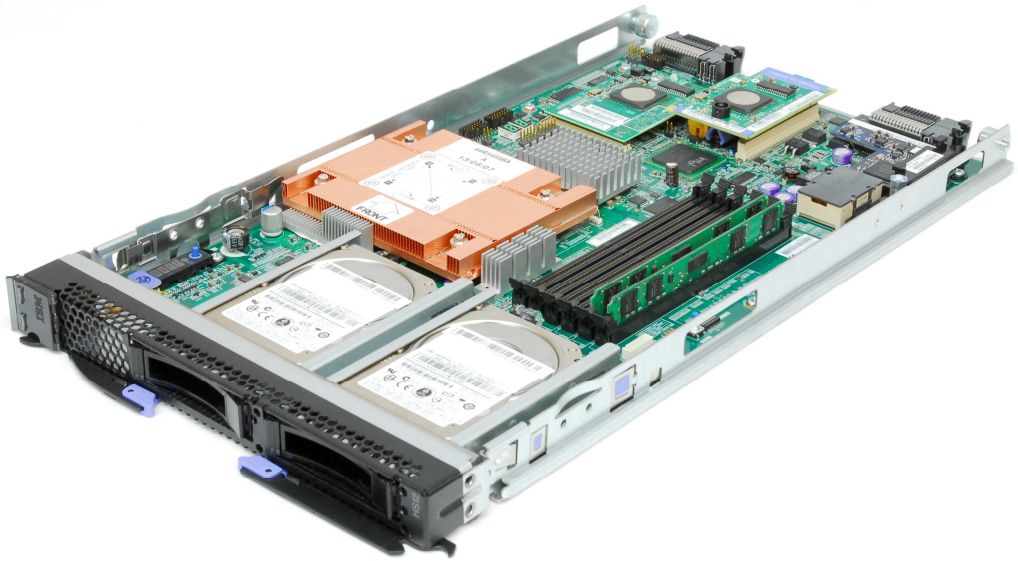
HS12 – New Function. New Price Point.

Same Trusted BladeCenter Solution

- 6 DIMMs DDR2 memory
  - Low cost 12GB, 24GB max
- Flexible disk options
  - 2 Not-Hot-Swap SATA (up to 80GB each)
  - 2 Hot Swap SAS, RAID 0 &1 support (up to 146GB each)
  - 2 Hot Swap SSD, RAID 0 & 1 support (up to 31.4GB each)
- Supports single, dual, and quad core Intel CPU's: from single-core 1.86Ghz, to 2.83Ghz quad-core (or NEW 3.0Ghz dual-core)
- All the same I/O as HS21
- Supports cKVM
- Supported in all chassis
- Pricing starts at $999

Great Feature Set
Attractive pricing
Perfect for the SMB &
Non multi threaded apps

- **Departmental Print Server**
- **File server**
- **Application / Web server**
- **Light Mail**



IBM Power System Blades

NEW!

NEW!

	IBM JS12	IBM JS22	IBM JS23	IBM JS43
				
Footprint, Packaging	**Blade**	**Blade**	**Blade**	**Blade**
Processor	**POWER6**	**POWER6**	**POWER6+**	**POWER6+**
# of processors (# of cores)	**2**	**4**	**4**	**8**
GHz clock	**3.8**	**4.0**	**4.2**	**4.2**
L3 Cache	**0**	**0**	**32MB**	**32MB**
DDR2 GB memory	**4 to 64**	**4 to 32**	**4 to 64**	**8 to 128**
Internal storage*	**73GB – 600TB**	**73GB – 600TB**	**69GB – 600TB**	**69GB – 600TB**
Maximum rPerf	**14.71**	**30.26**	**36.28**	**68.2**
PCIe PCI-X slots	**1 1**	**1 1**	**2**	**4**
Max I/O drawers	**N/A**	**N/A**	**N/A**	**N/A**
Max micro-partitions	**40**	**40**	**40[1]**	**80[1]**
IBM i Operating System	**5.4 & 6.1**	**5.4 & 6.1**	**6.1**	**6.1**
AIX® support	**5.3, 6.1**	**5.3, 6.1**	**5.3, 6.1**	**5.3, 6.1**
Linux® support	**RHEL 4.6 / 5.1 SLES 10 / 11**	**RHEL 4.6/ 5.1 SLES 10 / 11**	**RHEL 4.6 / 5.1 SLES 10 / 11**	**RHEL 4.6 / 5.1 SLES 10 / 11**

(1) Requires purchase of optional feature to support micro-partitions *With maximum I/O drawers Optional

LS22 & LS42 Value Proposition

Next generation AMD blades built for quad-core

LS42 – Significant power savings for comparable performance and price

- Consumed less power than HP's "Tigerton" blade (double-digit %)
- Competitive performance to HP's "Tigerton" blade
- Leadership floating point performance
- Ideal apps include virtualization and database

LS22 – HPC Blade for Memory-Intensive Applications

- Leadership floating-point performance
- Optional 800MHz memory (20% faster than 667MHz)
- Memory booster increases throughput to remote memory (up to 96%)

More than twice as fast as previous generation LS21 and LS41

LS22 / LS42

..now with "Shanghai" processor (2.7 Ghz - 75 watts)

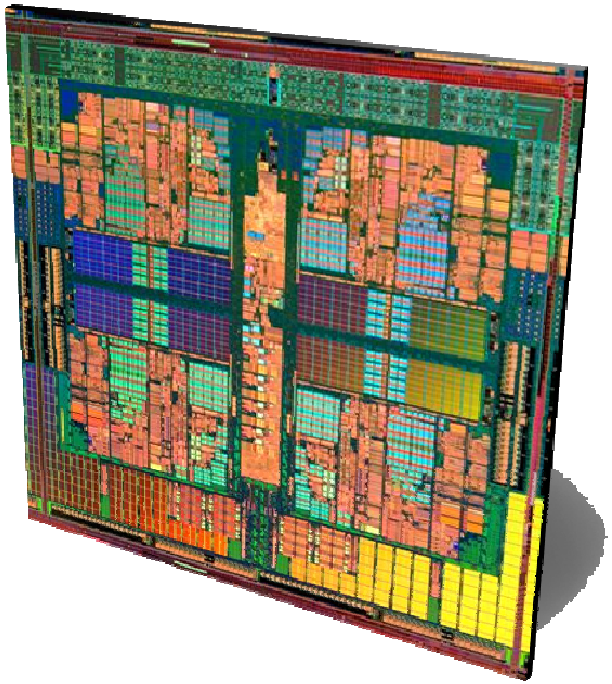
Announce: 18 nov 2008

Availability: 30 nov 2008

Quad-Core AMD Opteron “Barcelona” in a nutshell…

- Barcelona is AMD’s first quad-core Opteron processor

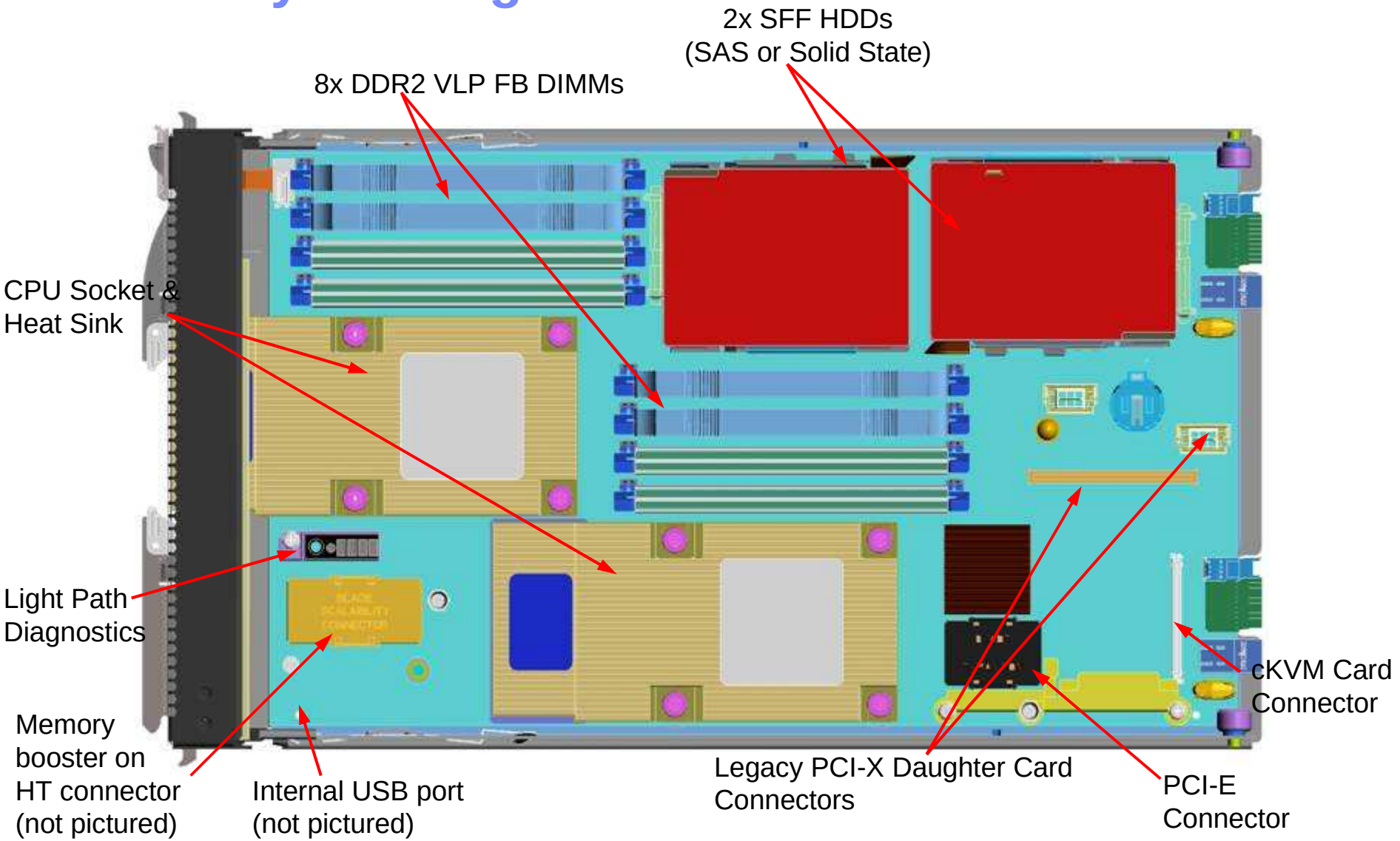
  - Better performance. Better performance per watt.
  - Dual Dynamic Power Management: independently power cores and memory controller for added efficiency and performance
  - More power efficient DDR2 Memory vs. FBDIMM
  - Increased memory bandwidth



…from "Barcelona" to "Shanghai"

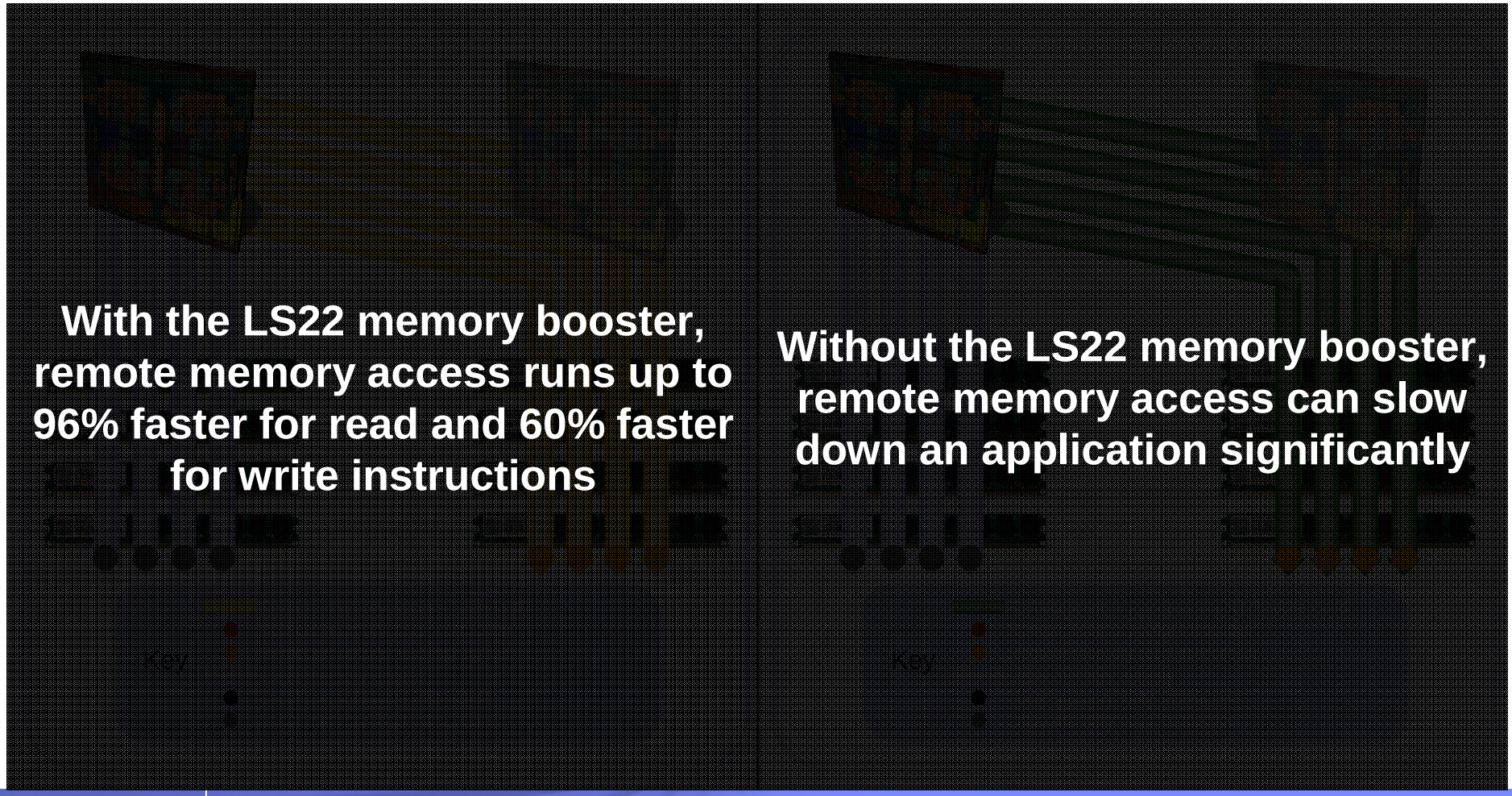
Quad-Core AMD Opteron™ ("Barcelona") Features	New With "Shanghai"
65nm Technology	45nm Technology Significantly reduced power
AMD Balanced Smart Cache	L3 grows to 6MB *(2x overall more cache than "Barcelona")*
HyperTransport 1.0 @ 8GB/s	HyperTransport 3.0 @ 17.6GB/s
AMD-V™ with Rapid Virtualization Indexing	Designed for 25% faster "world Switch" time
AMD Memory Optimizer Technology	DDR2-800 Memory Support *(~10% greater delivered memory bandwidth vs. 65nm QC)*
Drop-in Upgradeability Investment Protection	Continued Drop-in Upgradeability Investment Protection

LS22 Layout Diagram



LS22 memory booster improves memory performance

Up to 96% faster memory throughput in dual-socket configuration running applications requiring fewer cores and more capacity memory



Lucas Blade Feature Comparison

	Morrison		Lucas	
	LS20	-1	LS22	LS42
MTM	8850-xxx	xxx	7901-xxx	7902-xxx
Width	30mm	m	30mm	60mm
Chipset		HT1000	HT2100/HT1000	HT2100/HT1000
Power Plane		ed	Split	Split
Max # of Processors	2		2	4
Processor Models	AMD Opteron 2xx Single Core & Dual Core 68W	ron 8xxx Core 95W	AMD Opteron 23xx Quad Core 79W, 115W	AMD Opteron 83xx Quad Core 79W, 115W
Max Proc SKU	2.4GHz 68W Dual Core	Dual Core Dual Core	2.3GHz 115W Quad Core 1.9GHz 79W Quad Core	2.3GHz 115W Quad Core 1.9GHz 79W Quad Core
Max Memory	4 DIMMs / 8GB DDR1 up to 400MHz	/ 64GB to 667MHz	8 DIMMs / 64GB VLP DDR2 up to 800MHz	16 DIMMs / 128GB VLP DDR2 up to 800MHz
Storage	2x fixed SCSI	FF SAS	2x fixed SFF SAS or 2x SSD	2x fixed SFF SAS or 2x SSD
Imbed USB	No		YES	YES
Ethernet	2x Gigabit	w/TOE	2x Gigabit w/TOE IPv6	4x Gigabit w/TOE IPv6
I/O	1 PCI-X	1 PCI-E	1 PCI-X and 1 PCI-E	2 PCI-X and 1 PCI-E
Management	BMC w/IPMI 1.5	PMI 2.0	BMC w/IPMI 2.0	BMC w/IPMI 2.0
Warranty	3 yr	3 yr	3yr	3yr

Faster I/O with new HT2100 chipset on base 30mm blade

Dual Dynamic Power Management to independently power cores and memory controller (better performance and better performance per watt)

Latest quad-core processors

Faster, 800MHz memory & projected support for 8GB DIMMs ; Memory booster for added performance

Support for up to 2 HDDs on 30mm blade & support for latest generation solid state drives that are more reliable and require less power

Internal USB; optional **VMware ESX i 3.5**

Support for IPv6

Better Performance
Better Performance Per Watt
More Reliability

Programs, features and dates are subject to change.

IBM USB Key for VMware ESXi

Part #: 41Y8268 Announce: Feb 17 GA: March 9

- **Positioning**
  - Simple and intuitive start-up experience for the new virtualization user providing easy on-ramp to virtualization
  - All the sophistication of VMware ESX and VI3 for existing virtual infrastructure customers

- **Initiatives driving the need for VMware ESXi**
  - Strengthen Security & Improve Reliability
  - Simplify Management of Hardware Resources & Virtual Machine Hosts
  - Enable Plug-&-Play Capacity Management in the Data Center

- **Merrill Lynch CIO Survey – April 2007**
  - "Adoption of x86 virtualization is growing rapidly"
    - Customers deploying x86 Virtualization grows from 8% to 18%
    - Intent to use increases from 68% to 85%
    - Expected deployment within 2 year moves from 29% to 58%
  - "Virtualization also goes hand in hand with server consolidation"
    - "74% of CIOs say they are moving toward bigger "scale up" machines and thus away from scale out architectures"

LS42 2+2 = investment protection you can afford

Introducing the industry's only snap-n-scale blade that can grow as your business grows…

…and won't break the bank!

Scale Up

- Start with a 30mm, 2-socket scalable LS42
- 2x AMD 8,300 series quad-core processors
- 4GB memory standard (up to 32GB on 8 DIMMs)
- 2x fixed SAS or SSD
- Ready to scale to 4 sockets with additional MPE

- Add MPE to create a 60mm, 4-socket Ls42
- 4x AMD 8,300 processors
- 8GB standard (up to 64GB on 16 DIMMs)
- 64GB on 16 DIMMs
- 2x fixed SAS or SSD

- **128GB on 16 DIMMs trough 8GB dimm – (ann 10 feb 2009 / G.A. 9 mar 2009)**

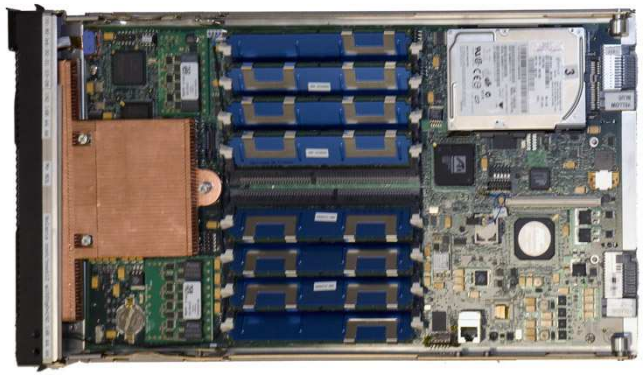
- **embedded VMWare ESXi3.5 through an optional USB key – (ann 10 feb 2009 / G.A. 9 mar 2009)**

Themis Joint Development with IBM and Sun: T2BC Blade Server

- **Themis has a long history building UltraSPARC workstations on a “Blade-like” form-factor**
- **IBM approached Themis about building an UltraSPARC based Blade Server for the BladeCenter**
- **Themis, IBM and Sun Engineering teams worked closely together to insure the T2BC integrated seamlessly into the BladeCenter Environment.**

UltraSPARC T2 Processor

Solaris Operating System



BladeCenter

Themis T2BC Blade Server

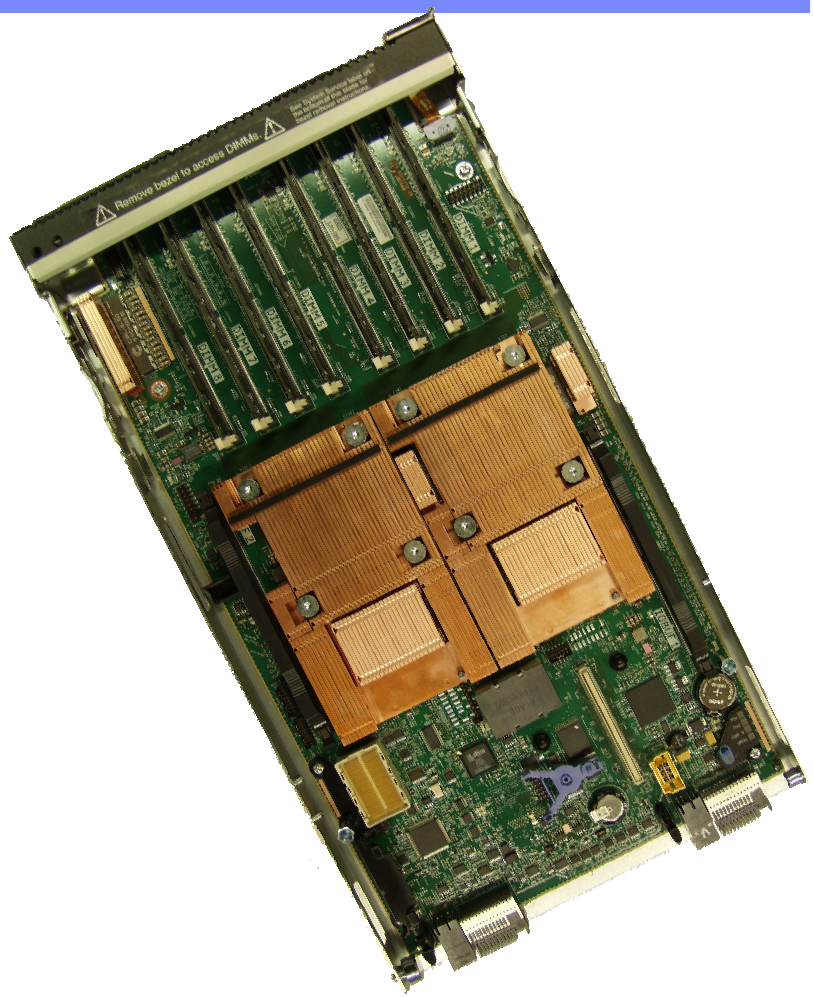
- One 4/8 cores 1.2 GHz UltraSPARC T2 Processor
- Up to 32 GB of FBDIMM memory in 8 DIMM Slots
- Network Fabric
  - Two Gbit Ethernet Ports Standard
  - Fibre Channel or InfiBand ports with Optional CFFV Daughter Cards
  - Two 10 Gbit Ethernet Ports with Second Optional Daughter Card
- 2.5” Internal Hard Drives: Two SATA or One SAS
- Front Panel Serial Port and Status LEDs
- System Manager/Environmental Monitor
  - Voltage, Temp
- Runs Solaris 10
- Based on Reference Design for Sun T5120 Server

IBM BladeCenter QS22

■ Third generation of IBM Cell blade is designed to drive production deployments for selected HPC applications and workloads that require double precision, large memory, parallel processing and/or streaming data

■ Target industries/workloads include: Medical Imaging, Electronic Design Automation (EDA), Aerospace and Defense, DVS, Seismic, Financial Markets, Healthcare and Life Sciences, Digital Media, etc.

■QS22 is complementary to other IBM systems based on Intel, AMD and POWER processors



PowerXCell 8i processor on QS22 offers:

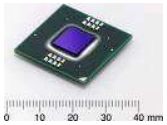
- 10 times or more faster processing than traditional processors for targeted workloads
- 5 times faster double precision processing than previous generation blades
- 16 times more memory (maximum) than the previous generation blade

QS22

Announce: 13 may 2008

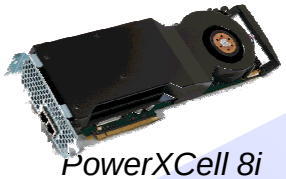
Availability: 6 june 2008

Cell/B.E. architecture reaches wide and deep – from consumer products to high performance computing



Toshiba SpursEngine (SPU's. + Host)

SCE PS3 (Cell/B.E. + GPU)



PowerXCell 8i PCI card (Cell/B.E. + Host)

Mercury 1u Dual Cell

Sony Cell/B.E. Computing Unit

(Cell/B.E. + GPU + AV I/O)

IBM BladeServer (2 Cell/B.E. or PowerXCell 8i)

Mini-Roadrunner Custom

Roadrunner (16,000 PowerXCell 8i. + AMD)

Consumer ***Business*** ***Enterprise*** ***High Performance Computing***

Common OS's, Infrastructure, Tools, Libraries, Code…
the SAME SPE code runs from *end to end*

Infrastructure Savings

- **Significant Infrastructure Savings with BladeCenter**
  - **More than twice the density of 1U servers**
  - **up to 83% fewer cables than typical 1U**
  - **up to 64% fewer cables than our competitors**

Per 42 Servers (IDE, dual SAN, dual enet, KVM, redun pwr)	1U Servers	Blades	Reduction / Addition
Rack Space	42U	21U	-50%
Ethernet Cabling	84	6 / 24	-71%
Fibre Channel Cabling	84	12	-86%
KVM Cabling	42	0 / 3	-93%
Systems Mgmt Cabling	42	6	-86%
Power Cords	84	12	-86%
PDU's	8	4	-50%
KVM Switches	6	0 / 1	-83%

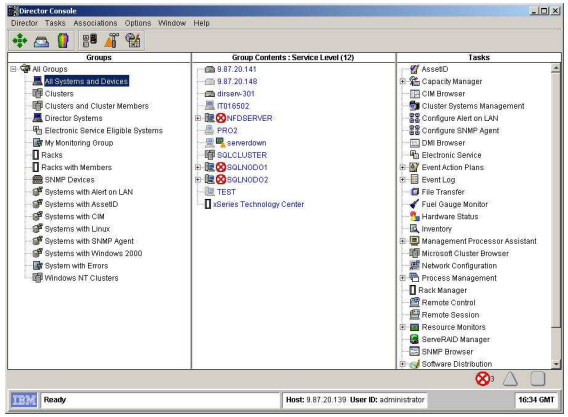
Additional Notes: Networking, SAN and KVM Switching takes 10+ Power Cords and 2U to 8U in Rack
Power cord and PDU figures assume equivalent function of redundant power in 1U server

Agenda

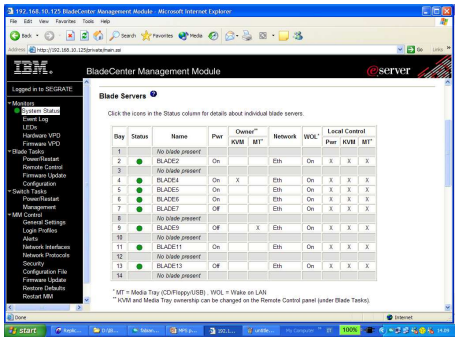
- BladeCenter solution
- **System Management & Cool Blue strategy**
- System x “high end” servers
- *coffee break*
- System Storage portfolio

BladeCenter management

2. Director Console

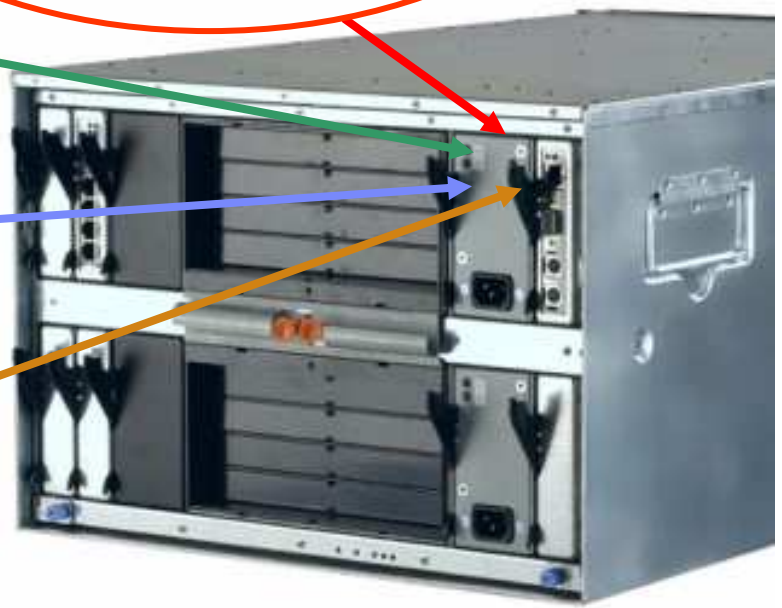


1. Web Interface

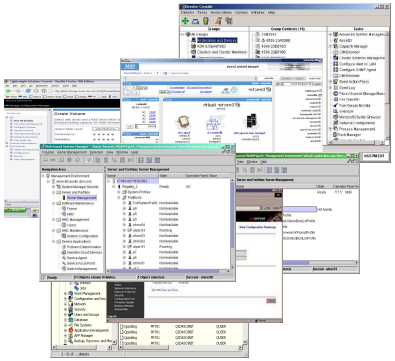


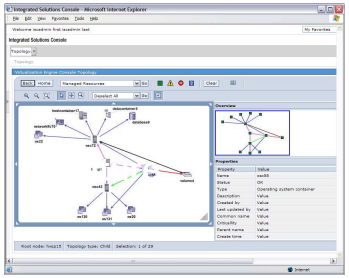
3. Telnet Interface

4. Command Line Interface (MPCLI)



IBM Systems Director on x86, v6.1





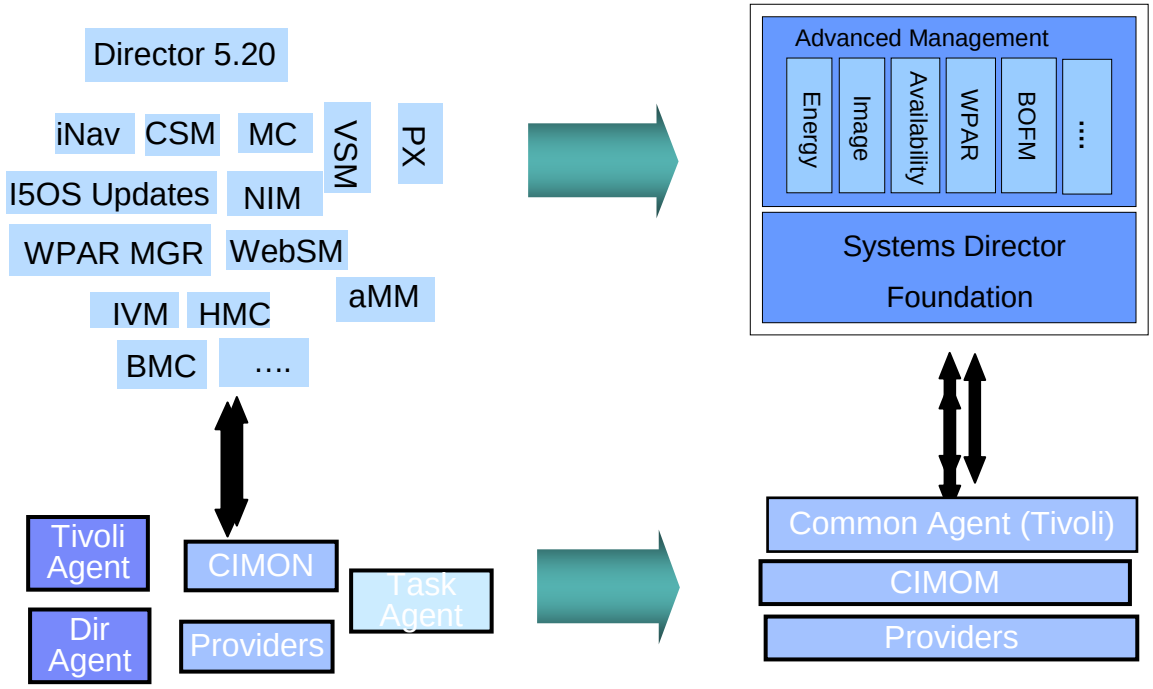
NEW!

Ann: 7 october 2008

Avail:

- web, 21 november 2008

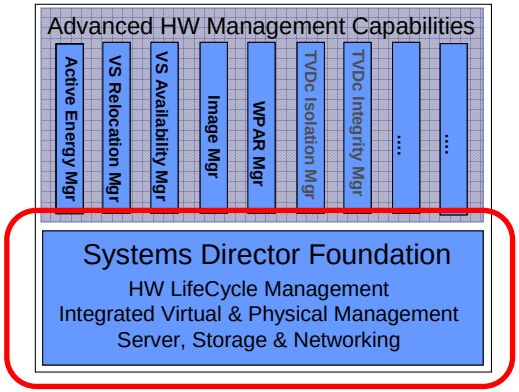
-phys, 12 december 2008



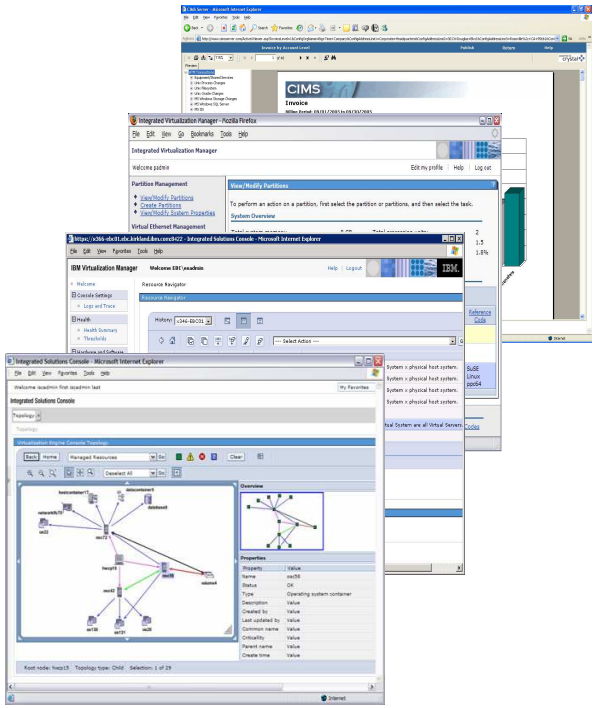
- **Simplified Web User Interface with stream lined task integration and simplification**
- **Modular and extensible foundation enabling advanced platform management capabilities.**
- **Standards based data model and instrumentation delivering with our Systems and Storage**
- **Shared Common Agent with TPM 7.1**

IBM Systems Director Foundation

Platform Lifecycle Management



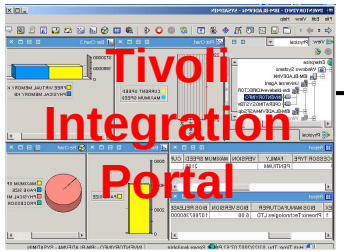
- **Consolidation of Platform Management Tools**
  - Single consistent cross-platform management tool
  - Simplified tasks via Web based interface
- **Integrated Physical and Virtual Management**
  - Discovery and Inventory of physical and virtual resources
  - Configuration and provisioning of platform resources
  - Status, Health, and Monitoring of platform resources
  - Visualization of server resource topologies
- **Platform Update Management**
  - Simplified consistent cross-platform tools to acquire, distribute and install firmware and OS updates
- **System Planning and Deployment Tools**
  - Systems and Virtualization planning for new systems
  - Initial system and OS deployment



No Charge for Managers Included with Director Foundation

Platform Management Blueprint in Action:

E2E Management



Tivoli Monitoring

Tivoli Provisioning Manager

Microsoft · ca · altiris · bmcsoftware SOLUTION PARTNER

Integration

Seed and Grow

3rd Party Tools

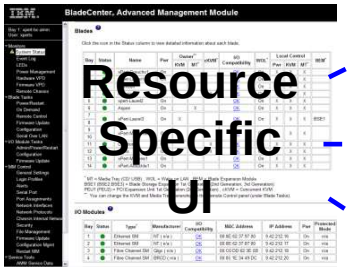
Basic Management

IBM® Systems Director

Physical and Virtual Management
Server, Storage, Networking

Foundation		Advanced Management	
Health	Updates	Image	Energy
Inventory	Virtualization	Availability	….

Required Management



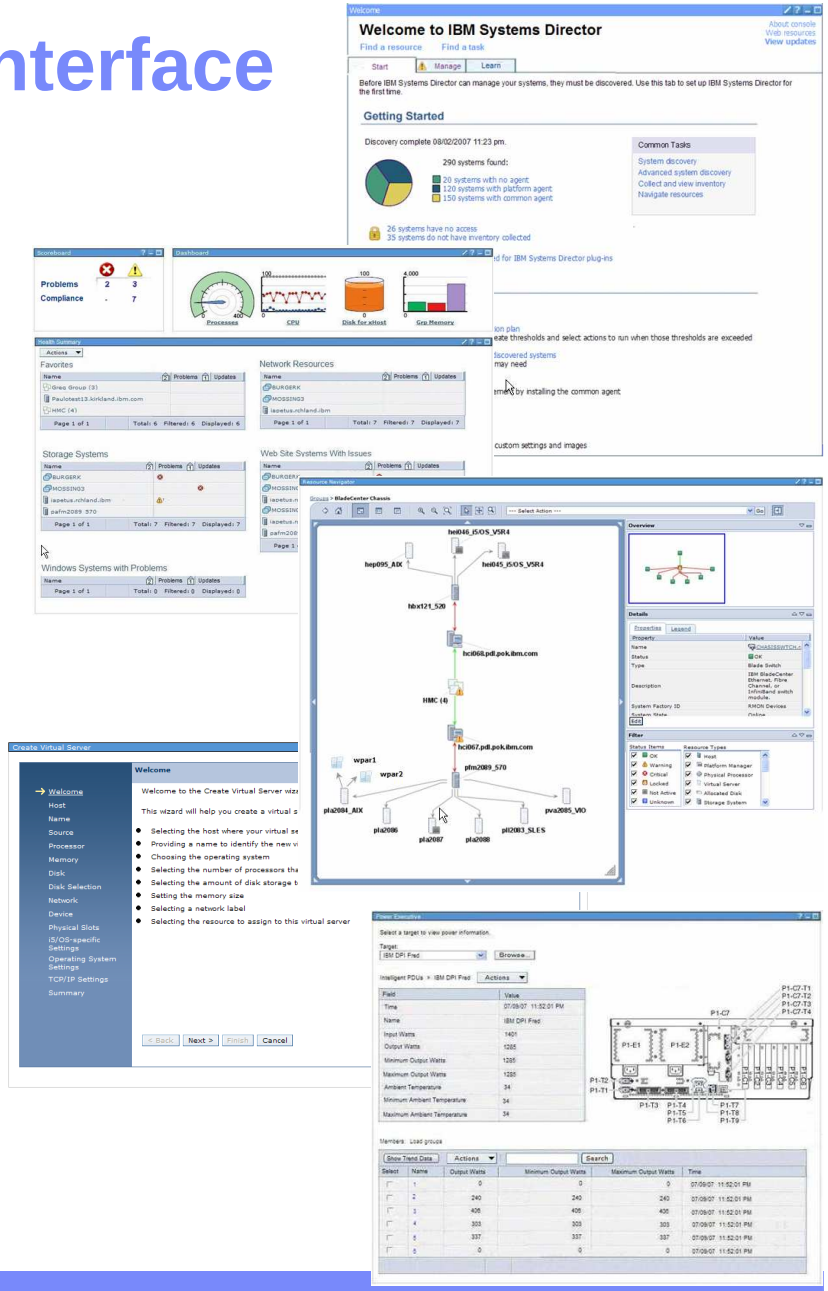
Operating Systems: z/OS · Windows · Linux · i5/OS · AIX L

Virtualization Software: vmware · Xen · IBM TotalStorage SAN Volume Controller · Microsoft Virtual Server · z/VM · Advanced POWER Virtualization

Hardware

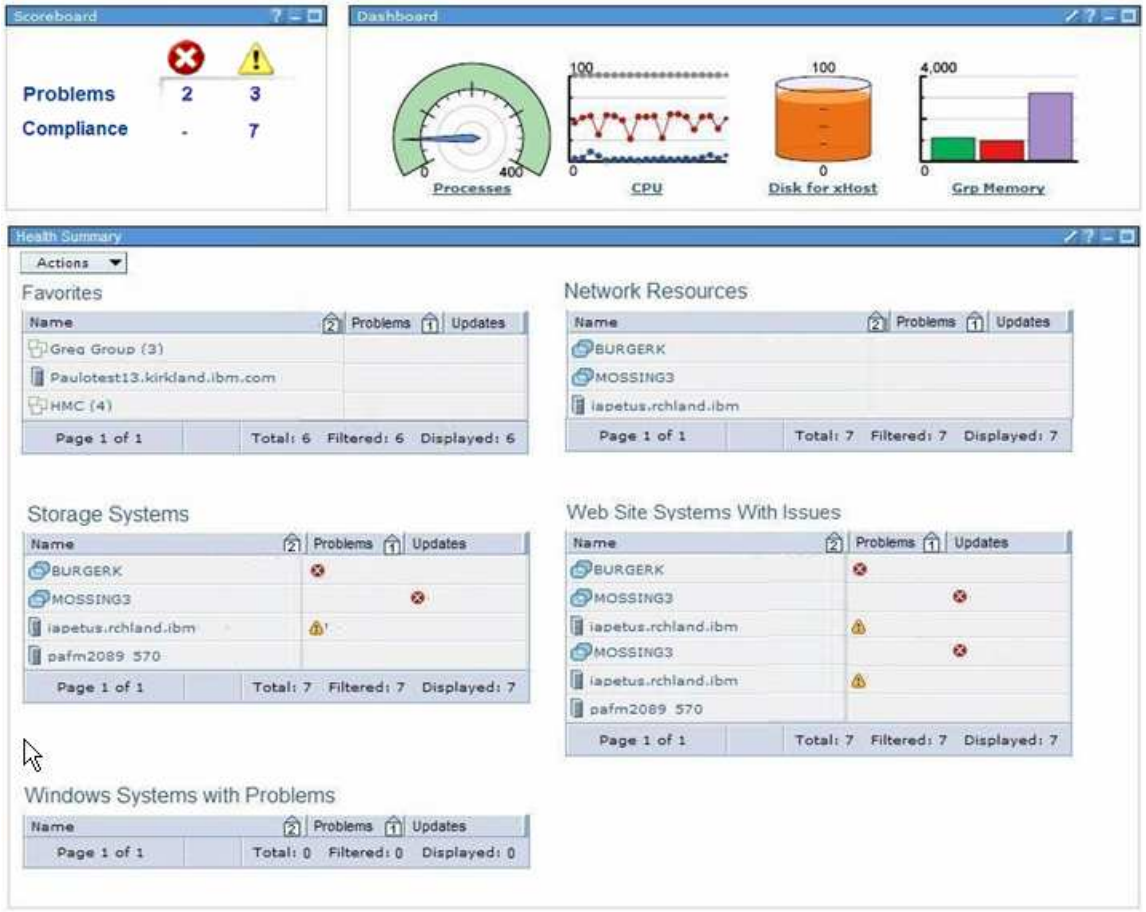
Simplified Web Based User Interface

- **Setup and Configuration**
  - **Start, manage, learn**
- **Focus on Health, Automation**
  - **Health Summary**
  - **Monitors**
  - **Thresholds**
- **Easy to Navigate IBM Systems**
  - **Power Systems summary**
  - **Intuitive drilldown**
  - **Topology map**
- **Simply Manage Virtual Systems**
  - **Create virtual server**
  - **Edit virtual resources**
  - **Relocate**



Focus on Health, Status, Automation

- **Health summary**
  - **Favorite systems**
  - **Critical monitors**
  - **Group thumbnails**
- **Monitoring**
  - **Monitor critical resources (AIX,VIOS,etc examples)**
  - **Thresholds**
  - **Events**
- **Automation Plans**
  - **Notify**
  - **Run commands**
  - **Trigger tasks**



Blade Deployment Made Easy:
IBM BladeCenter Open Fabric Manager

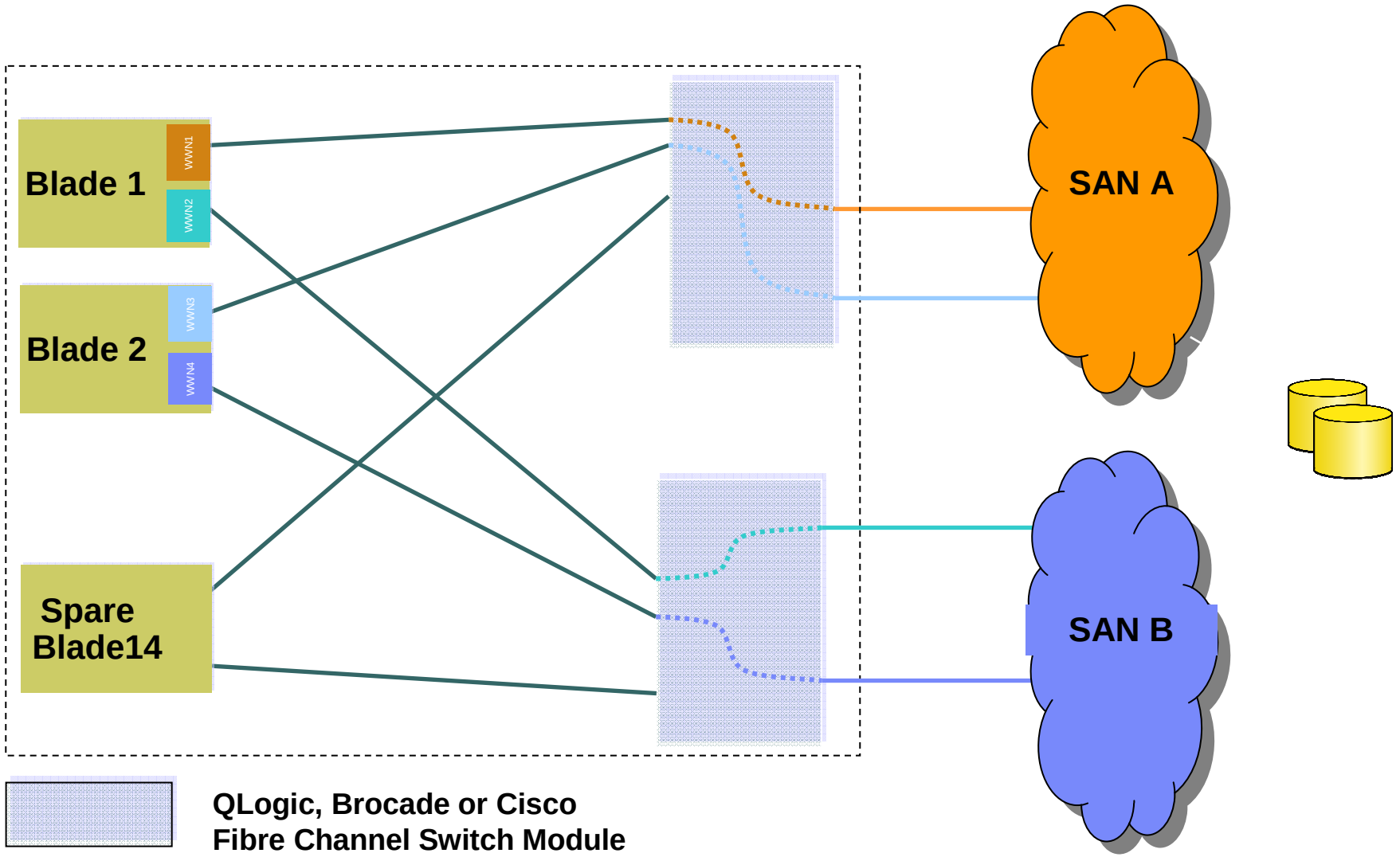
…What is Open Fabric Manager?

- ***Advanced Management Module-based* Firmware**
  - MAC, WWN address assignment and management for initial blade deployment and re-deployment
- **Optional *Advanced Upgrade*: Standalone Utility or IBM Director Extension**
  - MAC, WWN Address assignment and management for initial blade deployment and re-deployment
  - Creates blade failover pools – Event Action Plans
  - Provides I/O parameter and VLAN migration in case of failover
- **Embedded switch enhancements**
  - Easy to use GUI for switch configuration
  - Switch stacking for network simplification

announce 13 november 2007
availability: 21 december 2007
(plug-in available for Dir 5.2)

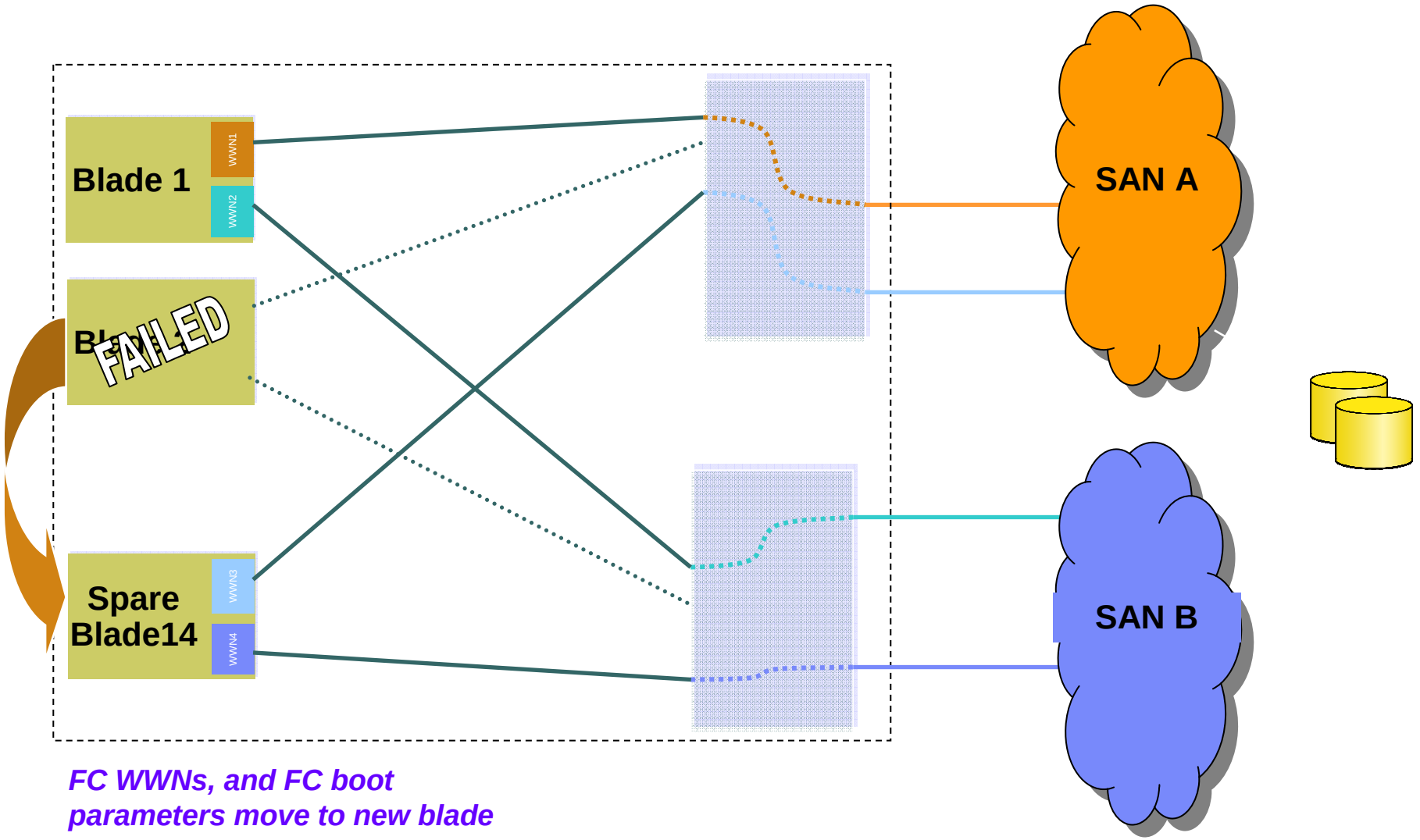
Open Fabric Manager

Open Fabric Manager simplifies server deployment and failover



Open Fabric Manager

Open Fabric Manager simplifies server deployment and failover

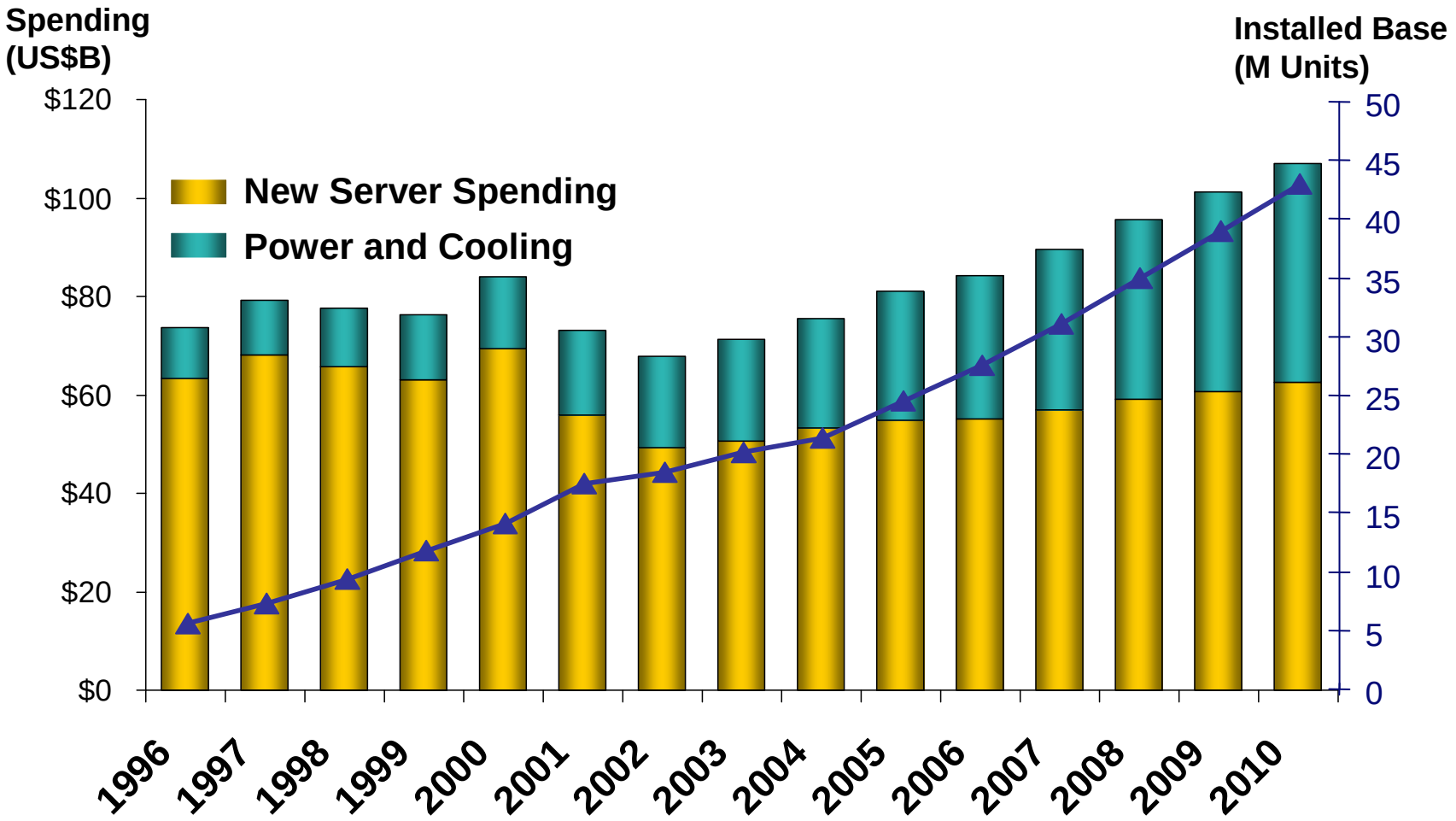


FC WWNs, and FC boot parameters move to new blade

Energy innovation: CoolBlue strategy

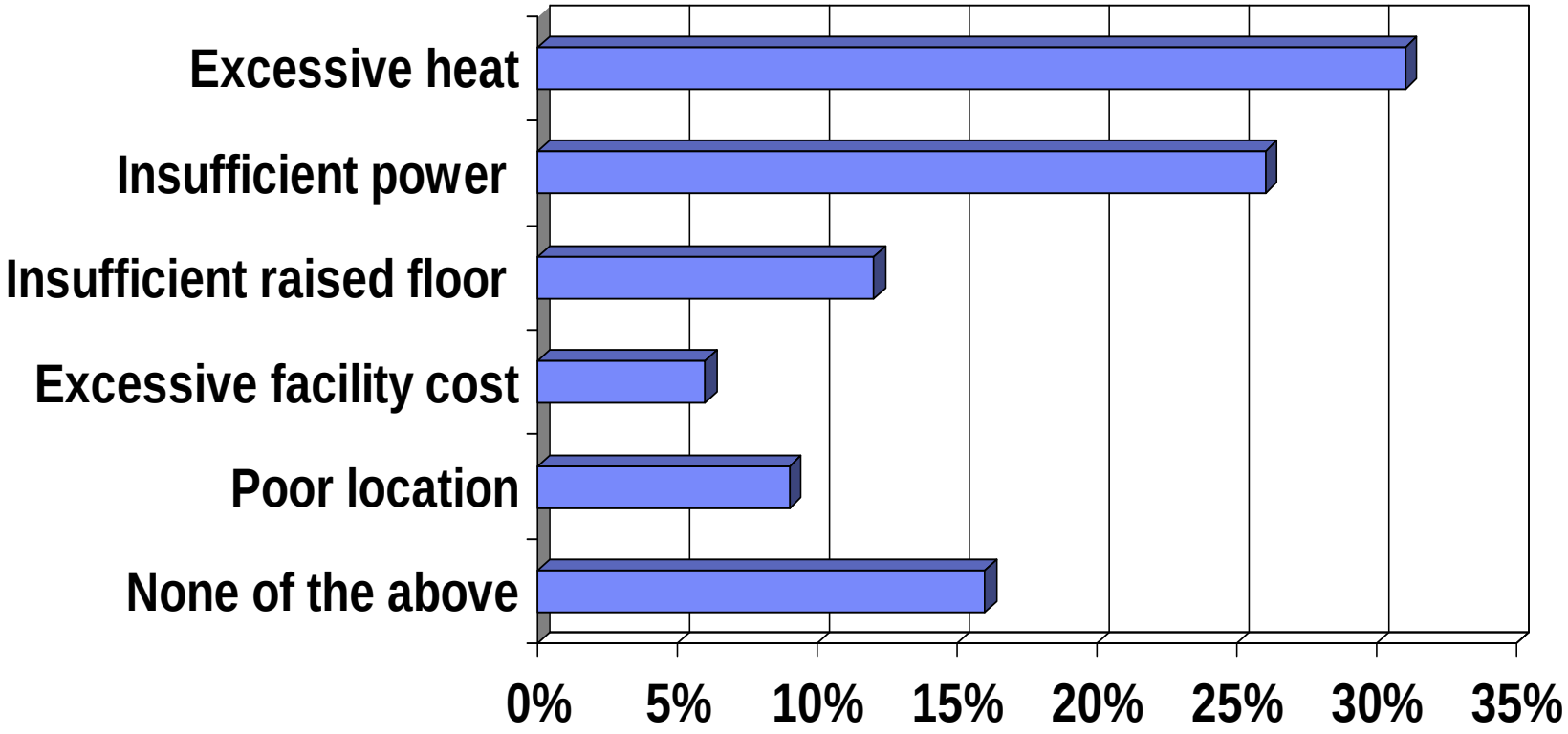
- IBM systems architecture, chip design and software
- Systems Director Active Energy Manager
- Rear Door Heat Exchanger
- Calibrated Vector Cooling
- 90% efficient power supplies
- Power Configurator
- Thermal Analyzer

Worldwide Server Market (IDC) : il reale costo dei server



IDC Presentation, The Impact of Power and Cooling on Data Center Infrastructure, Doc #201722, May 2006

Question:
What is the greatest facility problem with your primary data center?
(Gartner 2006)

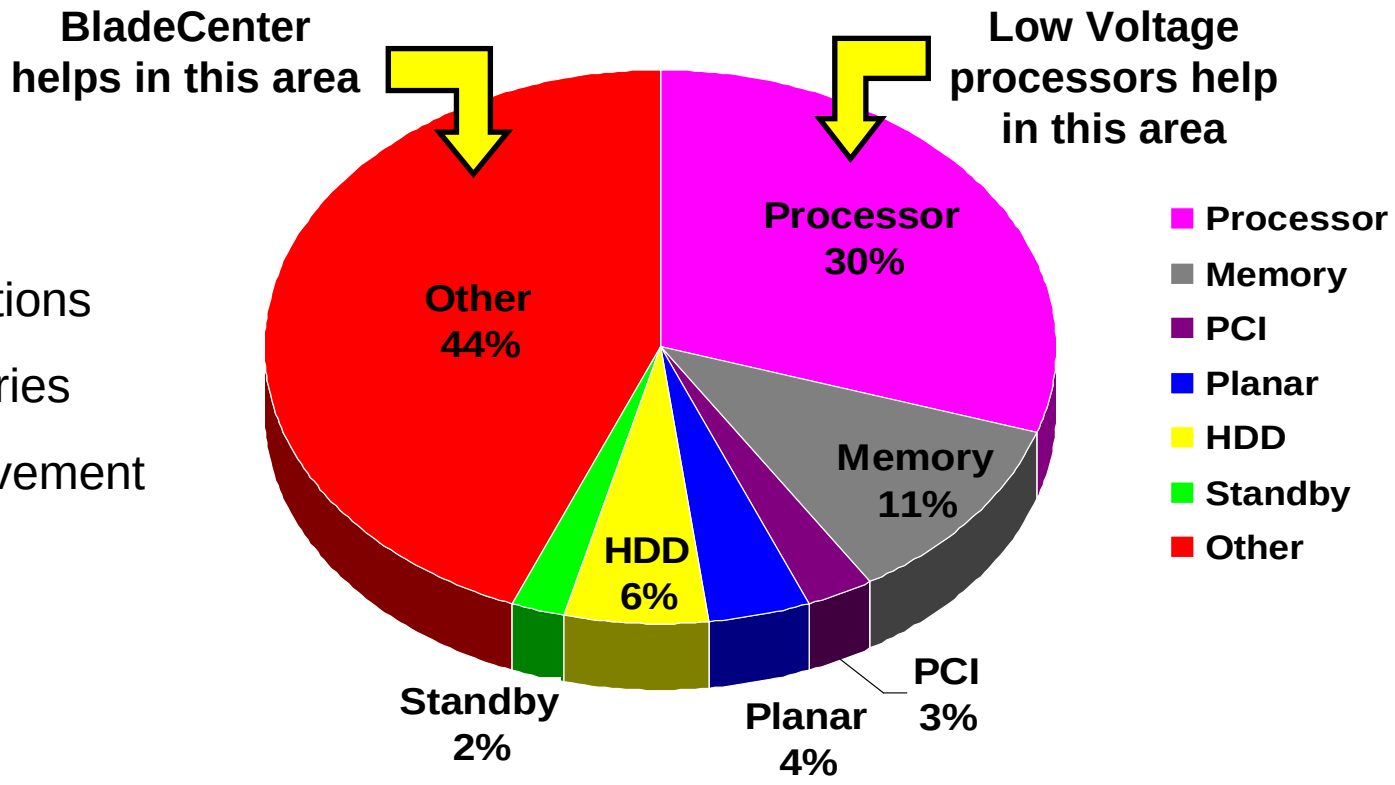


What's using the power?

The processor power growth is the largest single contributor but there are many other areas - the more you pack into a server the more power it needs!

OTHER?

- AC to DC Transitions
- DC to DC Deliveries
- Fans and air movement



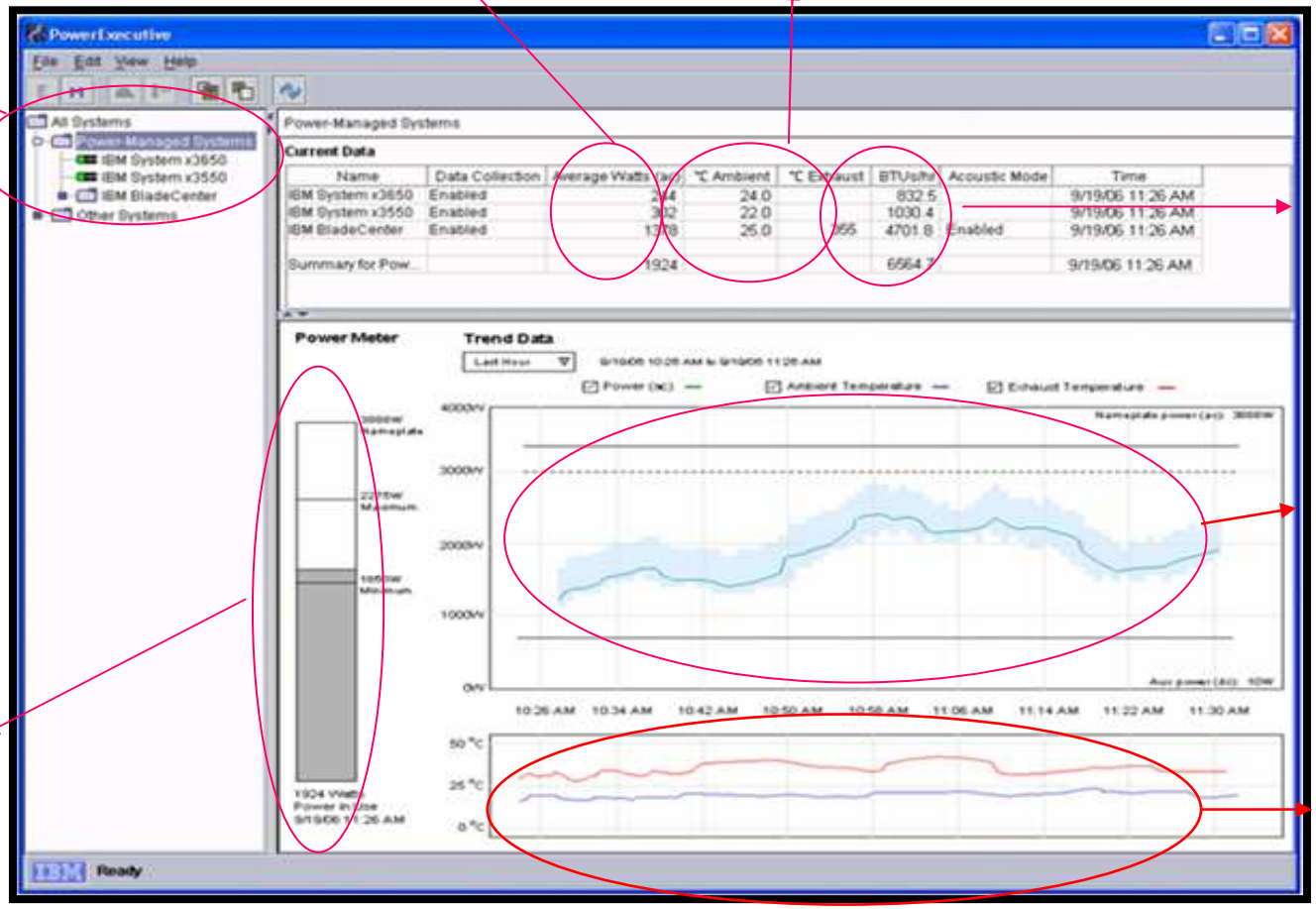
IBM® *Systems Director Active Energy Manager* ™ in action!

Manage Power at the rack and server level

Monitor:
- **Power supply**
- **Blades**
- **I/O modules**
- **Mgmt module**
- **Blowers**
- **Media tray**
- **Midplane**

Compare actual vs. name plate power at system level

View inlet and exhaust temperatures



Track heat emitted

Trend power use over time

Trend temperature over time

Compare rack actual power vs. Label Power

Supported systems: **BladeCenter BC-H 8852,BC-E 8677, BC-T 8730/8720, BC-HT 8750/8740, BC-S 8886. Blades HS20 8843,HS21 8853, LS20 8850, LS21 7971, LS41 7972, HS21 XM, HC10 7996 . System x: x3550,x3650,x3655,x3755,x3850,x3950,and the new x3350, x3850 M2, and x3950 M2**

Agenda

- BladeCenter solution
- System Management & Cool Blue strategy
- **System x “high end” servers**

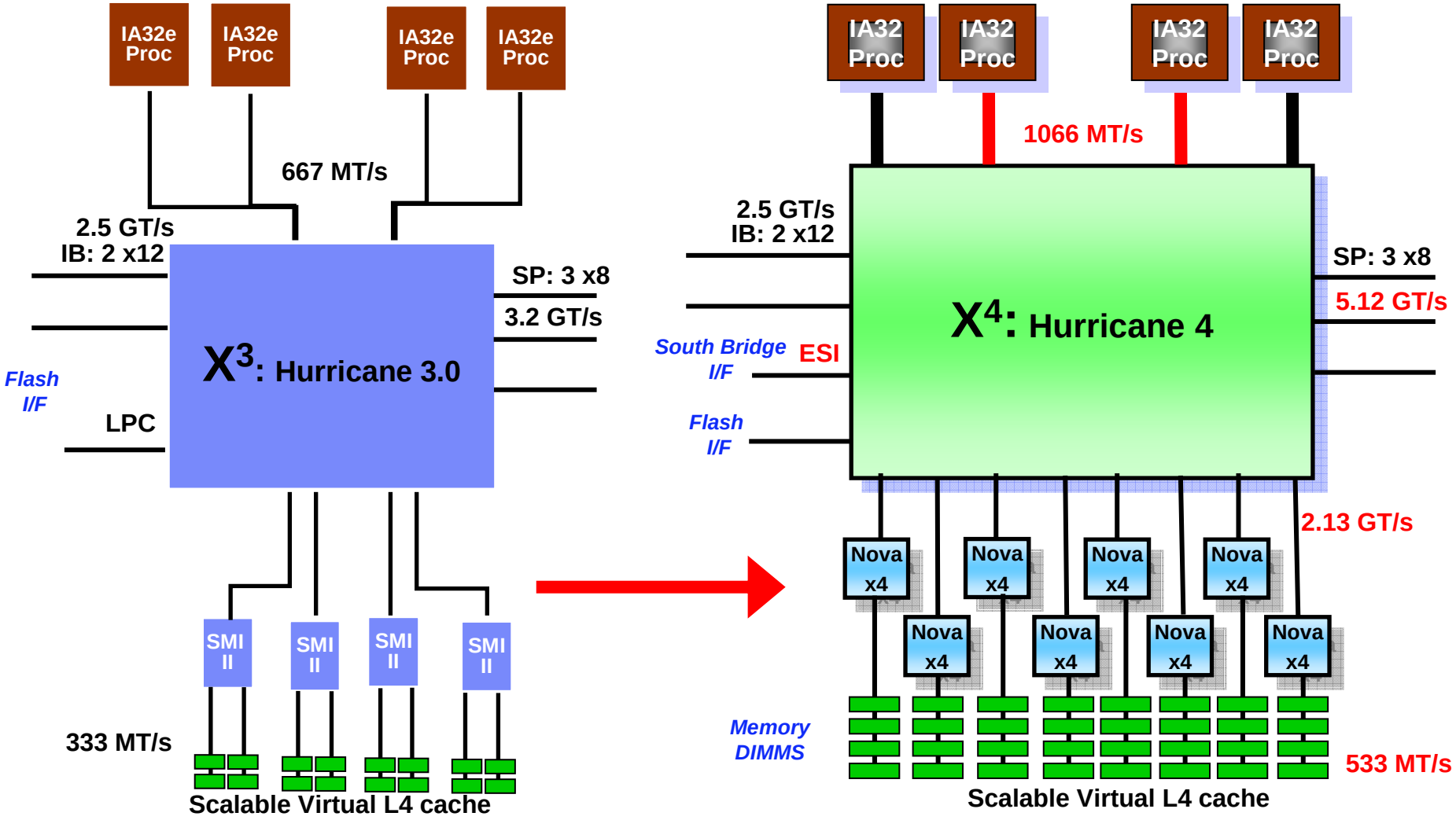
High Performance Systems : x3850 M2 – x3950 M2

- **Embedded Hypervisor Models - 3i**
  - **Announce: 25 march 08**
  - **Availability: 9 may 2008**
    - **Allows system to boot as virtualized platform**
    - **Eliminates hours of primary partition installation activities**

7 Steps to Success - Benefits of X4 over X3-

1) **Separate FSB for each processor**
2) **FSB frequency increased from 667Mhz to 1066Mhz**
3) **2.6x aggregate FSB bandwidth improvement for higher performance**
4) **Memory bandwidth increased from 333Mhz to 533 Mhz**
5) **4X memory capacity (2X from chipset, 2X from DRAM technology)**
6) **Internal chipset bandwidth and queues increased to support 4 core processors**
7) **Almost 2X increase in scalability port bandwidth for improved scaling**

Evolving X3 into X4



CPU's & Chipset Hurricane 4 Description

Processors

Intel Xeon Processor "Tigerton"

- x7350 (2.93GHz 8MB L2 Quad Core)
- E7330 (2.40GHz 6MB L2 Quad Core)
- E7320 (2.13GHz 4MB L2 Quad Core)
- E7310 (1.60GHz 8MB L2 Dual Core)

Intel Xeon Processor "Dunnington"

NEW!

Ann:16/09/08
GA:10/10/08

- E7420 (2.13 GHz 6 MB L2 Quad Core)
- E7450 (2.4 GHz 9 MB L2 Six Core)
- x7460 (2.66 GHz 9 MB L2 Six Core)
- L7445 (2.13 GHz 6 MB L2 Quad Core)

Processor Interface

- Quad 1066 FSB - 16GB/s
  - **2.6x increase over Hurricane 3.0**
- Snoop Filter for Quad FSB coherency tracking

Memory

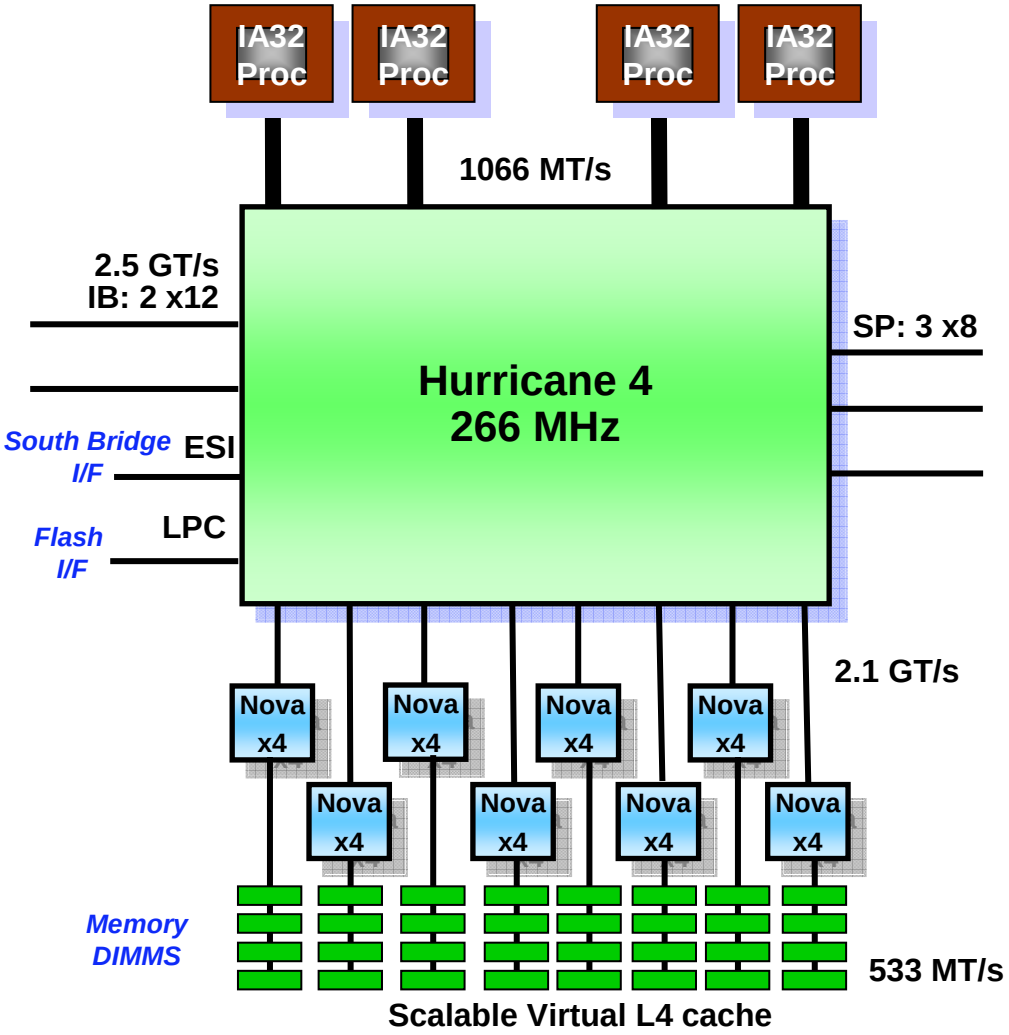
- 8 Novax4 EI3 channels
- 34GB/s Read, 17GB/s Write
- DDR2/3-533, 1GB, 2GB, 4GB, 8GB DIMMs
- X4 Chipkill w/RBS, Memory mirroring, Hot Add/Replace

Direct connect I/O

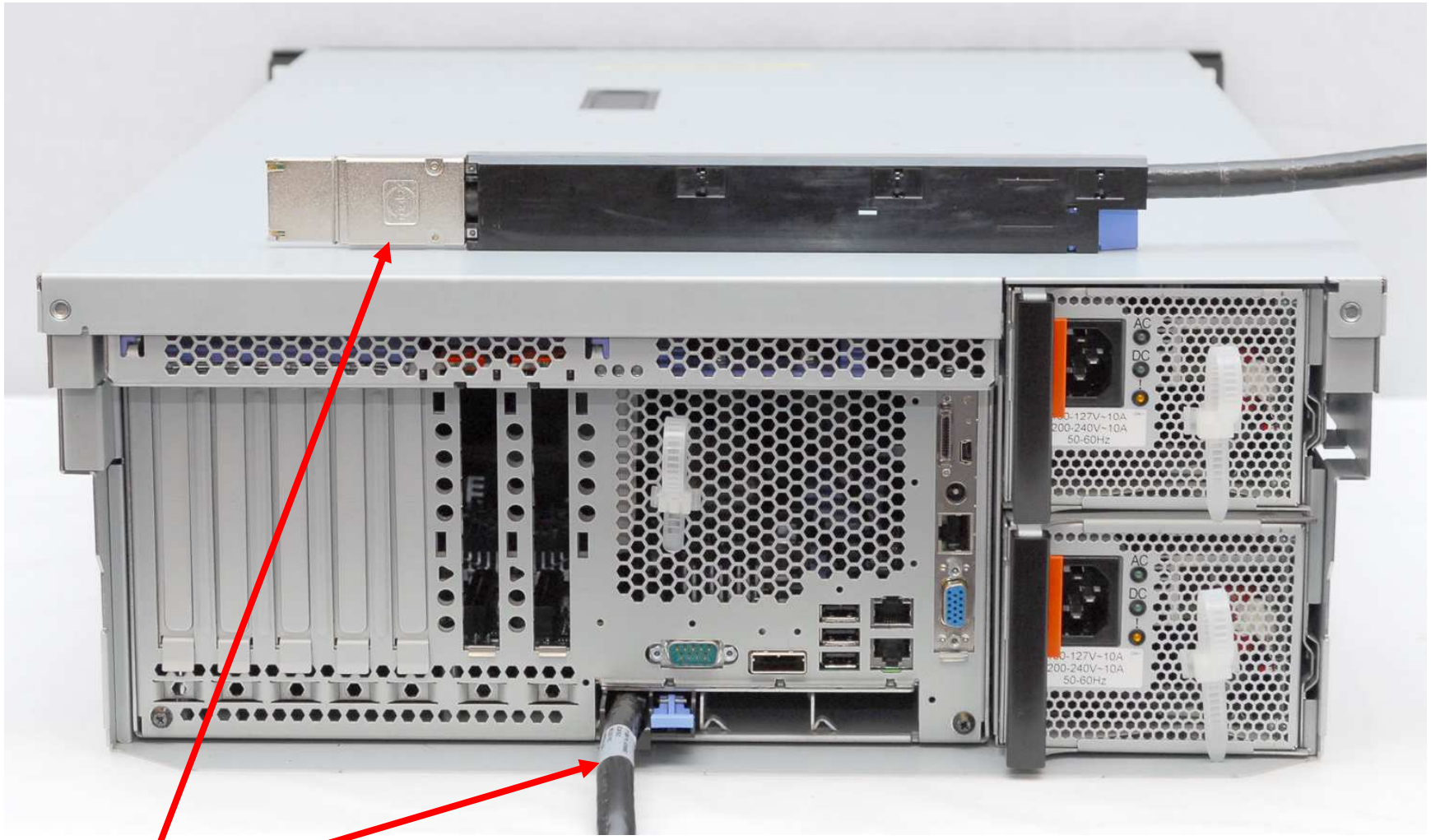
- 2 x12 IB Ports – 12GB/s
- Connects to Calgary (PCIX) and Calioc2 (PCIE)
- ESI support for ICH-8 South Bridge

Scalability

- 3 Scalability Ports – 30GB/s
- Up to 16 sockets



Multi Chassis configuration



Scalability Cable

"Athena" Scalability Upgrade: ..from x3850 M2 to x3950 M2

x3850 M2

A 4U rack-optimized model, expandable to 16U (..and 16 CPU sockets!) using a "ScaleXpander Option Kit" and three additional chassis.
Installing the ScaleXpander Option Kit turns the x3850 M2 into an x3950 M2 (including a new bezel)

ScaleXpander Option Kit

- P/N 44E4249
- Available from 15 feb 2008

- Scalability Cable 3.08m
- Entry Cable Management Arm
- ScaleXpander chip

x3950 M2

IBM System x3950 M2-specific:
ScaleXpander Kit *standard*

Scalability Icon lights up when active

IBM eX4 Unmatched Reliability, Scalability and Performance

Mainframe Inspired Solutions for the x86 Market

For more information visit eX4 Sales Support

Top 5 Reasons to purchase an IBM x3850 M2 / x3950 M2

1. **Most Reliable x86 Platform for your Mission Critical Apps**

   Includes more reliability features then any industry x86 server

   IBM Chipkill™ Memory *Memory ProteXion™*

   Hot Swap PCI & Memory *Predictive Failure Analysis*

2. **Low power and high utilization for maximum efficiency**

   Multi-processor utilization, DDR2 memory technology, and lower wattage energy efficient power supplies for lower total cost of ownership

3. **Greatest top end performance x86 platform**

   Large 64 Dimm Memory Capacity, IBM eX4 Technology, and scalability to 16 sockets delivers leadership performance

   #1 tpc-c x86 score *#1 VMmark 24-core score*

4. **Lowest cost for large memory and socket licensed software**

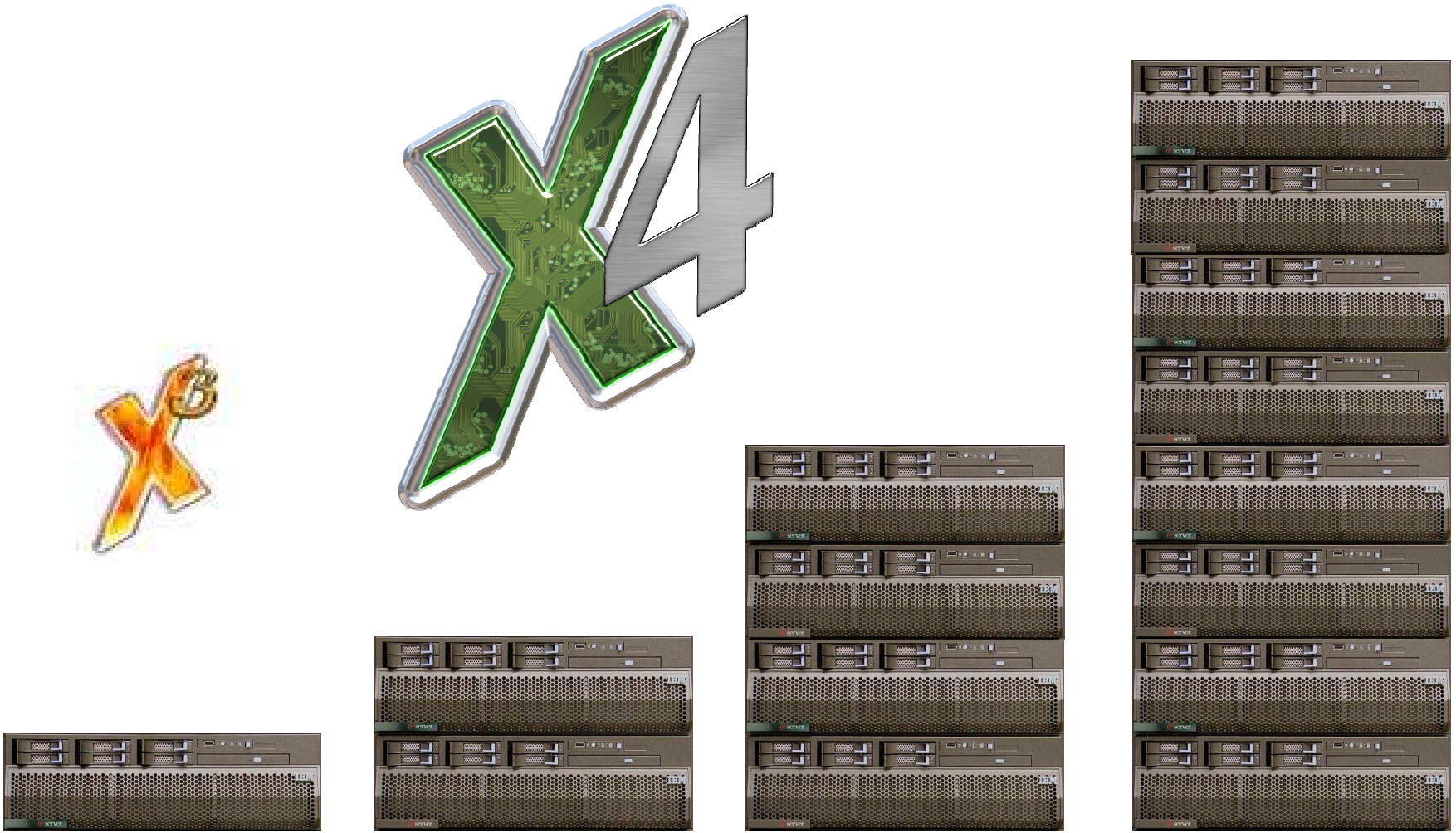
   10% cost savings for high memory capacity, combined with 40% lower memory latency and 60% more memory bandwidth ability to have 64 Dimms with only two processor, creates ideal memory rich platform

   22% lower cost per SAP SC *22% lower cost per VMWare VM*

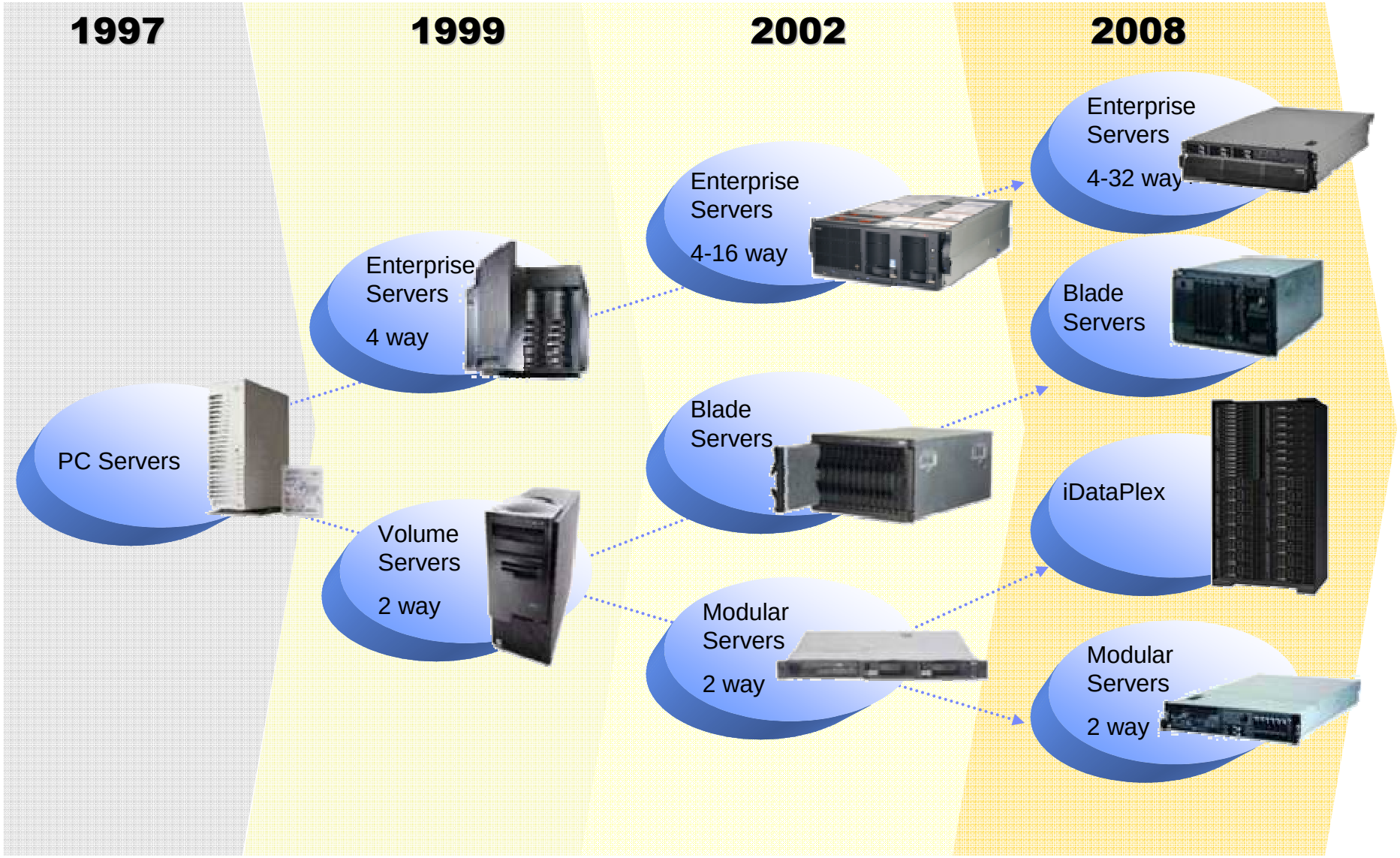
5. **Investment protection with 'pay as you grow' scalability**

   Modular scaleable design allows your system to grow as your business grows up to 4 times an original fully loaded configuration, without any additional initial cost expenditure

High Performance Systems



Decade Of Innovation



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Revised January 19, 2006

Notes on benchmarks and values

The IBM benchmarks results shown herein were derived using particular, well configured, development-level and generally-available computer systems. Buyers should consult other sources of information to evaluate the performance of systems they are considering buying and should consider conducting application oriented testing. For additional information about the benchmarks, values and systems tested, contact your local IBM office or IBM authorized reseller or access the Web site of the benchmark consortium or benchmark vendor.

IBM benchmark results can be found in the IBM System p5, ~ p5, pSeries, OpenPower and IBM RS/6000 Performance Report at http://www.ibm.com/servers/systems/p/hardware/system_perf.html.

All performance measurements were made with AIX or AIX 5L operating systems unless otherwise indicated to have used Linux. For new and upgraded systems, AIX Version 4.3 or AIX 5L were used. All other systems used previous versions of AIX. The SPEC CPU2000, LINPACK, and Technical Computing benchmarks were compiled using IBM's high performance C, C++, and FORTRAN compilers for AIX 5L and Linux. For new and upgraded systems, the latest versions of these compilers were used: XL C Enterprise Edition V7.0 for AIX, XL C/C++ Enterprise Edition V7.0 for AIX, XL FORTRAN Enterprise Edition V9.1 for AIX, XL C/C++ Advanced Edition V7.0 for Linux, and XL FORTRAN Advanced Edition V9.1 for Linux. The SPEC CPU95 (retired in 2000) tests used preprocessors, KAP 3.2 for FORTRAN and KAP/C 1.4.2 from Kuck & Associates and VAST-2 v4.01X8 from Pacific-Sierra Research. The preprocessors were purchased separately from these vendors. Other software packages like IBM ESSL for AIX, MASS for AIX and Kazushige Goto's BLAS Library for Linux were also used in some benchmarks.

For a definition/explanation of each benchmark and the full list of detailed results, visit the Web site of the benchmark consortium or benchmark vendor.

TPC	http://www.tpc.org
SPEC	http://www.spec.org
LINPACK	http://www.netlib.org/benchmark/performance.pdf
Pro/E	http://www.proe.com
GPC	http://www.spec.org/gpc
NotesBench	http://www.notesbench.org
VolanoMark	http://www.volano.com
STREAM	http://www.cs.virginia.edu/stream/
SAP	http://www.sap.com/benchmark/
Oracle Applications	http://www.oracle.com/apps_benchmark/
PeopleSoft - To get information on PeopleSoft benchmarks, contact PeopleSoft directly	
Siebel	http://www.siebel.com/crm/performance_benchmark/index.shtm
Baan	http://www.ssaglobal.com
Microsoft Exchange	http://www.microsoft.com/exchange/evaluation/performance/default.asp
Veritest	http://www.veritest.com/clients/reports
Fluent	http://www.fluent.com/software/fluent/index.htm
TOP500 Supercomputers	http://www.top500.org/
Ideas International	http://www.ideasinternational.com/benchmark/bench.html
Storage Performance Council	http://www.storageperformance.org/results

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Notes on Performance Estimates

rPerf

rPerf (Relative Performance) is an estimate of commercial processing performance relative to other IBM UNIX systems. It is derived from an IBM analytical model which uses characteristics from IBM internal workloads, TPC and SPEC benchmarks. The rPerf model is not intended to represent any specific public benchmark results and should not be reasonably used in that way. The model simulates some of the system operations such as CPU, cache and memory. However, the model does not simulate disk or network I/O operations.

rPerf estimates are calculated based on systems with the latest levels of AIX 5L and other pertinent software at the time of system announcement. Actual performance will vary based on application and configuration specifics. The IBM @server pSeries 640 is the baseline reference system and has a value of 1.0. Although rPerf may be used to approximate relative IBM UNIX commercial processing performance, actual system performance may vary and is dependent upon many factors including system hardware configuration and software design and configuration.

All performance estimates are provided "AS IS" and no warranties or guarantees are expressed or implied by IBM. Buyers should consult other sources of information, including system benchmarks, and application sizing guides to evaluate the performance of a system they are considering buying. For additional information about rPerf, contact your local IBM office or IBM authorized reseller.

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