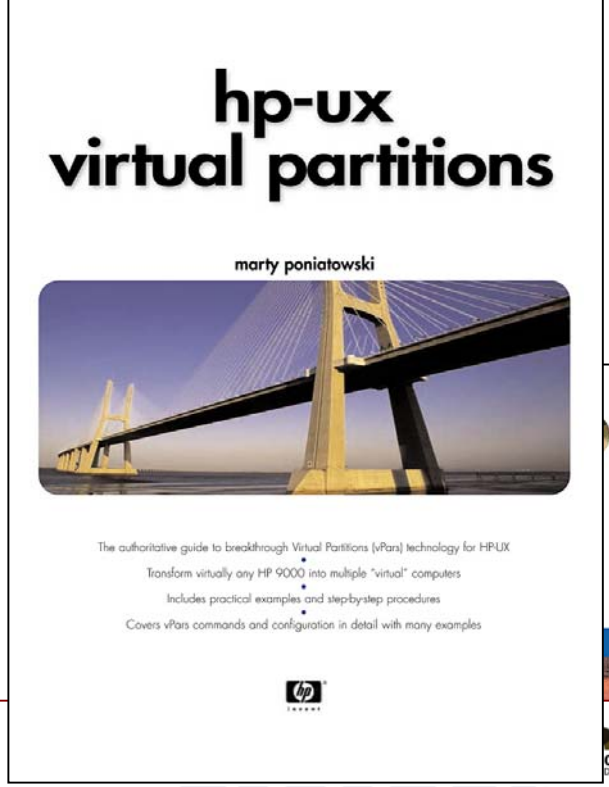
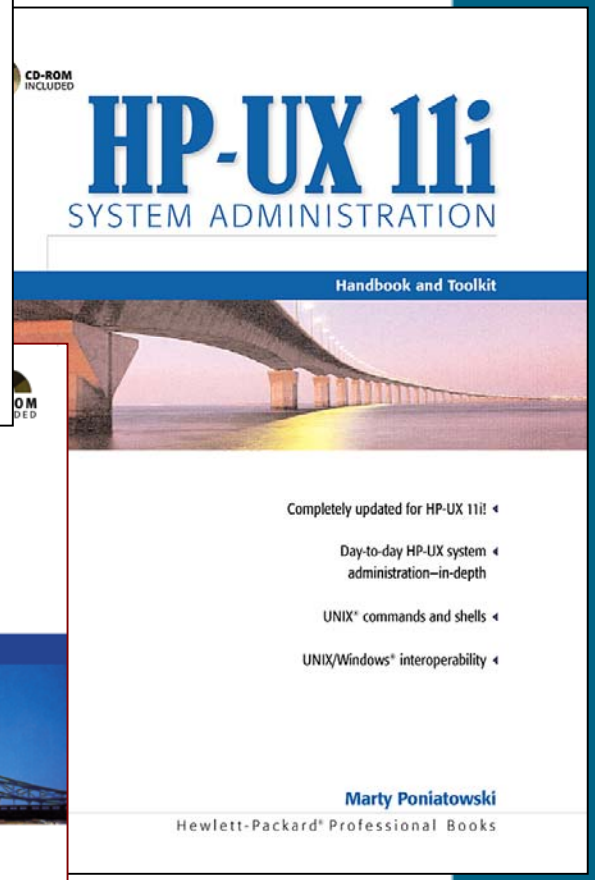
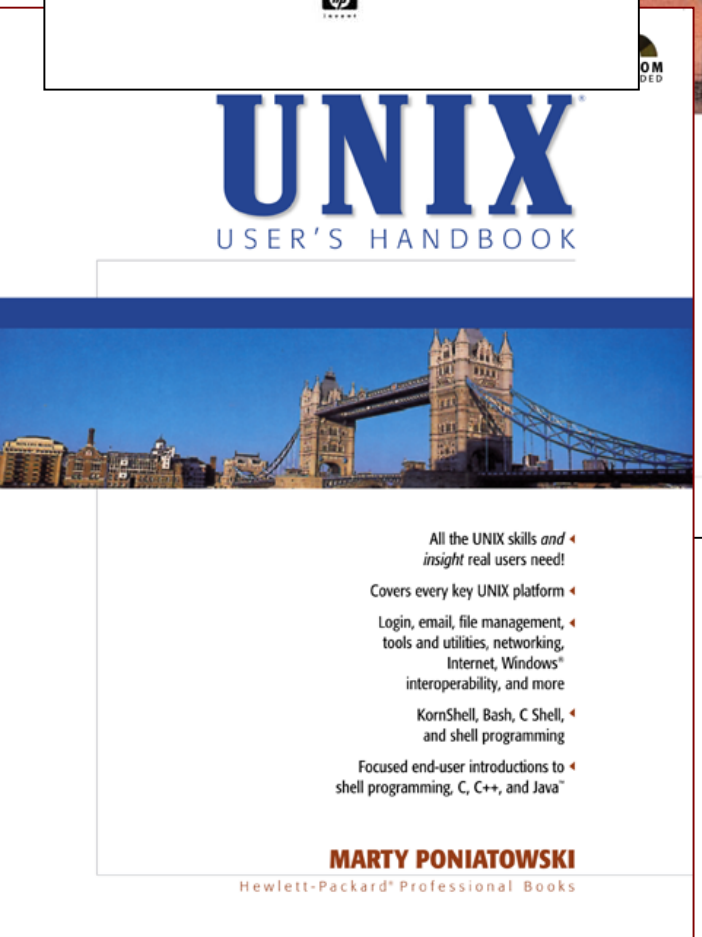



# Technology Update: HP Adaptive Enterprise

HP 9000 (PA-RISC)

Integrity (Itanium)

Partition Continuum

Itanium

Server Consolidation

HP-UX

Linux

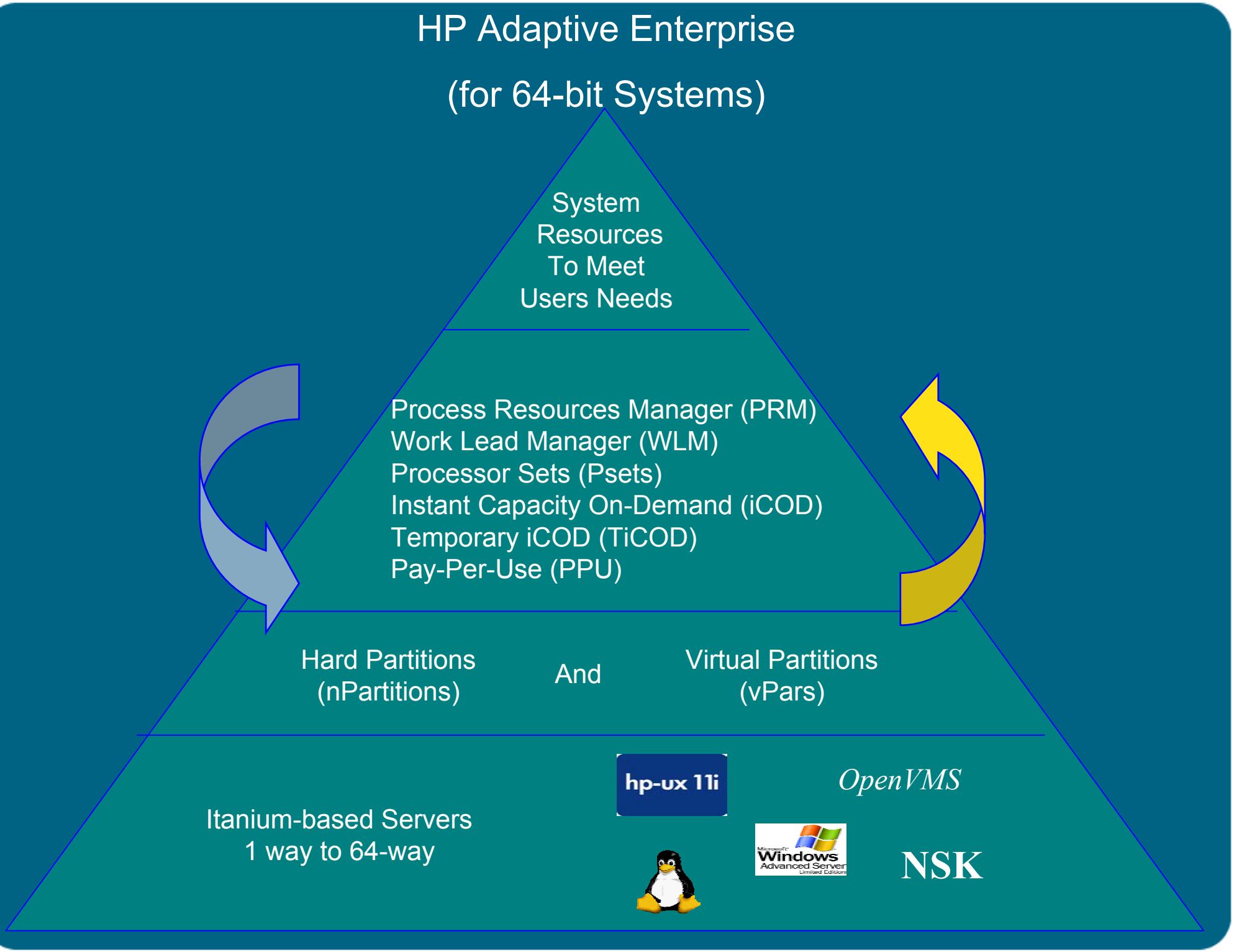
Windows

Marty Poniatowski

(rev11)

# HP Adaptive Enterprise

## (for 64-bit Systems)



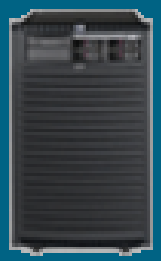
# Extending the scalability & performance with PA-8800 processors

Same chassis as current PA-8700 servers

New & improved HP 9000 chassis

**Superdome**

**128-way**



**rp8420-32**

**32-way**

**rp7420-16**

**16-way**

**rp4440-8**

**8-way**

**rp3440-4**

**4-way**

**rp3410-2**

**2-way**

From top to bottom, dual-core processors will be offered across the HP 9000 product family

Features

- 20-40% performance improvement with the *same* number of processors
- Double the number of processors in the same size or smaller size chassis
- In-box upgrades from PA-8600, PA-8700 and PA-8700+
- In-box upgrades to PA-8900 and HP Integrity
- Same HP-UX 11i OS as PA-8700

Benefits

- Enhanced scalability for growing workloads
- Lower TCO from better performance and performance density
- Superior Hardware and software investment protection

# HP Integrity servers:
# The broadest line of Itanium®-based systems

CPUs

**128** HP Integrity Superdome

Up to 128-way scalability and hard partitioning capability for leading consolidation using MX2

- Up to 128 Intel® Itanium® 2 processors
- Up to 512 GB memory
- 192 PCI-X slots (with I/O expansion)
- Up to 16 hard partitions

**32** HP Integrity rx8620 with server expansion unit (SEU)

32-way scalability and hard partitioning capability for Consolidation using MX2

- 2- to 32-way Intel Itanium 2 processors
- Up to 128 GB memory
- 32 PCI-X slots (with SEU)
- Up to 4 hard partitions
- 2 servers per 2m rack

**16** HP Integrity rx7620

16-way flexibility with high performance, density, and partitioning capabilities using MX2

- 2- to 16-way Intel Itanium 2 processors
- Up to 64 GB memory
- 15 PCI-X slots
- Up to 2 hard partitions
- 4 servers per 2m rack

**8** HP Integrity rx4640 and rx5670

8-way high-performance servers in ultra-dense and highly scalable models using MX2

- 1- to 8-way Intel Itanium 2 processors
- Up to 64 and 96 GB memory
- 6 and 10 PCI-X slots
- 10 and 5 servers per 2m rack

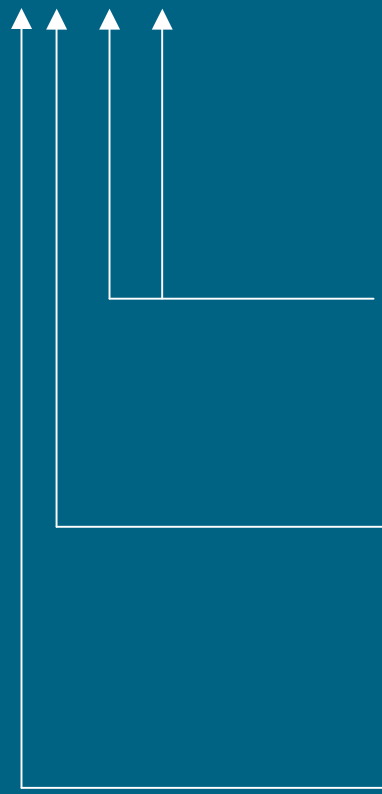
**2** HP Integrity rx2600 and rx1600

2-way ultra-dense, power-packed server redefines entry-level computing using MX2

- 1- to 2-way Intel Itanium 2 (rx2600) or Low Voltage Itanium 2 (rx2600 1.4 - 1.0 GHz, rx1600 – 1.0GHz) processors
- 1U (rx1600) & 2U (rx2600) Form Factor
- Up to 24 GB memory
- 4 PCI-X slots
- 20 servers per 2m rack

# hp server naming decoder ring numeric digits

hp server aadddd



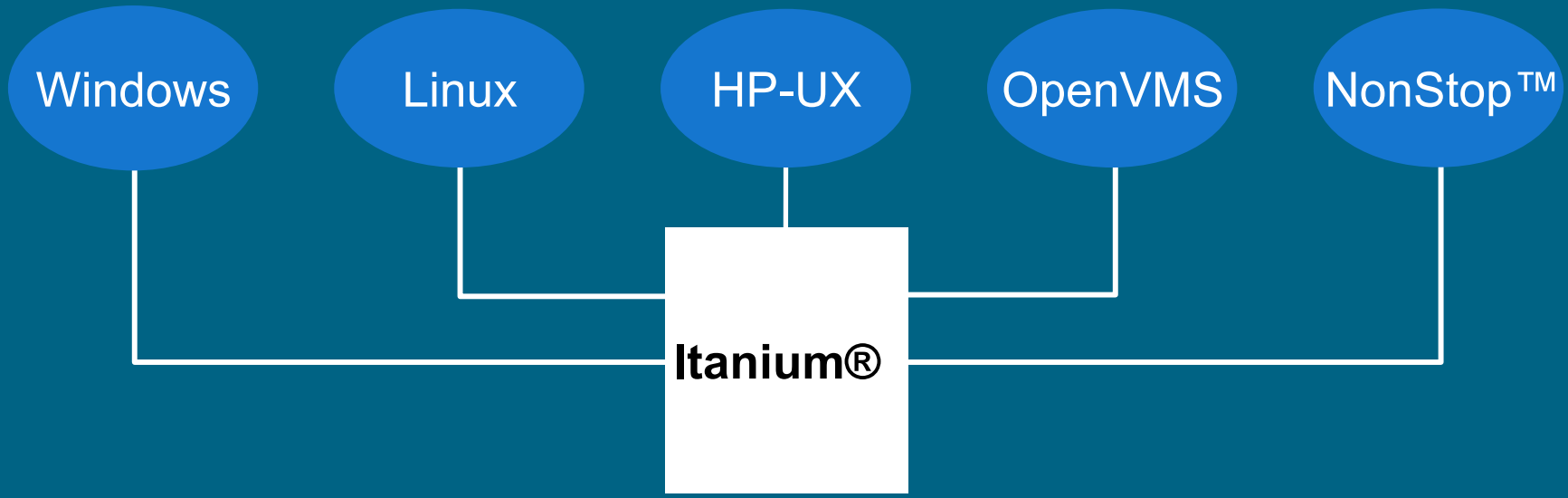
00 - 90 relative capacity & “newness” (upgrades, etc.)

Unique number for each architecture to ensure different systems do not have the same numbering across architectures

1-9 identifies family and/or relative positioning

# HP unifying approach

## HP unifying 64-bit strategy



# Guidelines for Choosing HP 9000 or Integrity servers

| | |
|---|---|
| HP Integrity  | You are:<br>• Running applications available on HP Integrity<br>• Utilizing MS Windows and Linux and wanting to scale beyond 32-bit capabilities<br>• Looking for multi-OS capabilities<br>• Desire an industry standards infrastructure<br>• Early adopter type<br>• Existing HP 9000 customers with new projects<br>• Refreshing their technology |
| HP 9000  | You are:<br>• Running application not available on HP Integrity (yet)<br>• Currently running HP 9000 servers and looking for pure capacity upgrades<br>• Needing OS features not yet on HP Integrity |

# rx7620 system architecture building blocks: cell board

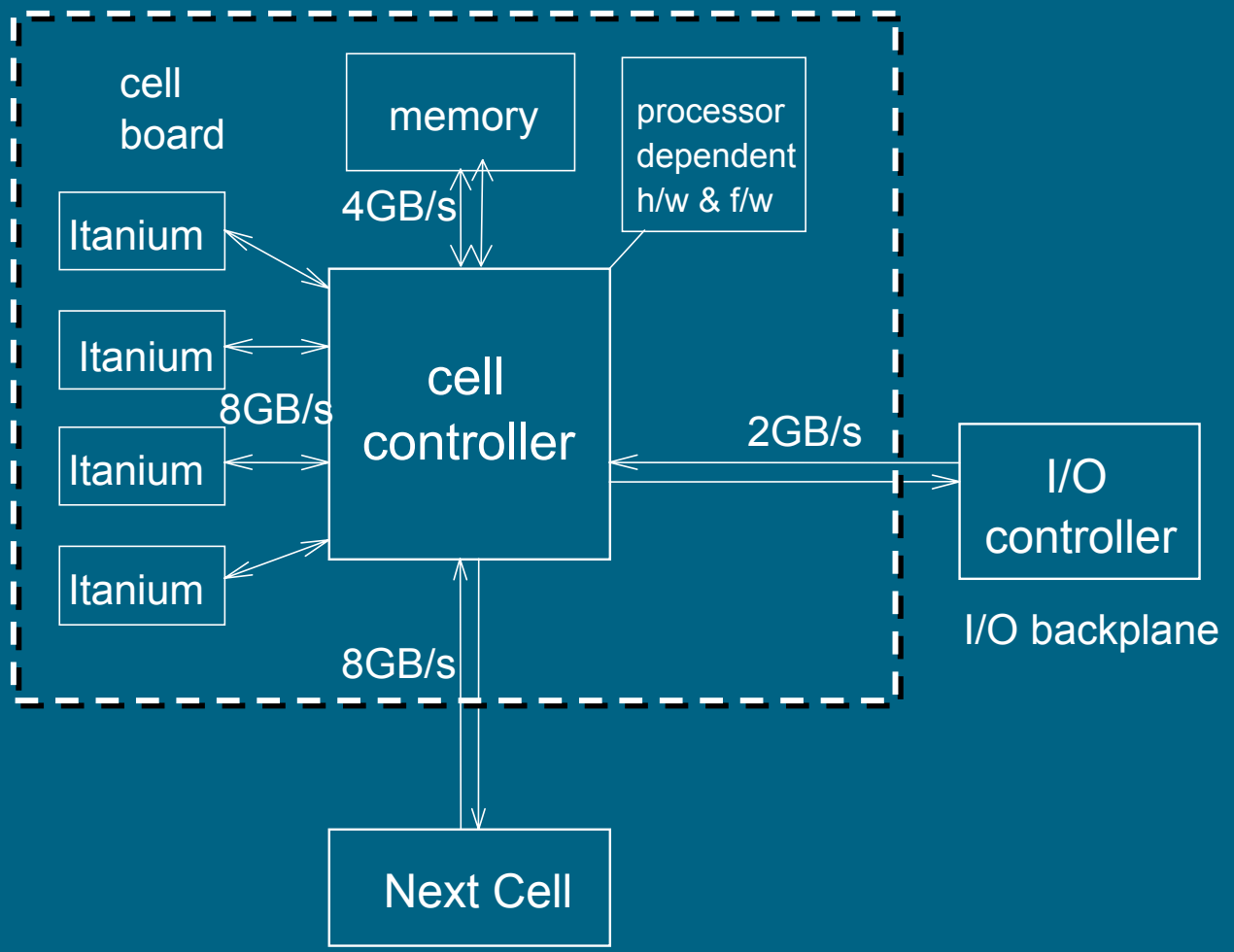
rx7620 is a

cell-based system

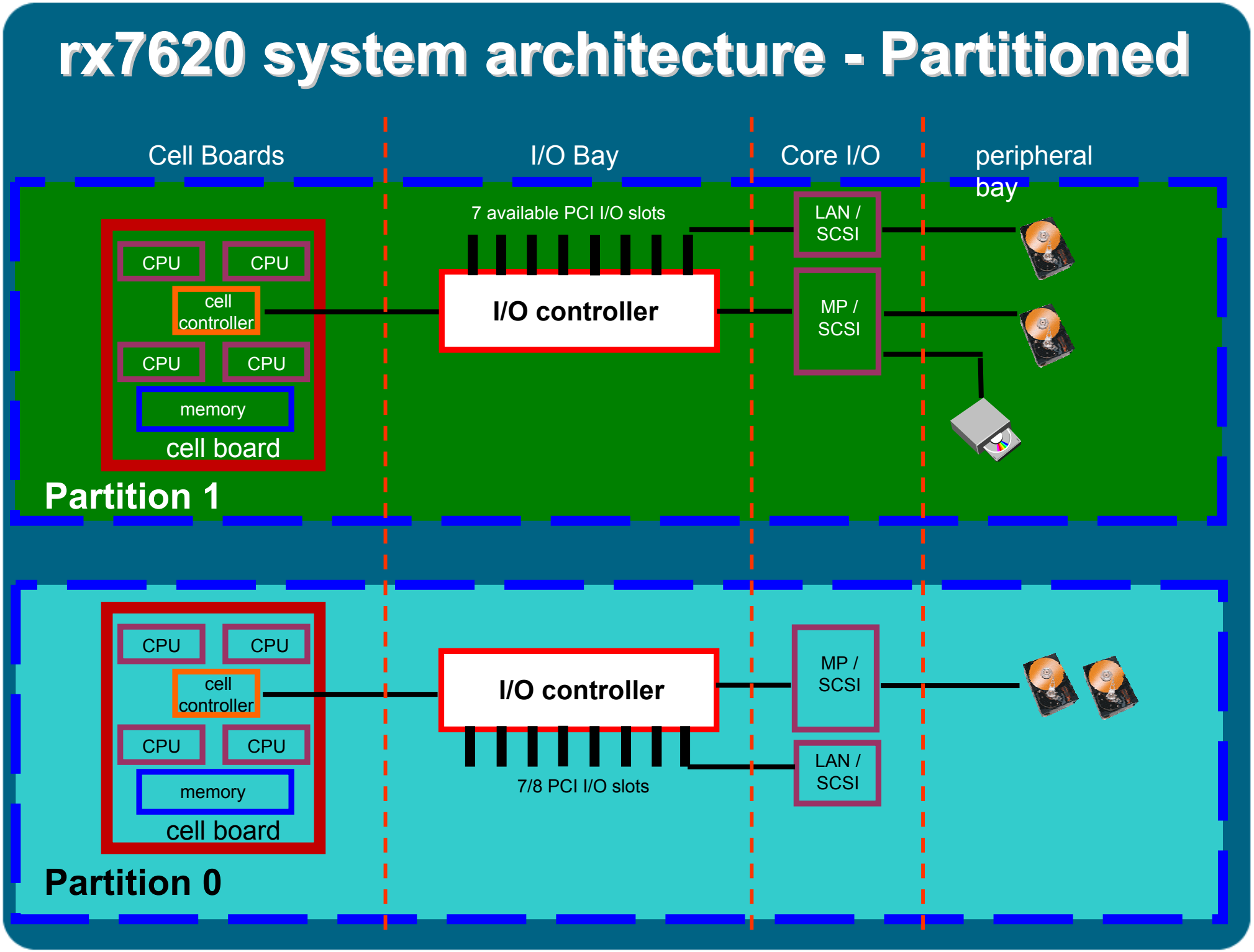
Interchangeable with the rx8620 cell

a cell consists of:

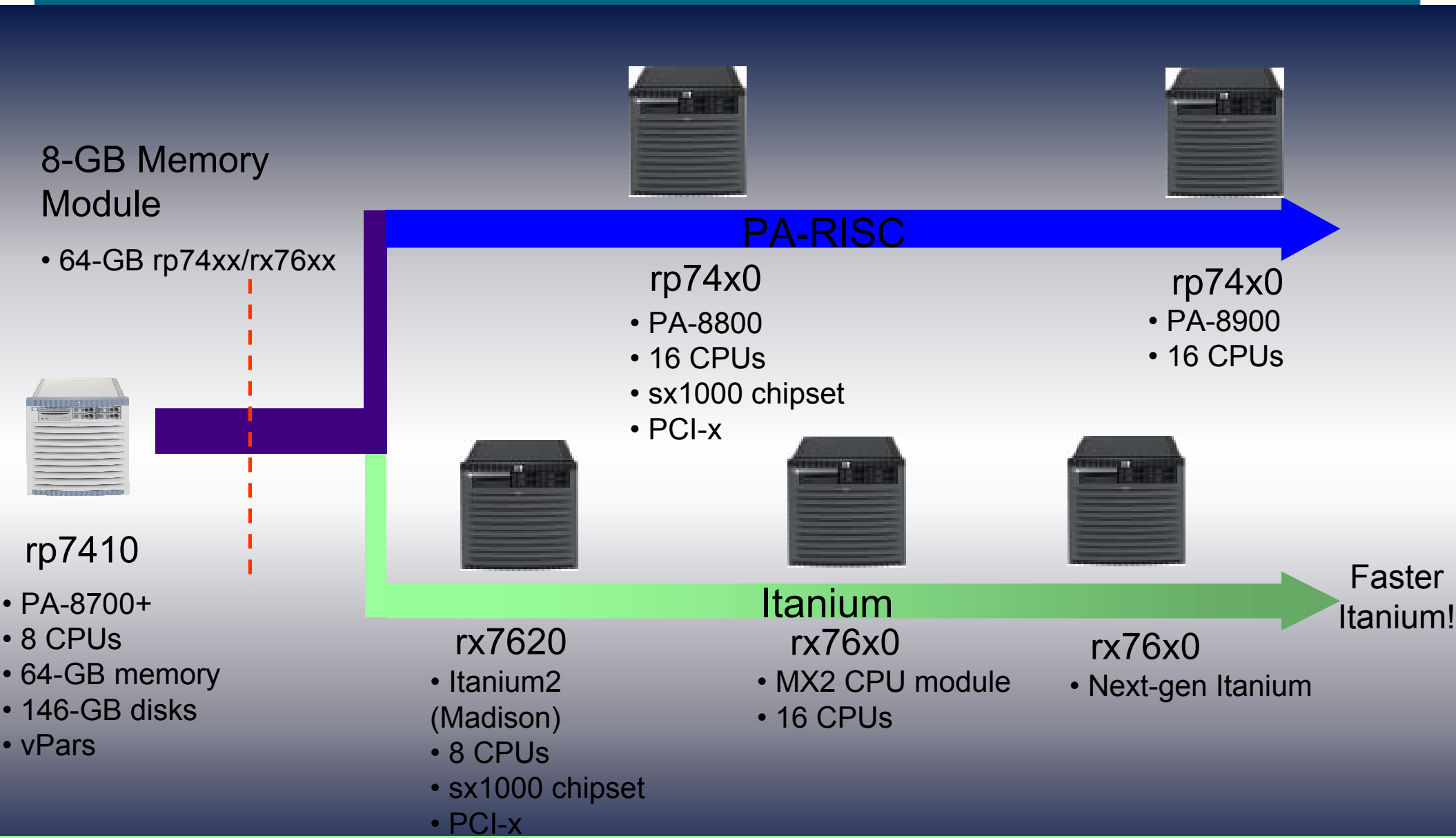
- 4 CPUs
- 2 to 16 GB of memory with 128-MBit DRAMs)
- link to PCI I/O slots and adjacent cell



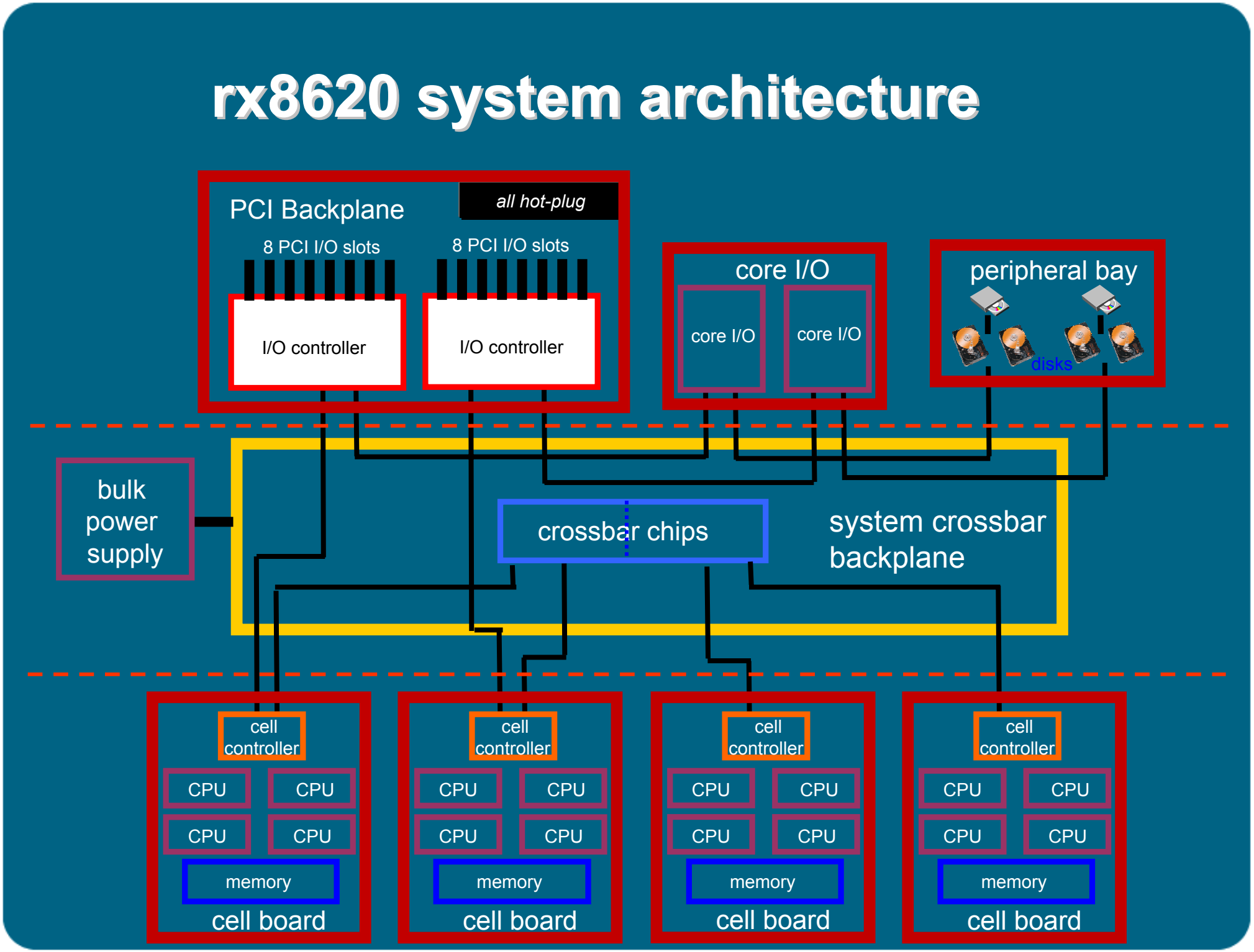
# rx7620 system architecture - Partitioned



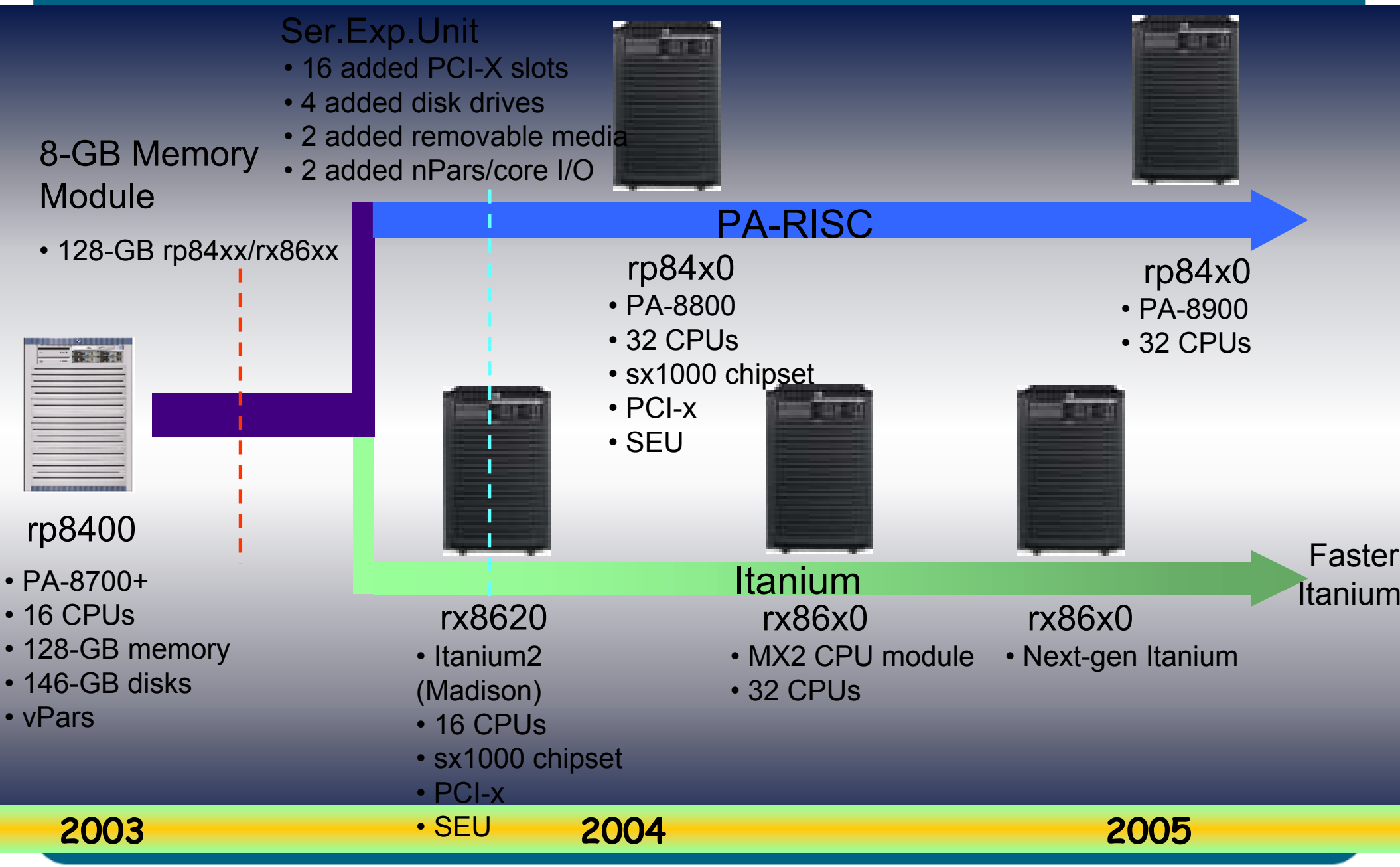
# 8-way roadmap



# rx8620 system architecture



# 16-way roadmap



# superdome: built for the future with investment protection today

- pa-8700
  - 98% performance increase to 389k TPC-C

2h 2001

- PA-8700+
  - 875 MHz
  - 64 CPUs
  - 256GB RAM
  - New I/O Cards

mid 2002

- Itanium
  - Madison
  - (1 CPU/chip)
  - 512GB RAM
  - PCI-X
  - linux
  - HP-UX

July 2003

- Itanium mx2
  - Madison
  - (2 CPUs/socket)
  - 128 CPUS
  - 1 TB RAM
- pa-8800
  - (2 CPUs/chip)
  - 128 CPUs
  - 1 TB RAM

1Q 2004

- Itanium
  - Montecito
  - (2 CPUs/chip)
  - 128 CPUs
  - 1 TB RAM
  - linux
  - windows
  - HP-UX

2h 2004

subject to change without notice

# hp superdome

## Performance & scalability

- single cabinet:
  - 32, 64 CPUs
  - 64, 128, 256 GBs
- 48, 96, 192 PCI slots
- HP-UX 11i OS
- management, security and e-services software

## Partitioning continuum

- hp hyperplex
- nPartitions (up to 16)
- virtual partitions
- resource management

## Utility technology & pricing

- iCOD
- utility pricing

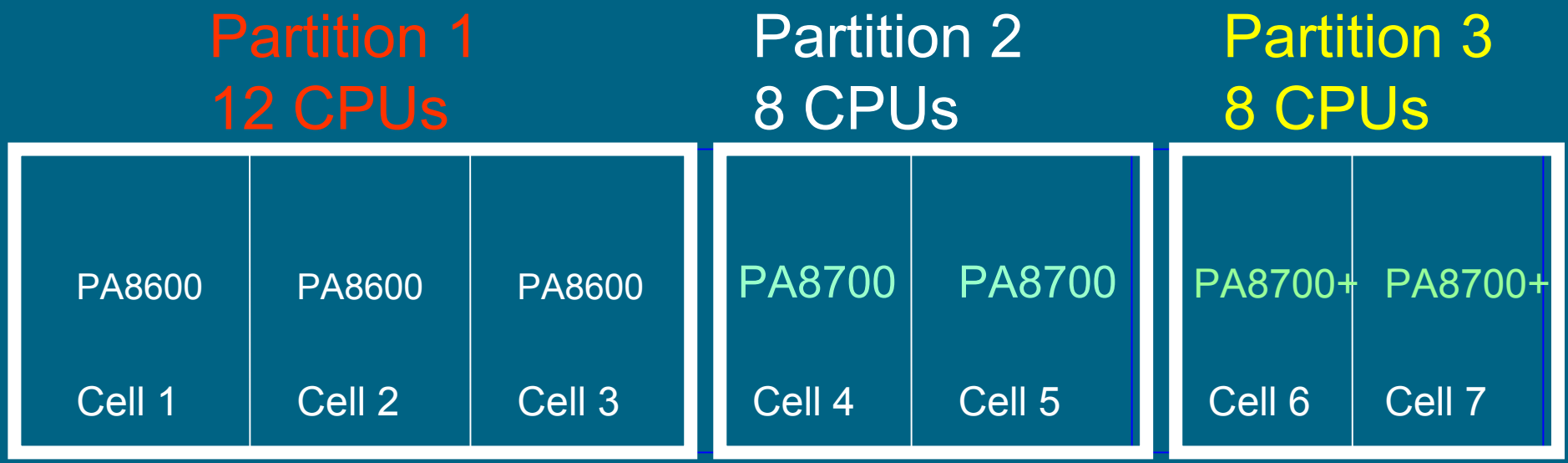
## High availability

- N+1 OLR fans
- N+1 OLR power supplies
- dual power source
- OLAR CPU, memory
- OLAR PCI I/O cards
- parity protected I/O data paths
- ECC on all CPU and memory paths
- dynamic processor resilience
- dynamic memory resilience

## Built for the future

- Itanium and PA-RISC
- Multi-OS: HP-UX, Linux and Windows

# Superdome Investment Protection and Upgrade Example




Partition 1: keep PA8600s for investment protection

Partition 3: upgrade to PA8700+ in month 4

Partition 2: upgrade to PA8700 in month 1

Can upgrade to PA8700 on line one partition at a time so applications running in other partitions can keep running.

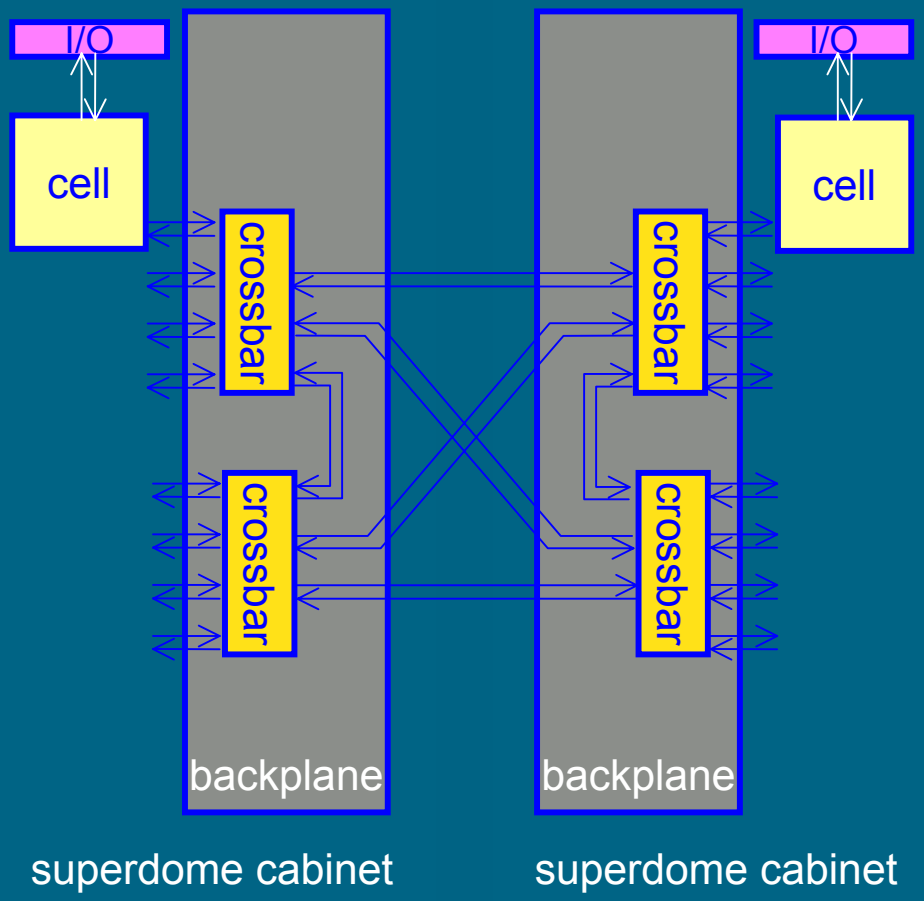
# 3 Generations of Cellular Infrastructure*

***Superdome shown, also applies to rp/rx8400 and rp/rx7610**


| PA-RISC Only<br>HP-UX Only | 64-way IPF, PA-RISC<br>Multi-OS<br>512GB-1TB ccNUMA<br>PCI-X | 128-way IPF, PA-RISC<br>3-4X Bandwidth Boost<br>4TB DDR ccNUMA<br>PCIX 2.0 DDR<br>SSHA improvements |
|---|---|---|
| "Yosemite"<br>4Q 2000 | SX1000<br>3Q 2003 | "Arches"<br>mid 2005 |
| | Upgrades via cell board swaps for IPF & PA-RISC | Upgrades via cell board and backplane swaps for IPF and PA-RISC |

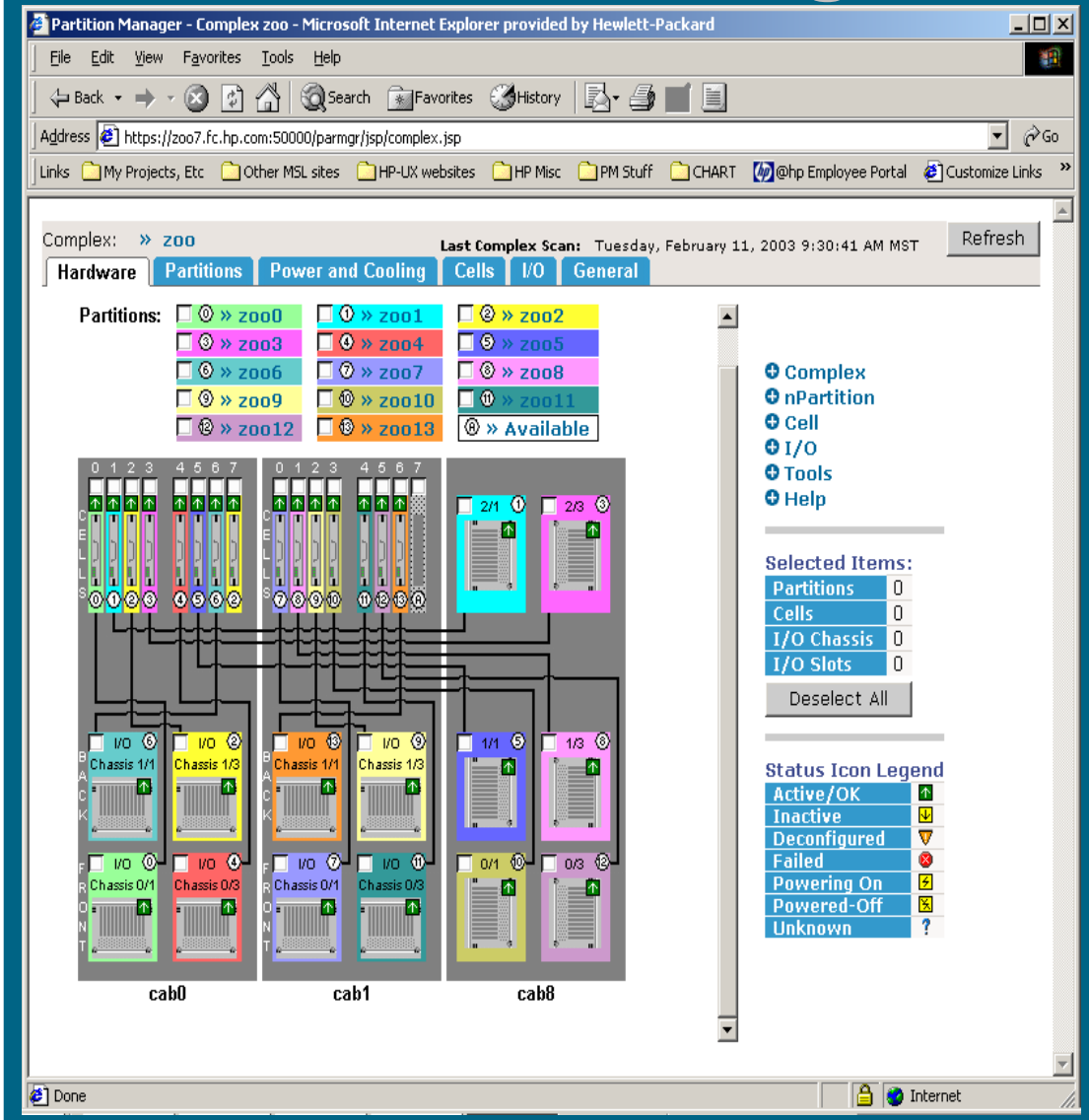
# Interconnect Fabric: Crossbar Mesh

- Fully-connected crossbar mesh
  - Four crossbars
  - Four cells per crossbar
- All links have equal bandwidth and latency
  - Minimizes latency
  - Maximizes usable bandwidth
- Implements point-to-point packet filtering and routing network
  - Allows hardware isolation of all faults
- Interconnect 16 cells with 3 latency domains
  - Cell local
  - Crossbar local
  - Remote crossbar

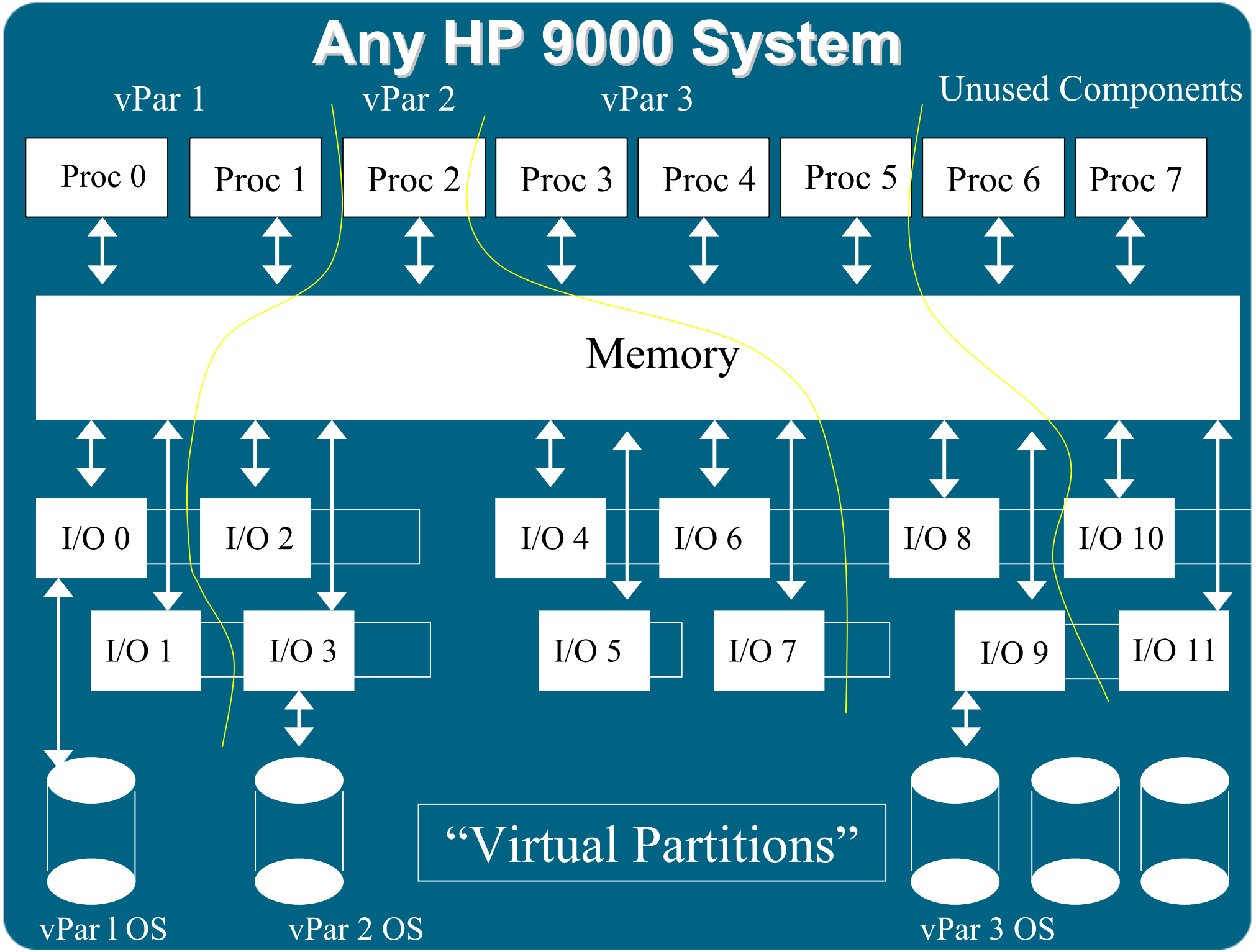



| Processors | SuperDome | UE10K | S80 | GS320 |
|---|---|---|---|---|
| 4 | 200 | 600 | ? | 325 |
| 8 | 250 | 600 | ? | 635 |
| 16 | 275 | 600 | ? | 790 |
| 32 | 315 | 600 | X | 870 |
| 64 | 335 | 600 | X | X |

# Partition Manager New Features

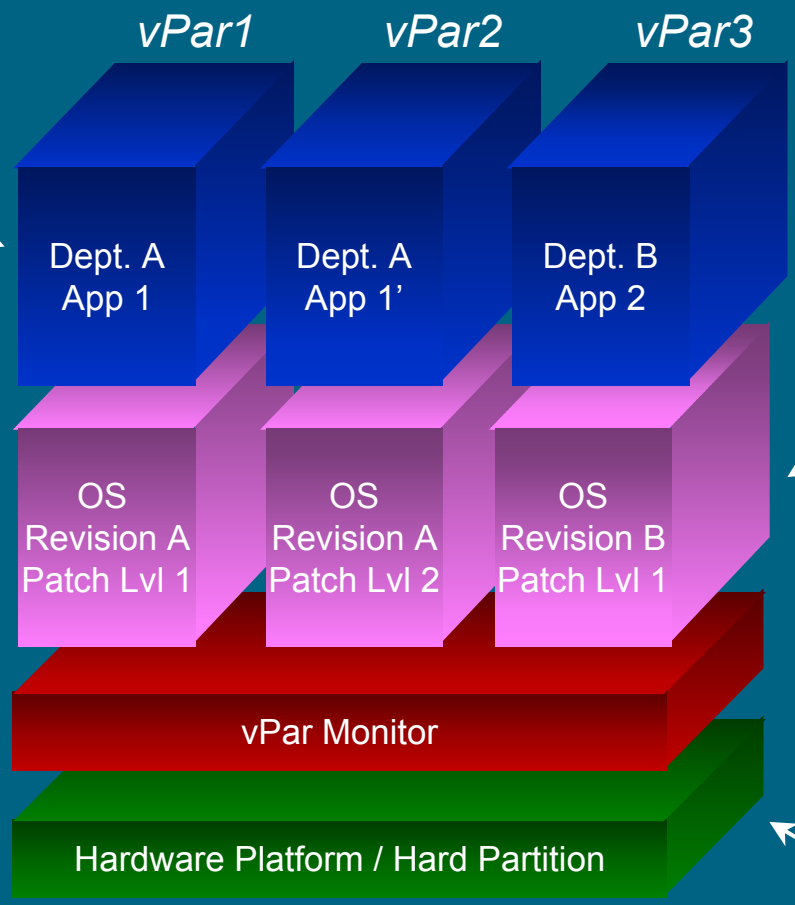



- ✓ New web interface
- ✓ Graphical “big picture” views of
  - nPars
  - Hardware in Complex
- ✓ Supports new OS/HW features
  - Cell local memory for HP-UX 11i v.2 partitions
  - Inter-partition security
- ✓ Remote admin of Superdome Madison complex
- ✓ Compatible with iCOD/Pay-Per-Use
- ✓ Increased integration with SCM 3.0
- ✓ Native on Windows (2H03)
- ✓ J2EE app runs in tomcat web server


Any HP 9000 System
vPar 1
vPar 2
vPar 3
Unused Components
Proc 0
Proc 1
Proc 2
Proc 3
Proc 4
Proc 5
Proc 6
Proc 7
Memory
I/O 0
I/O 2
I/O 4
I/O 6
I/O 8
I/O 10
I/O 1
I/O 3
I/O 5
I/O 7
I/O 9
I/O 11
"Virtual Partitions"
vPar 1 OS
vPar 2 OS
vPar 3 OS

# vPars logical overview
## Complete on HP-UX, evolving to Windows

- multiple applications or multiple instances or versions of the same application
- provides name space and resource isolation
- creates illusion of many separate hardware platforms
- manages shared physical resources
- monitors health of operating system instances



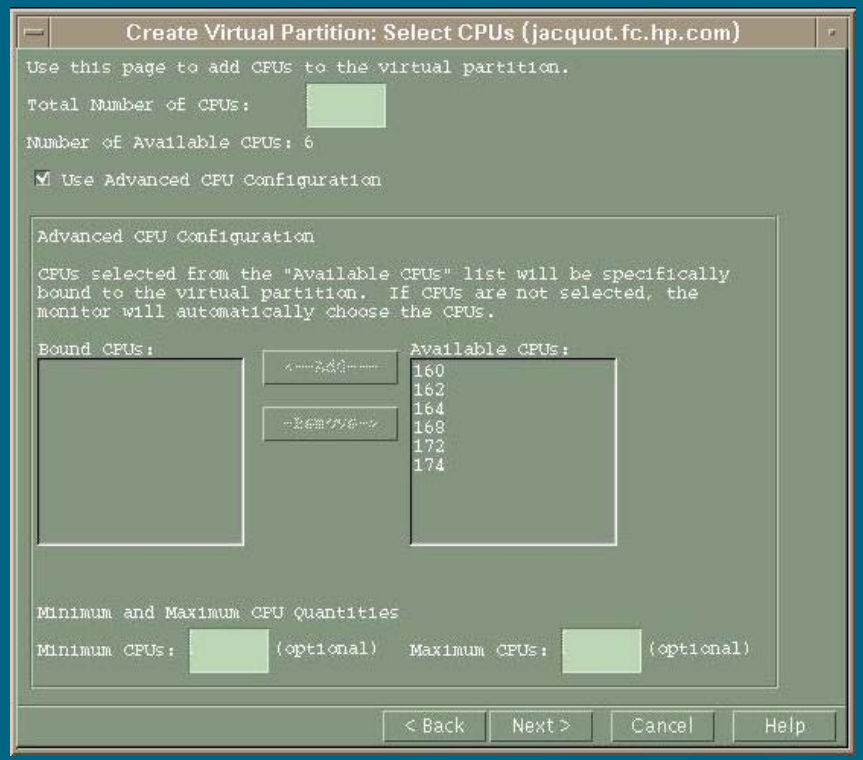

- each operating system instance tailored specifically for the application(s) it hosts
- operating systems instances are given a user-defined portion of the physical resources
- provides name space and resource isolation
- supported on cellular systems
- no additional platform support required

*note: command names subject to change*

# configuration & management commands

- *vparcreate* – create a new partition definition, with or without resources
- *vparremove* – destroy an existing partition definition
- *vparmodify*
  - add resources to an existing partition
  - remove resources from an existing partition
  - modify the attributes (e.g. boot path) of an existing partition
- *vparboot* – load and launch an operating system within an existing partition
- *vparreset* – stop/reset a partition
- *vparstatus*
  - display one or more partition definition(s) in human readable form
  - check the status of one or more partitions and/or the monitor

# virtual partition manager (vparmgr): GUI for managing virtual partitions




- Create, modify and delete virtual partitions (vpars)*
- Display assigned resources, attributes, and status of vpar
- Display vpar event log and samlog
- Boot and reset a vpar
- Direct invocation of task screens
- Preview create/modify vpar command lines prior to execution

✓*parmgr is vPar aware!*

*(it doesn't do vPars configuration at this point, but the 2 are planned to be integrated in the future)*

# *Pitney Bowes Server Consolidation Architecture*

## Superdome A

| | | |
|---|---|---|
| Cell 1 | | |
| Par 2 | BVAPPQ1 | BVDBQ1 |
| | | |
| | D3DBD4 | |
| Cell 2 | | SMKAPQ1 |
| Par 4 | BWD1 | |
| IOX | | COMDBP3 |
| | SFAD1 | COMDBD1 |
| Cell 4 | | BVVPARD1 |
| Par 1 | BVAPPD1 | INTRAD1 |
| | | EXTRAQ1 |
| | SINFAPD1 | WEBMD1 |
| Cell 6 | | |
| Par 6 | BWDBQ1 | CCDBQ1 |
| IOX | | |
| | | |

## Superdome B

| | | |
|---|---|---|
| Cell 0 | Cell 2 | DBP2 |
| Par 0 | Par 4 | HR Mgr WS |
| | | Novadigm,remedy |
| | | WEBMP2 |
| Cell 3 | Cell 3 | WNCAPP1 |
| Par 5 | Par 5 | |
| IOX | IOX | |
| | | WNCDBP1 |
| Cell 5 | Cell 4 | BWD |
| Par 3 | Par 1 | |
| | | |
| | | |
| Cell 7 | Cell 6 | |
| Par 7 | Par 2 | DWDBP1 |
| IOX | | |
| | | |

| | |
|---|---|
| | BWAPP1 |
| | |
| | |
| | |
| | CCDBT1 |
| | |
| | |
| | COMDBP2 |
| | |
| | |
| | ECDBP1 |

## Superdome C

| | | |
|---|---|---|
| Cell 0 | | |
| Par 0 | | |
| | | |
| | | |
| Cell 1 | | |
| Par 3 | | |
| | Crossba | |
| | Quad 0 | |
| Cell 5 | Crossba | |
| Par 1 | Quad 1 | |
| | | |
| | | |
| Cell 7 | | |
| Par 6 | | |
| IOX | | |
| | | |

| | | |
|---|---|---|
| Cell 2 | PBCDBP1 | |
| | | |
| | WEBMP1 | SINFAPP1 |
| | PBCDBD1 | |
| Cell 3 | | |
| Par 2 | ATSDBP1 | BWDBP2 |
| IOX | | |
| | | |
| Cell 4 | WNCAPQ1 | |
| Par 1 | | |
| | | |
| | WNCDBQ1 | CCDBP1 |
| Cell 6 | | |
| Par 3 | ATSDBP2 | |
| | | |
| | | |

| | |
|---|---|
| ICOD 750Mhz | Not Used |
| ICOD 550Mhz | VPAR |
| ServiceGuard | |

# JetBlue: Leveraging the best of HP ProLiant and Integrity to meet solution scalability needs

Maximum scale-out

Maximum scale-up

Several hundred ProLiant DL360, DL380,running entire domain infrastructure including: Firewall/VPN, load balancer, Antivirus, DNS DHCP, etc.

ProLiant DL580 servers running Content Management Server solution and several applications

Integrity rx5670 to consolidate multiple SQL databases

Evaluating Integrity Superdome for reservation system

Web & infrastructure front end

Enterprise applications and departmental data stores

Large-scale central data stores

# HP partitioning continuum
## Service level and cost control

| hard partitions with multiple nodes | hard partitions within a node | virtual partitions within a hard partition | | |
|---|---|---|---|---|
| HyperPlex | nPartitions | virtual partitions | Psets (Processor Sets) | PRM and WLM |
| – complete hardware and software isolation<br>– node granularity<br>– multiple OS images | – hardware isolation per cell<br>– complete software isolation<br>– cell granularity<br>– multiple OS images | – complete software isolation<br>– CPU granularity<br>– multiple OS images<br>– dynamic CPU migration | – dynamic creation<br>– ownership and access permissions<br>– PRM integration<br>– process binding | – dynamic resources<br>– automatic goal-based resource allocation via set SLOs<br>– share (%) granularity<br>– 1 OS image |

isolation
highest degree of separation

flexibility
highest degree of dynamic capabilities

# PRM on linux

- HP has modified the Linux scheduler to support loadable, dynamic "scheduling policies“. Work has been contributed to the Open Source community
- Allows a user to change the behavior of the CPU scheduler to meet specific needs of the workloads on the system
- HP is also delivering several policies that significantly enhance Linux for both uniprocessor and SMP systems:
  - Processor sets - create CPU groups and map apps to groups (open source)
  - A multiqueue scheduler  (open source)
  - A constant time scheduler (open source)
  - Fair Share Scheduling - the PRM product (not open source)

# New features in WLM

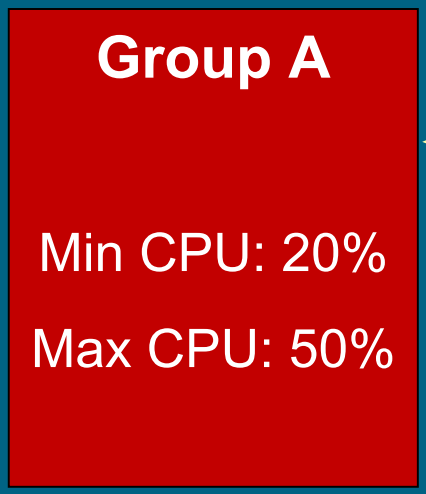
- **ServiceGuard integration –** HP-UX WLM can now detect when ServiceGuard packages are active on a system (such as when a failover occurs) and allocate resources accordingly.
- **Flexible capping –** HP-UX WLM now gives you even greater flexibility in managing unused CPU resources, by allowing selected users or applications to use the unused portion of CPU entitlements from other users and applications.
- **Application Response Measurement (ARM) Toolkit –** HP-UX WLM now supports the full compliment of GlancePlus Pak metrics making it easier than ever to manage application performance and meet SLOs.
- **Scripting interface –** HP-UX now provides a convenient interface for collecting metrics with shell scripts.
- **Integration with vPars, iCOD & Utility CPU's –** WLM can migrate CPU's between vPars, turn CPU's on/off and purchase CPU's online – all based on application demand and SLO requirements.
- **True net utilization reporting –** WLM can provide SMF- or CDR-equivalent utilization records (comma separate variable files) that can be directly imported into billing software – providing true utility computing to your end customers (Beta Jan 2003, Production May 2003).

# WLM Service Level Objectives

## SLO's use goals, constraints, and conditions.

**An SLO consists of:**

- **A workload (PRM group)**
- **Constraints (min, max cpu)**
- **A goal**
- **Priority**
- **Conditions (time of day, event, etc)**



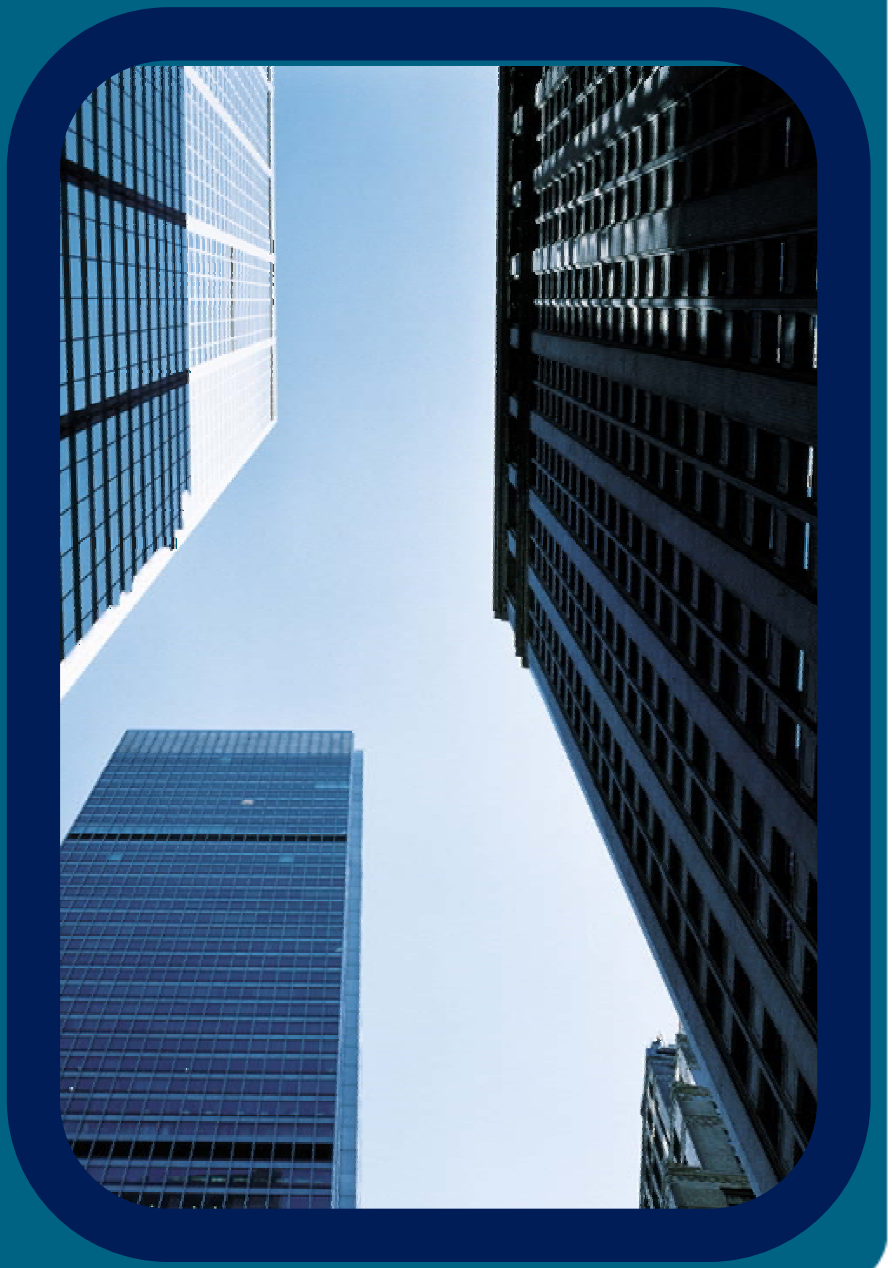

Group A receives 3 shares for each additional user.

Policy applies 9am to 5pm AND

when ServiceGuard Package XYZ

# WLM goal types

- Any of the following can be used to allocate resources to a workload:
  - resource utilization
    - CPU entitlement based on utilization of current entitlement
  - direct measurement of the performance of the workload
    - response time
    - throughput
  - measurement of load on application
    - number of users/processes
    - queue length



# Financial Services: Consolidating Oracle and WebLogic on Superdome using HP-UX WLM

Large Financial Services Company

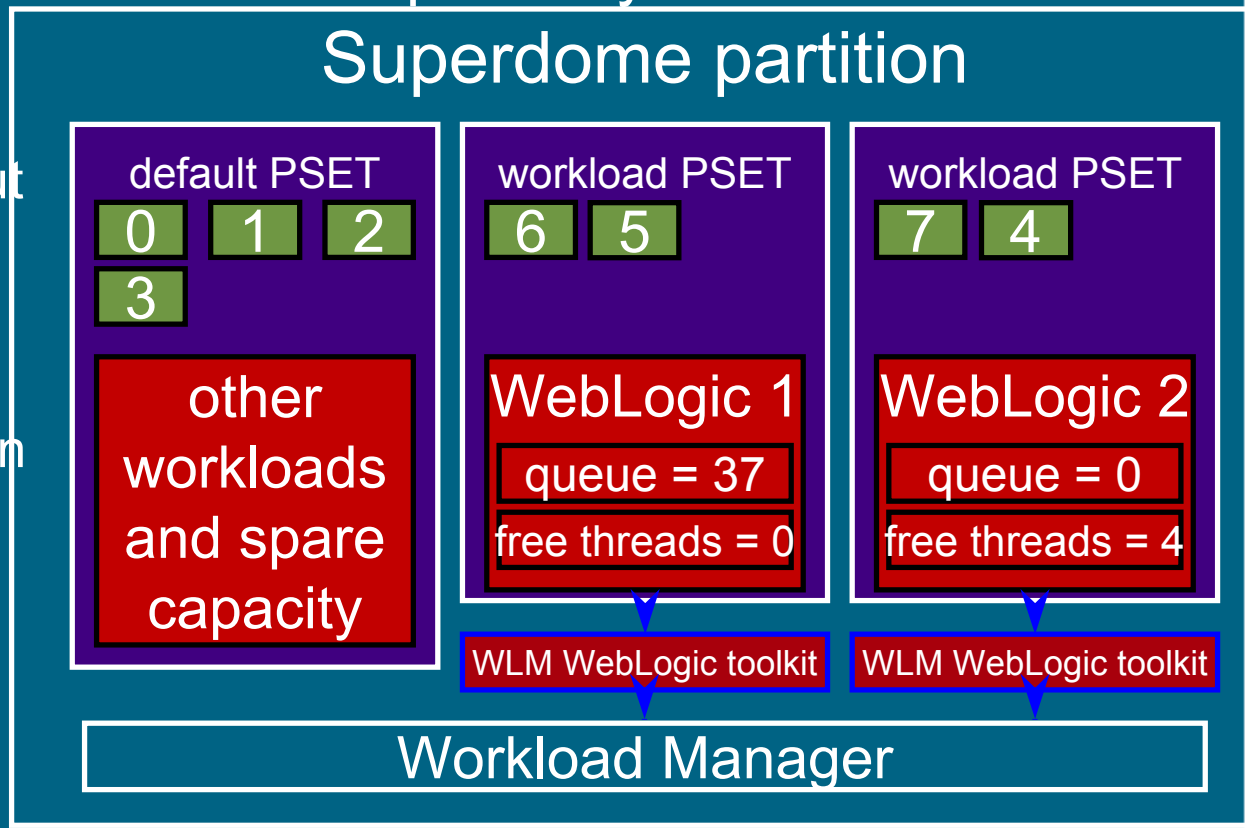
- 29,000 employees in 40 countries
- 82-year history
- Earned nearly $1.8 billion in 2001

The challenge

- incremental TCO benefits for HP Superdomes beyond hard partitioning
- improve system utilization

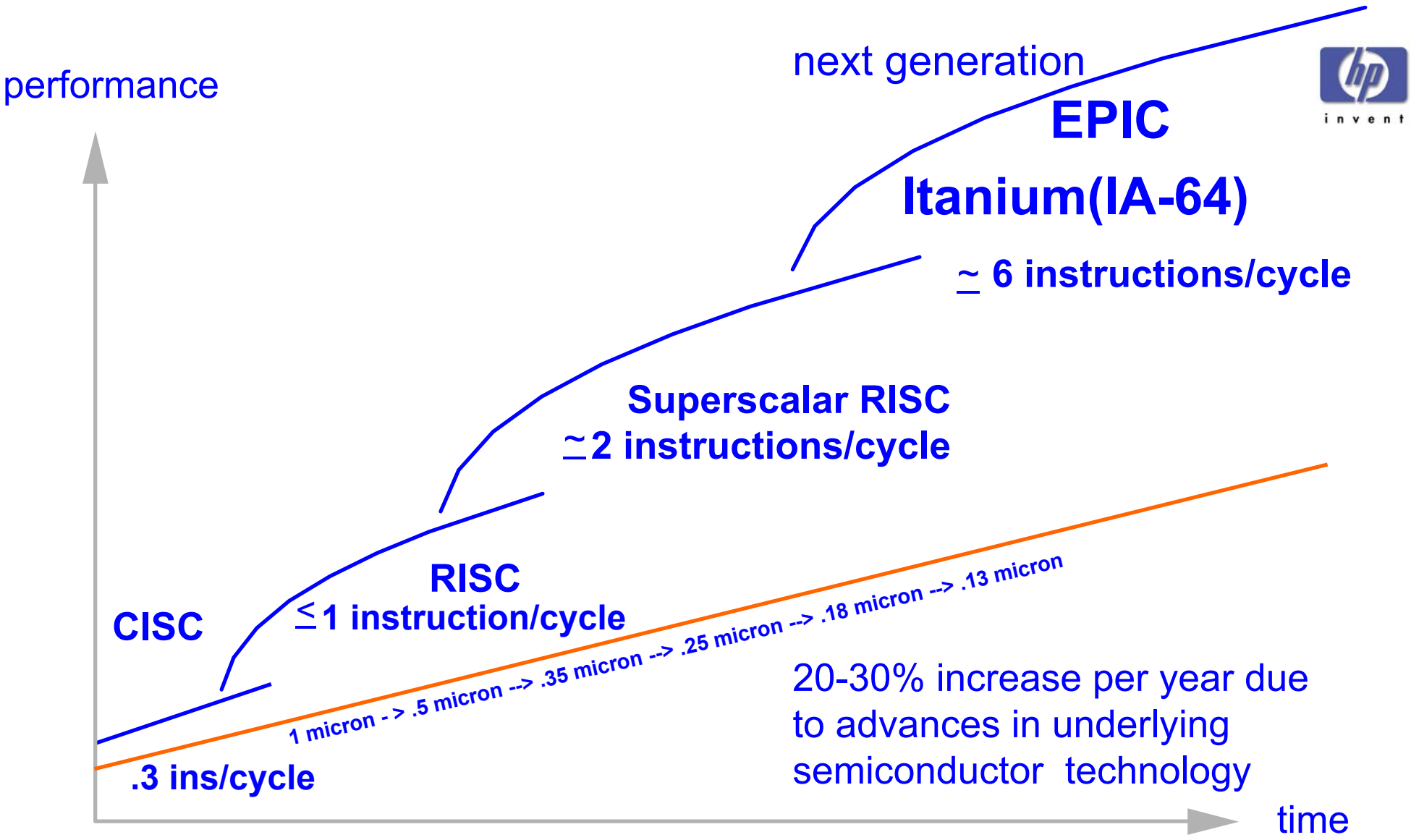
The solution

- Processor Sets (pSets) provide the optimal performance and throughput for WebLogic-based applications
- Current queue length and the number of idle threads in the associated thread pool are used as performance metrics for Workload Manager
- Workload Manager will dynamically resize processor




# HP's Itanium Strategy

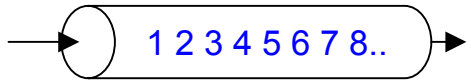
# processor evolution



# CPU architectures

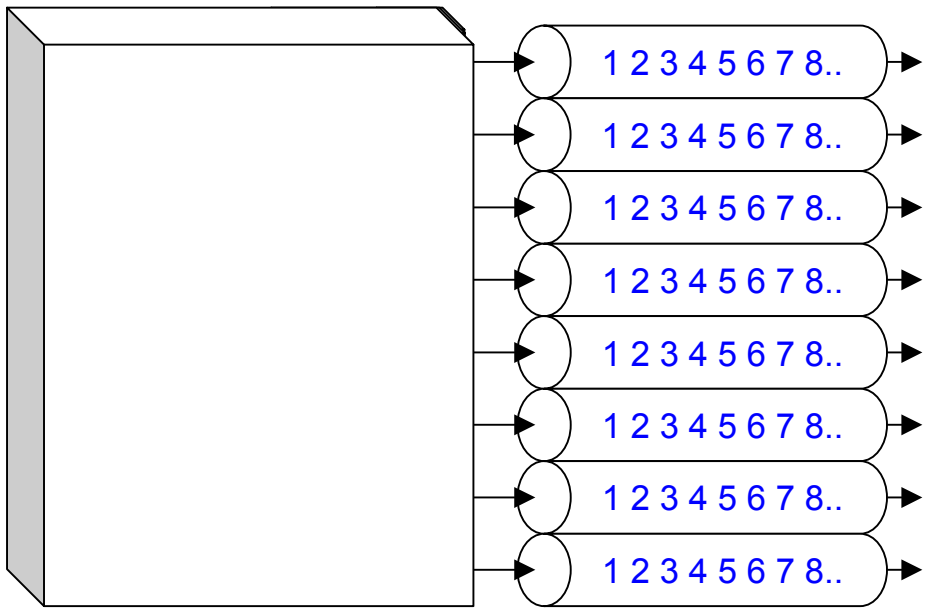
**RISC** (reduced instruction set computing)

- Pipeline stages run in parallel




**Superscalar RISC**

- Multiple parallel pipelines
- Hardware schedules instructions and evaluates potential conflicts
- code parallelisation at runtime

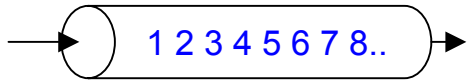



**Scheduler area grows as the square of the number of pipelines**

# CPU architectures

**RISC** (reduced instruction set computing)

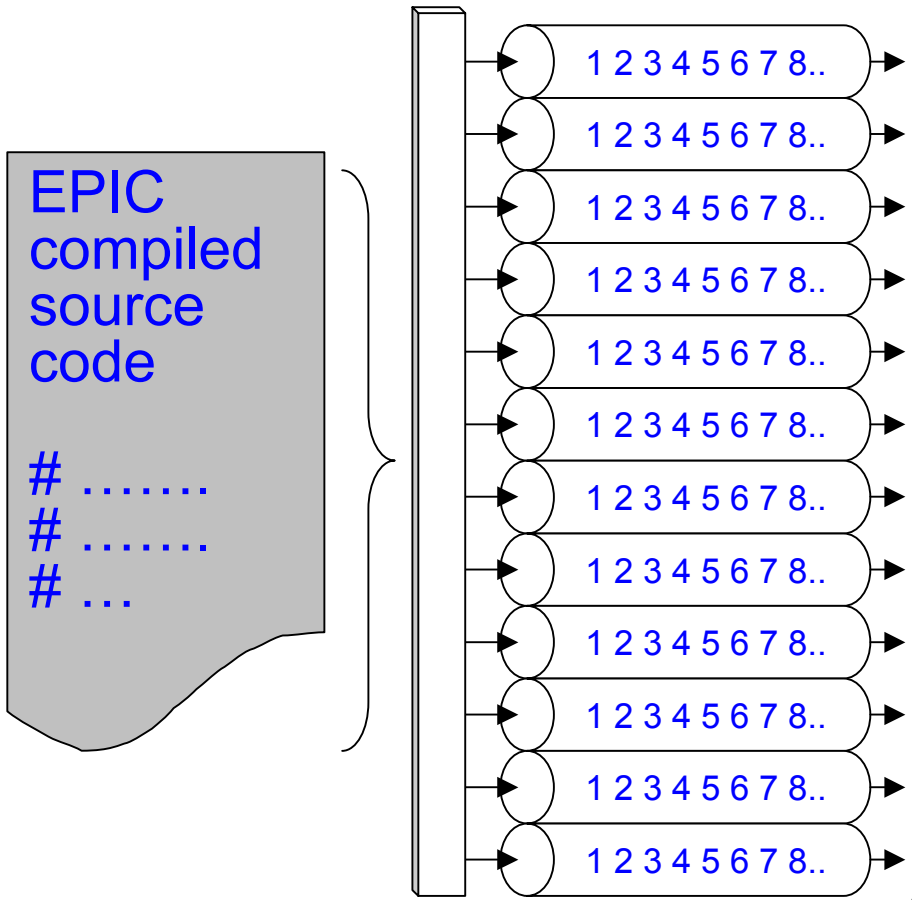
- Pipeline stages run in parallel



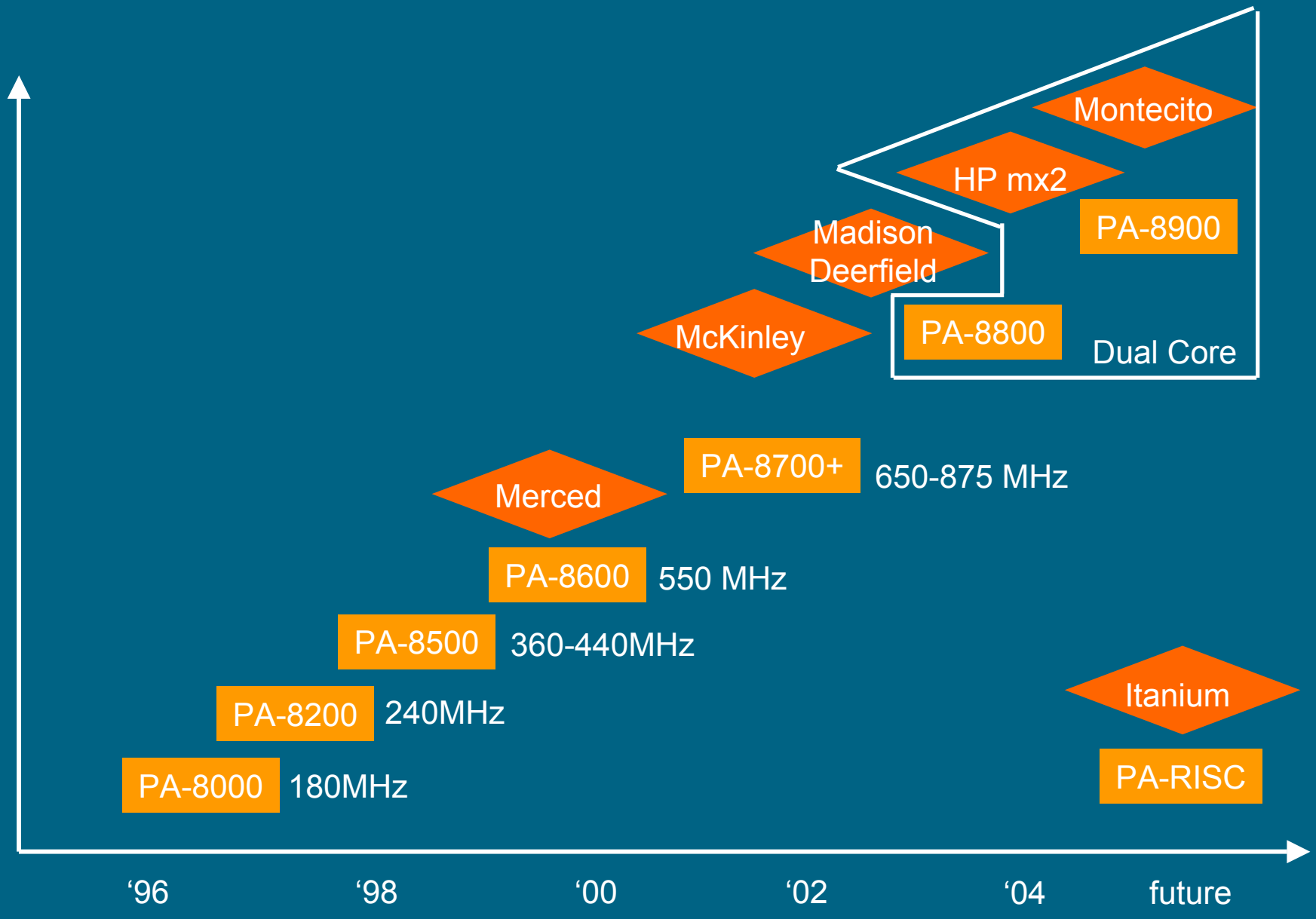

## EPIC

**(explicit parallel instruction comp.)**

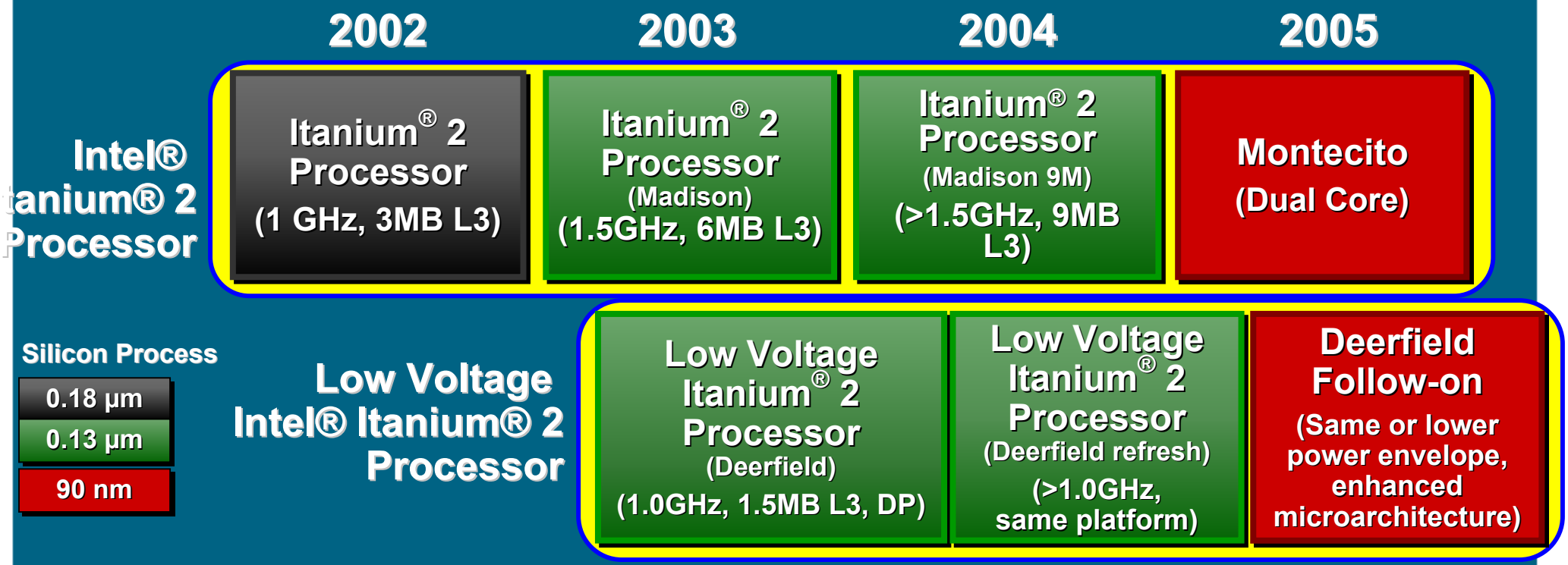
- Compiler schedules instructions and guarantees independence
- very large number of parallel pipelines possible
- code parallelisation at compiling



# Microprocessor Roadmap
# PA-RISC and Itanium



# Itanium® Processor Family Roadmap

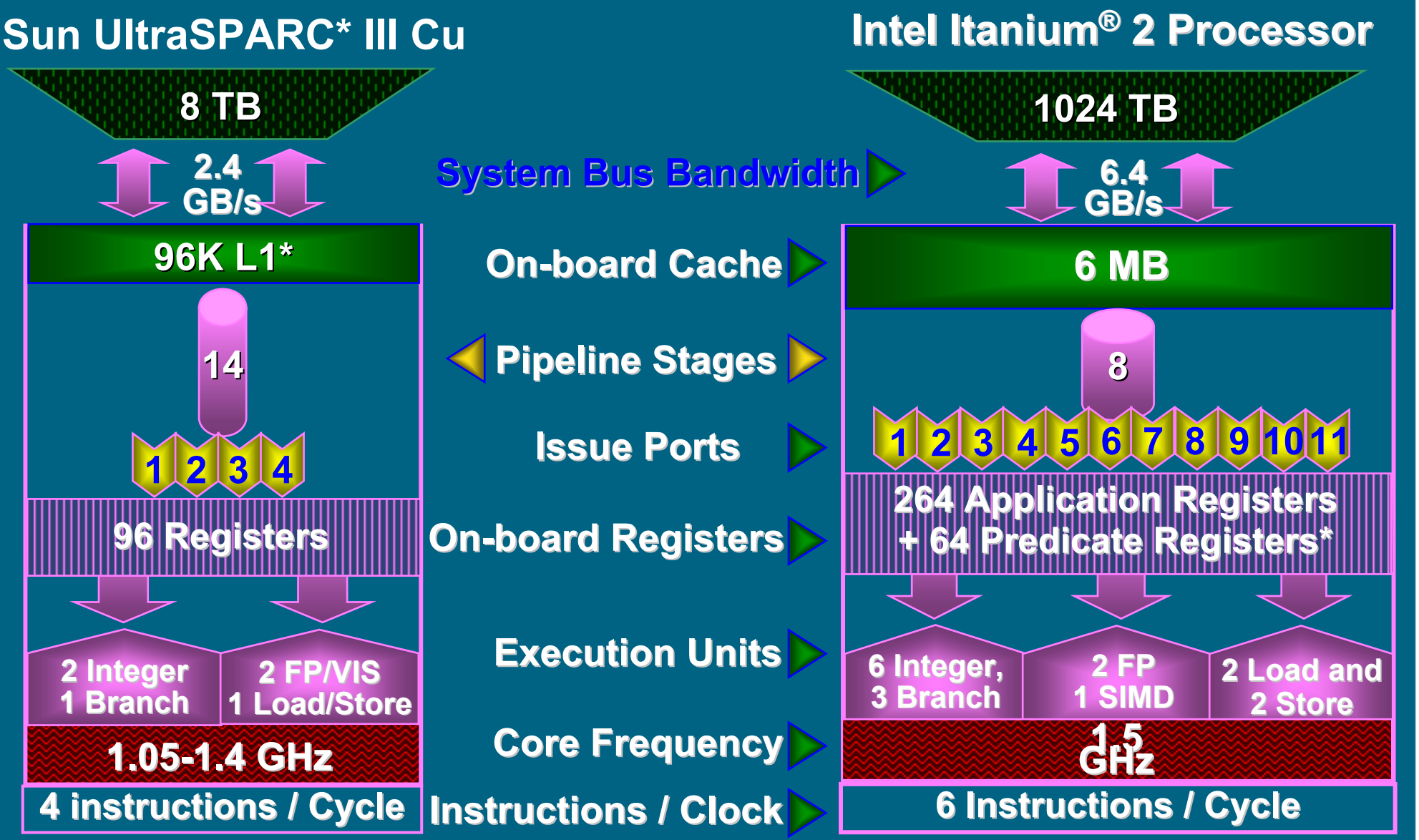



- Next Itanium® 2 processor (Madison) on track for production in June-July
- New Low Voltage Itanium® 2 processor (Deerfield) follows in 2H'03
- Itanium® 2 platform maintains same socket, bus and software compatibility
- Intel will enhance Itanium® 2 processors (Madison and Deerfield) in 2004
- Montecito processor will enable dual-core technology and enhanced microarchitecture in 2005

All dates specified are target dates, are provided for planning purposes only and are subject to change.

***Roadmap maintains world class performance***

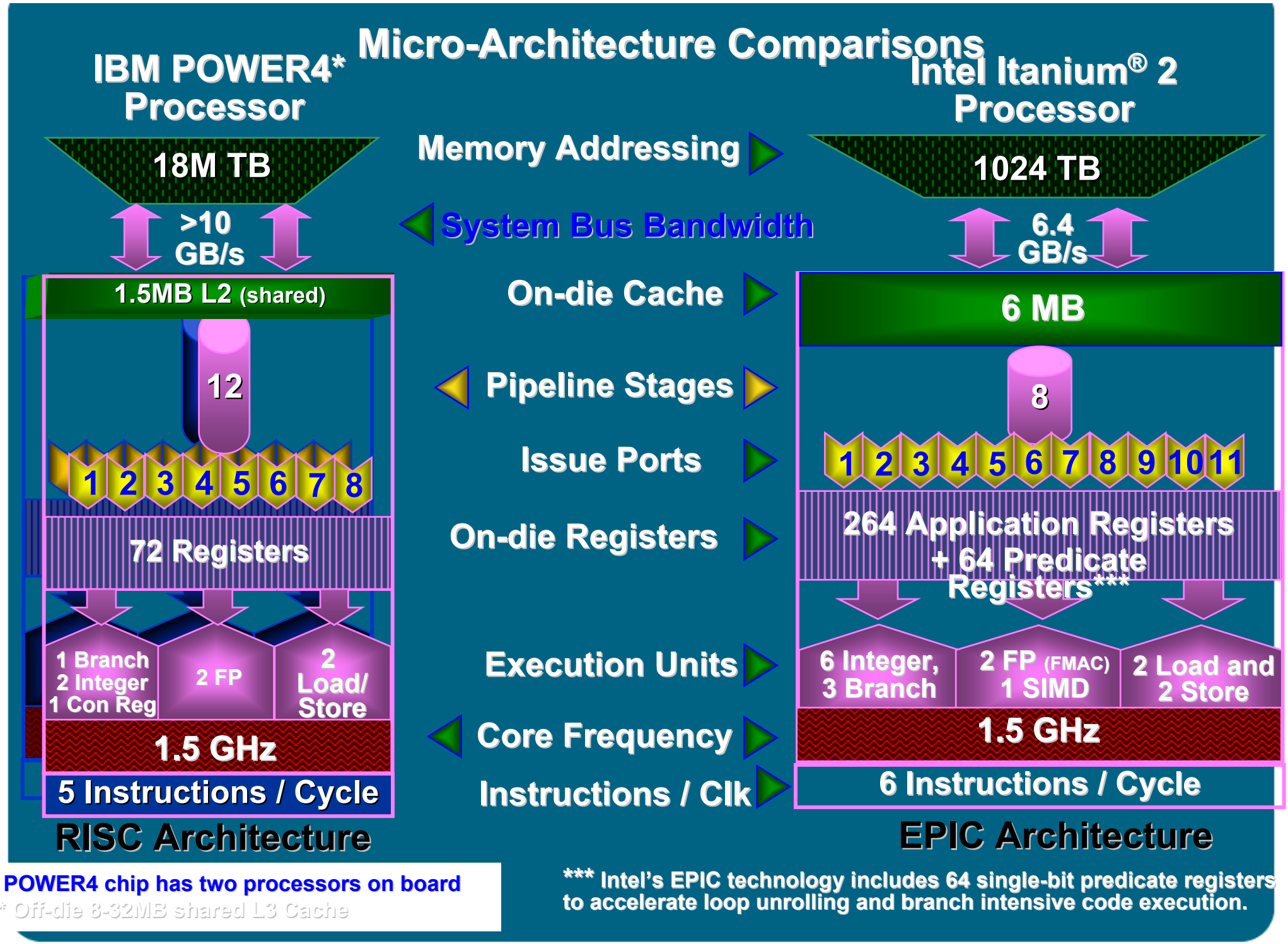
# Micro-Architecture Comparisons




* Intel's EPIC technology includes 64 single-bit predicate registers to accelerate loop unrolling and branch intensive code execution.

*CPU connects to external 8 MB L2 cache

# Micro-Architecture Comparisons

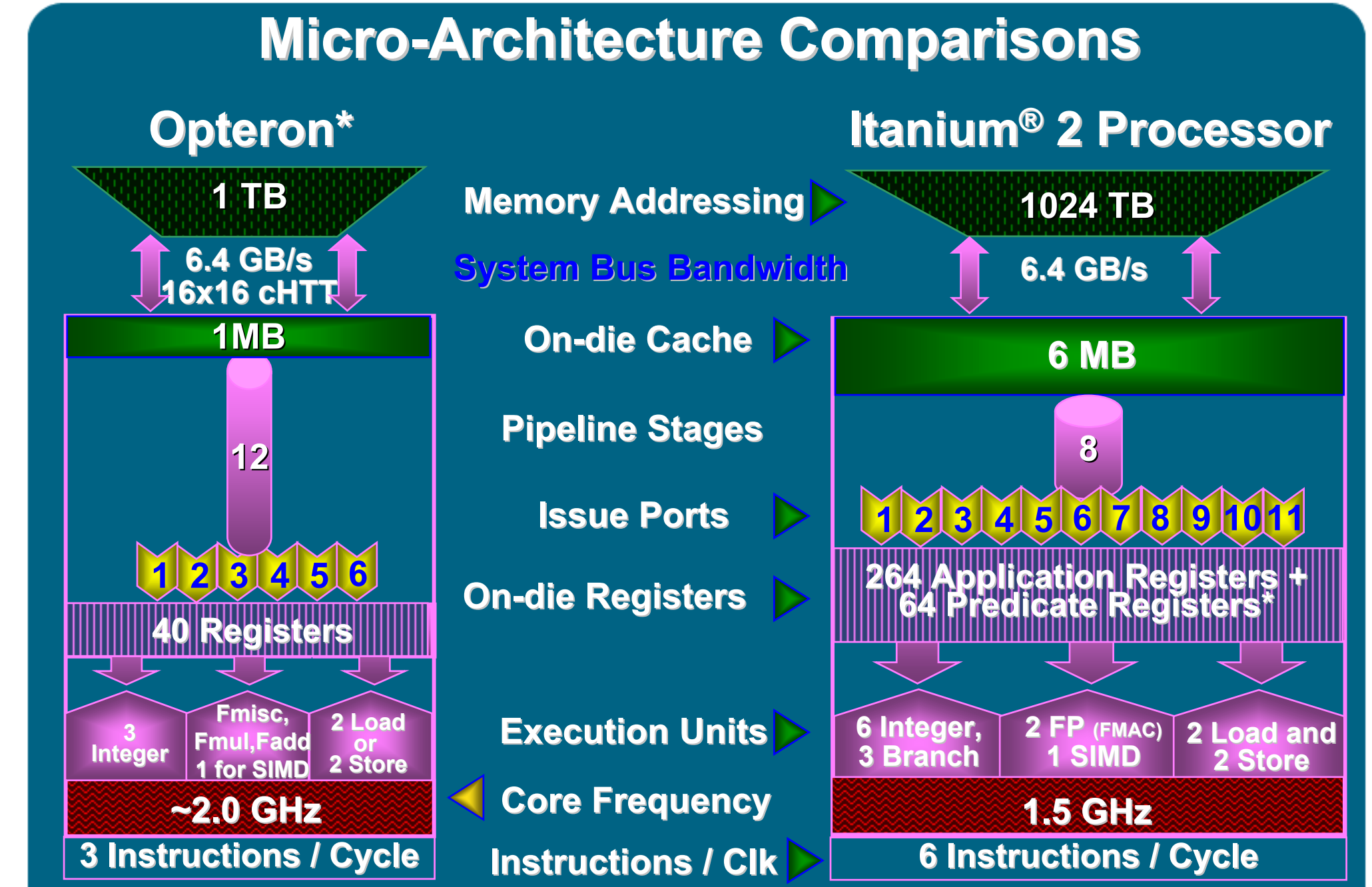



* POWER4 chip has two processors on board

** Off-die 8-32MB shared L3 Cache

*** Intel's EPIC technology includes 64 single-bit predicate registers to accelerate loop unrolling and branch intensive code execution.

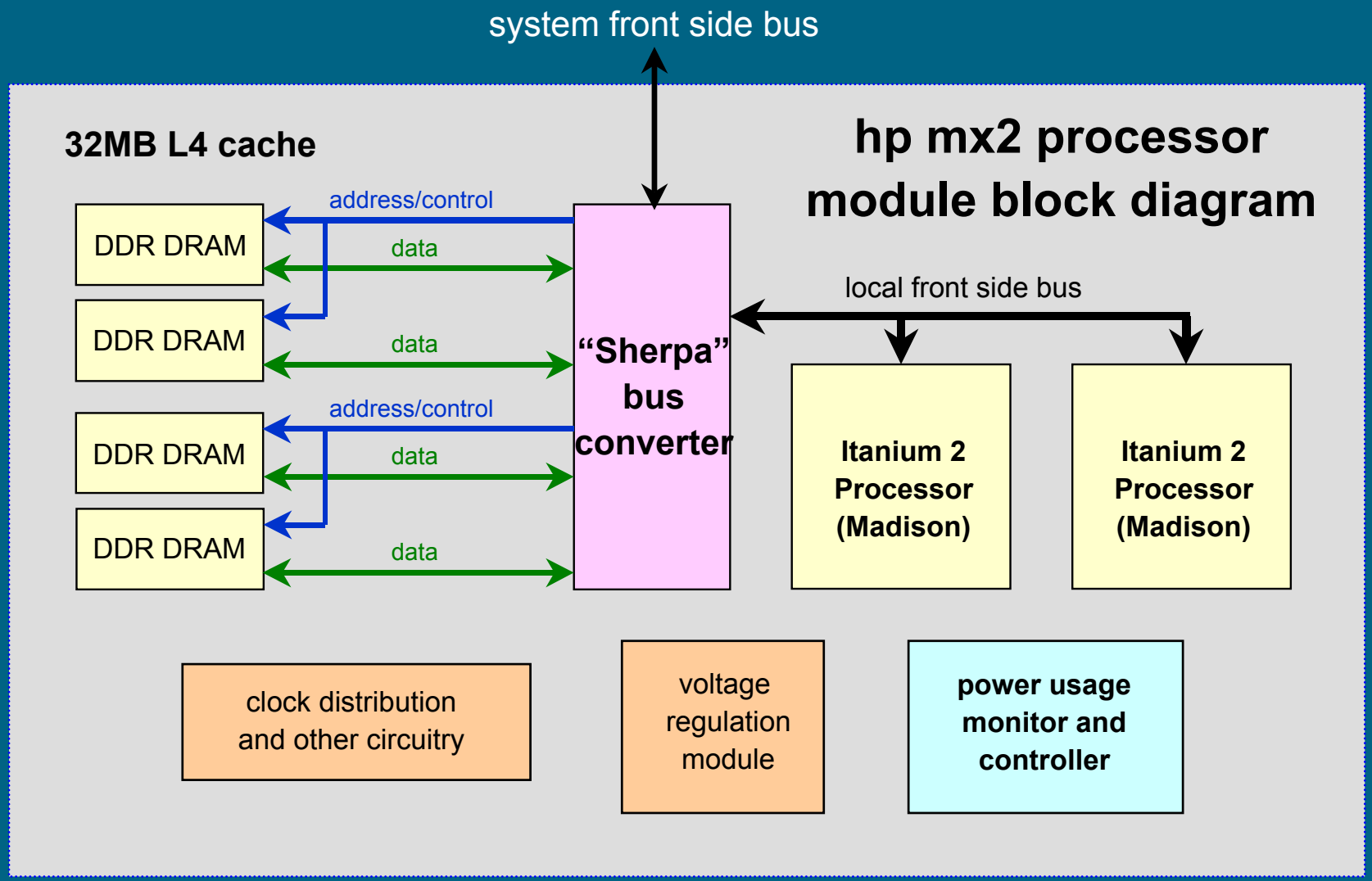
# Micro-Architecture Comparisons




* Intel's EPIC technology includes 64 single-bit predicate registers to accelerate loop unrolling and branch intensive code execution.

# mx2: multi-processor module architecture

Enables doubling of processors without doubling of bus load per socket



# HP Integrity servers offer unprecedented and sustained performance leadership

Across diverse workloads

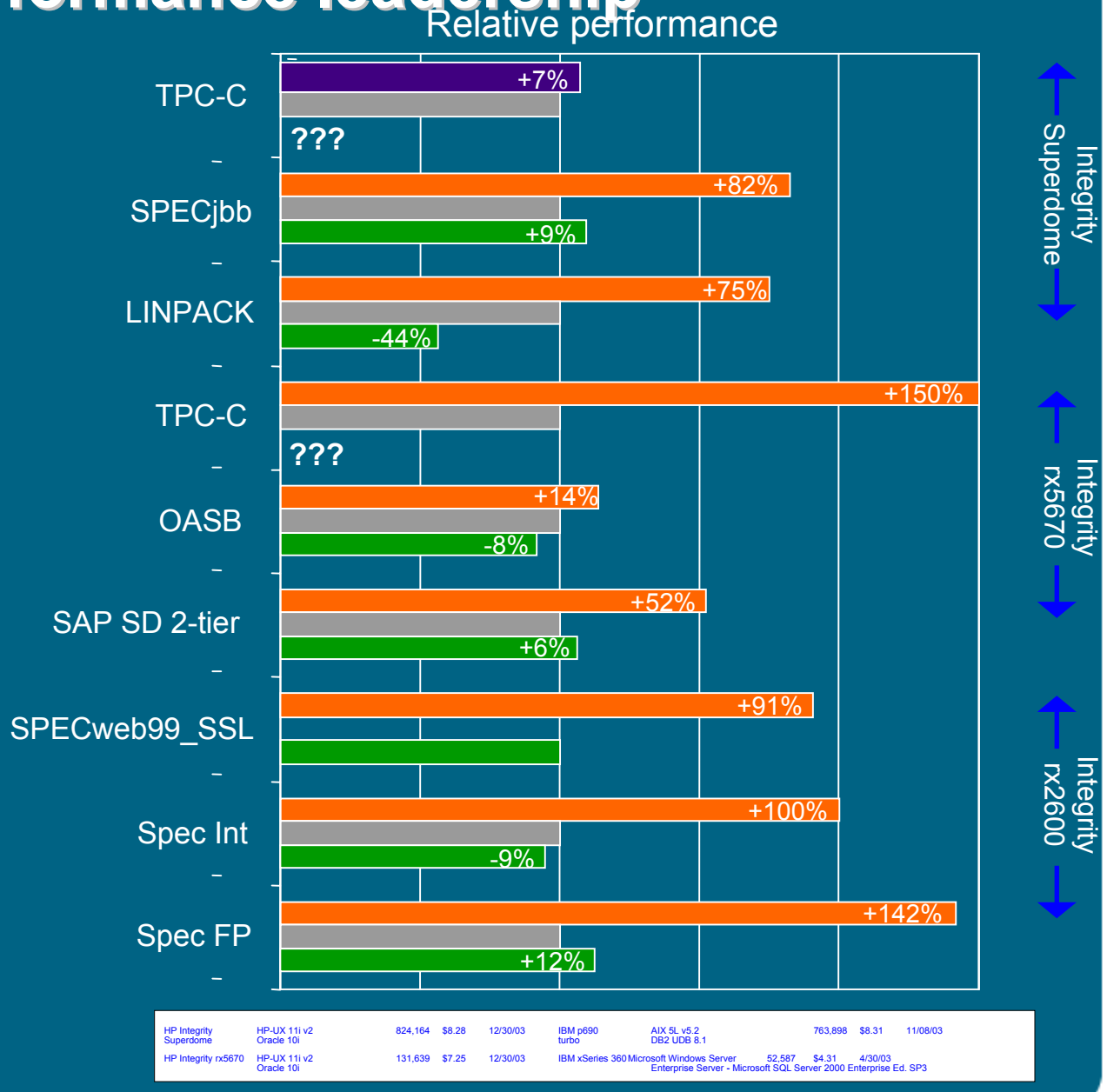
(TPC, SAP, Java, Oracle apps, SPEC CPU, and SPECweb99_SSL)

Across multiple operating systems

(HP-UX 11i v2, Linux, Microsoft Windows)

Across multiple servers

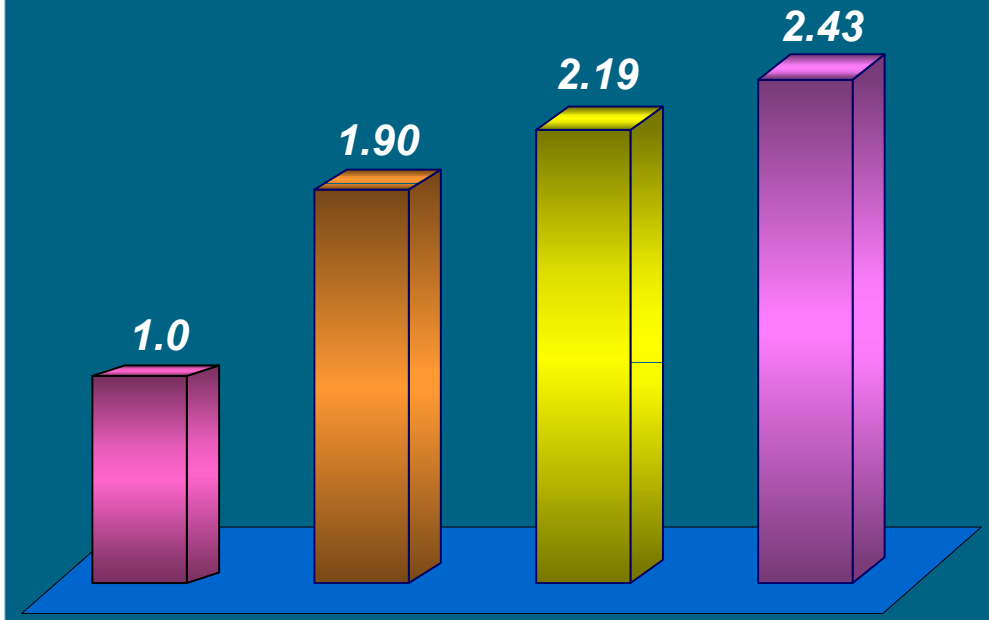
(Superdome, rx5670, and rx2600)



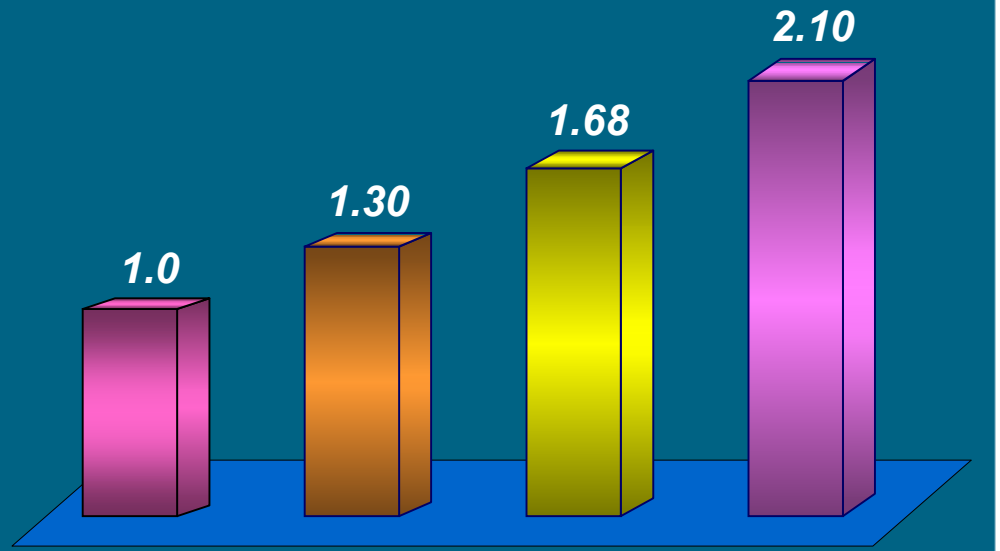

HP IBM Sun

# Outstanding Performance from New Intel® Itanium® 2 Processors

## Floating Point Performance
SPECfp_base2000




## Integer Performance
SPECint_base2000



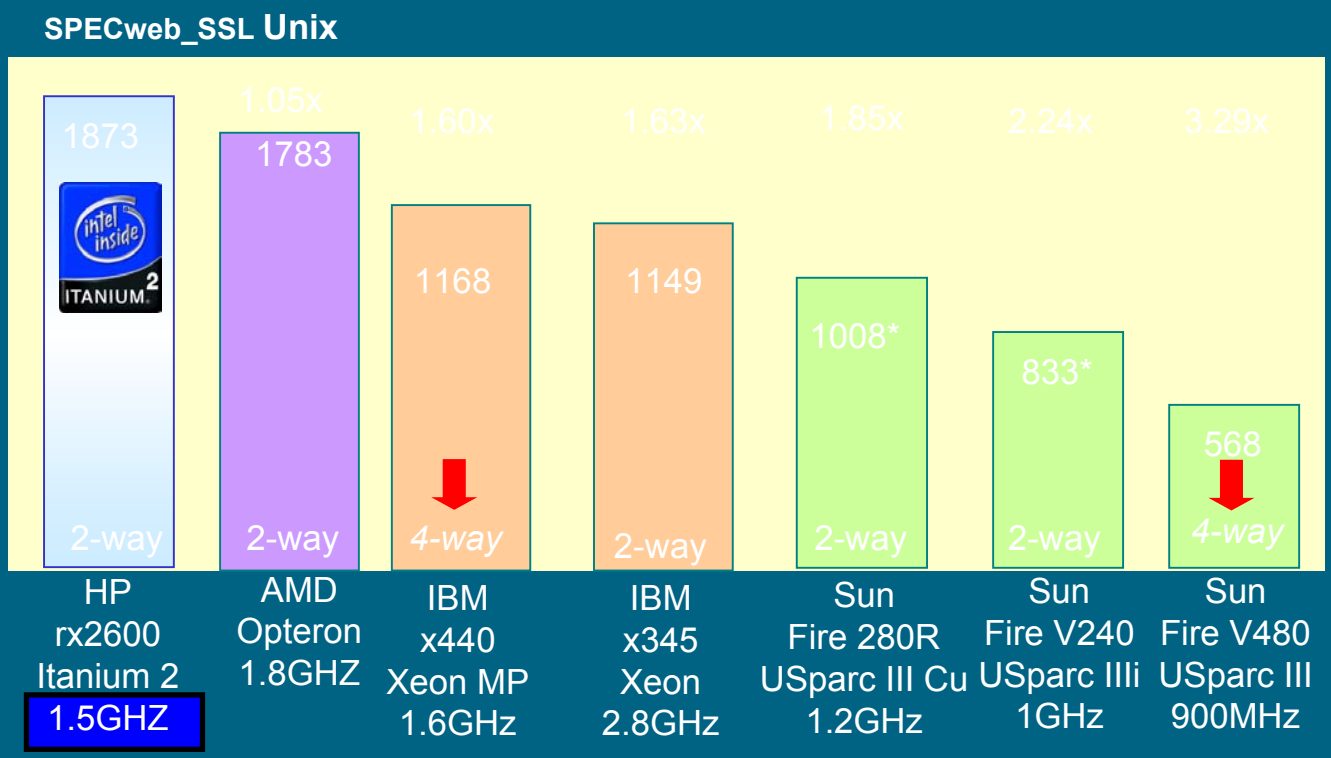

Sources: Sun – www.spec.org; Intel – Intel estimate (12/06 Munce)

***Deerfield significantly outperforms Sun in both floating point and integer performance***

# 2-way SLL encryption comparison

## #1 2-way for encryption/decryption

HP Server rx2600 with next generation Itanium 2 processors tops all other 2-way servers for SSL performance




*Sun result achieved through use of dedicated crypto accelerators

# “Pinnacles” generation superdome cell

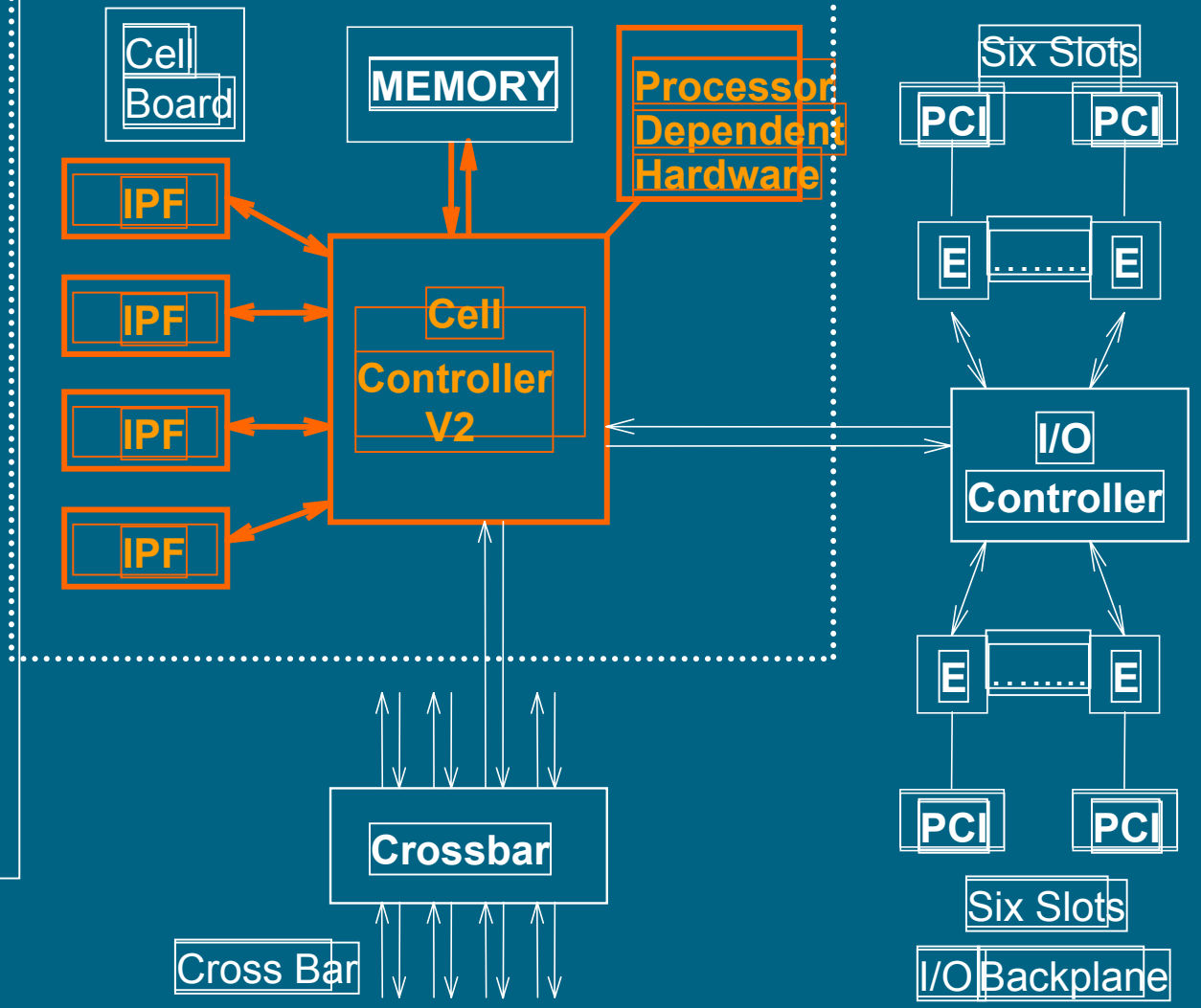
Supports PA 8800, 8900, and all Itanium® CPUs

Cell controller, cell board, and CPUs change (orange)

Memory DIMMS, I/O connection, and crossbar connection remain the same

All other system infrastructure (frame, backplane, I/O chassis, etc.) is preserved

Optional PCI-X I/O slots can also be used



# HP Itanium® 2-based systems for superior application performance

| | typical IA-32 system | typical RISC system | Itanium®2-based hp system | benefits: |
|---|---|---|---|---|
| CPU bus bandwidth | 1-3 GB/s | 2-4 GB/s | 6.4 GB/s | → faster OLTP |
| I/O bandwidth | 1 GB/s | 2 GB/s | 4 GB/s | → quicker web serving |
| on-chip resources | 8 general registers | 32 general registers | 128 general registers | → faster secure transactions |
| parallel execution | 1 instruction per cycle | 2-4 instructions per cycle | 6 instructions per cycle | → better decision support performance |

- leveraged hp & Intel expertise
- secure dedicated resources
- higher quality solutions
- lower cost
- faster time to market

hp invent solution center intel

# hp/Intel® Itanium® architecture solution centers

## an expansion of the hp/intel solution center world-wide initiative

- demonstrate the viability of Itanium-based solutions for enterprise customers in a multi-OS environment
- enable customer 'proof of concepts', ISV software validation, and SI support
- develop value-added customer solutions
- funded & staffed by hp and Intel
- the ideal combination of expertise, equipment, and environment in which to invent

# Making multi-operating systems work

HP-UX 11i

Non-Stop Kernel

OpenVMS

Microsoft Windows

**We are investing in**

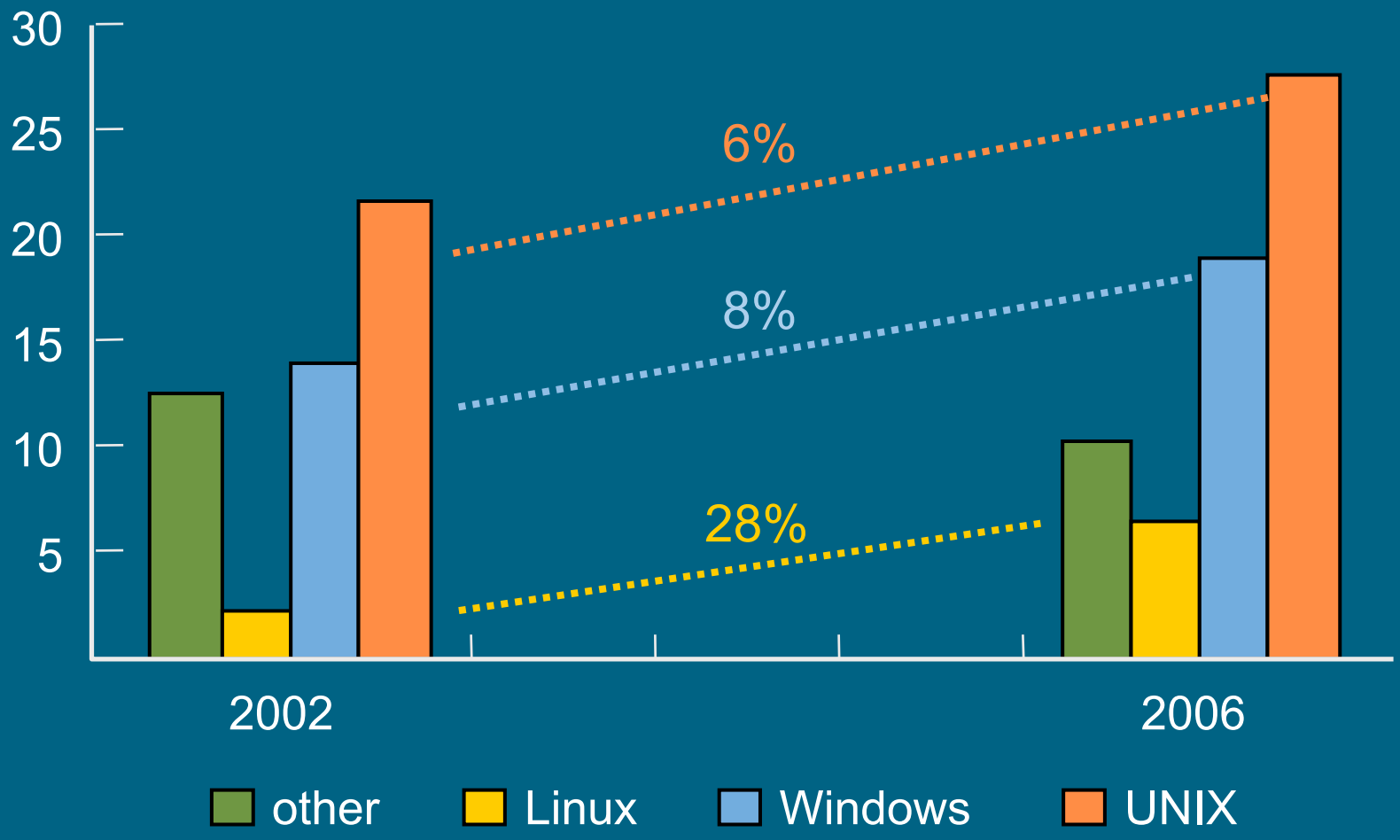
- HP-UX
  - Incorporate the best of Tru64 UNIX functionality into HP-UX
- Windows®
  - Lead the migration to .NET®
- Linux
  - Contribute IP to Linux community
- OpenVMS
- Non-Stop Kernel

**Multi-OS capabilities**

- IT virtualization technologies
- Security
  - Single sign-on
- High-availability
- Common management
  - One system management environment

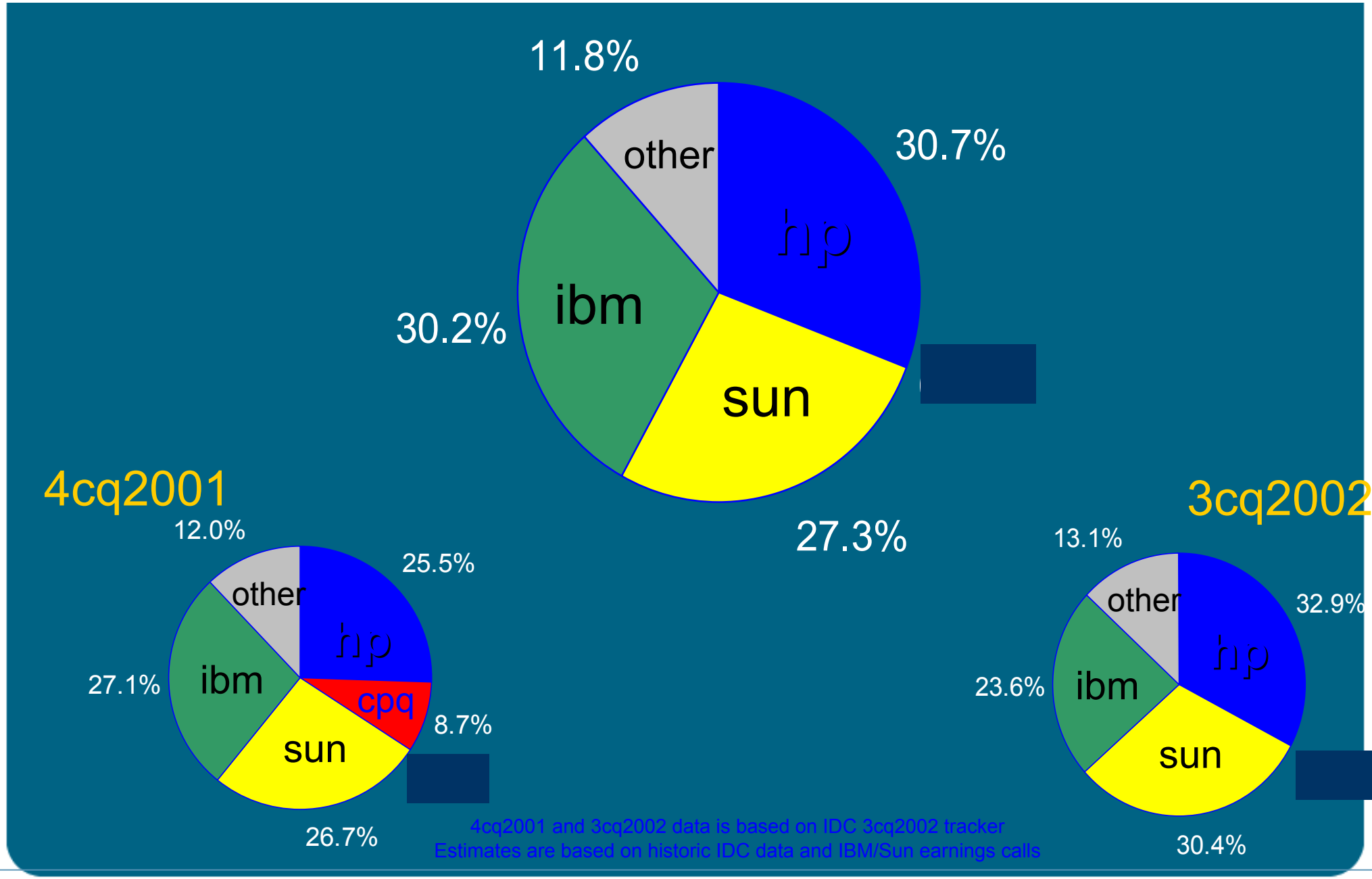

# HP-UX Update

# UNIX—a long term growth business for HP




source: IDC Server Tracker, Fall 2002

# worldwide unix server factory revenue
## total unix q4 cy2002 *estimate*



# hp-ux 11i operating environments

## hp-ux 11i mission critical operating environment

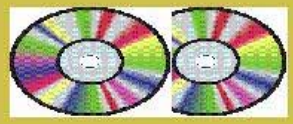
### hp-ux11i enterprise operating environment

#### HP-UX 11i Operating Environment

- hp-ux os
- network drivers
- web QoS peak
- apache w/s
- ignite/ux
- java RTE
- java JDK
- java JPI
- cifs client
- cifs server
- servicecontrol manager
- system configuration repository
- software distributor/ux
- netscape LDAPserver
- pam keberos
- ems framework
- netscape communicator

- online jfs 3.3
- mirror disk/UX
- process resource manager (PRM)
- glance plus
- openView performance agent
- single-system event and availability management
- event monitoring services (EMS) HA Monitors

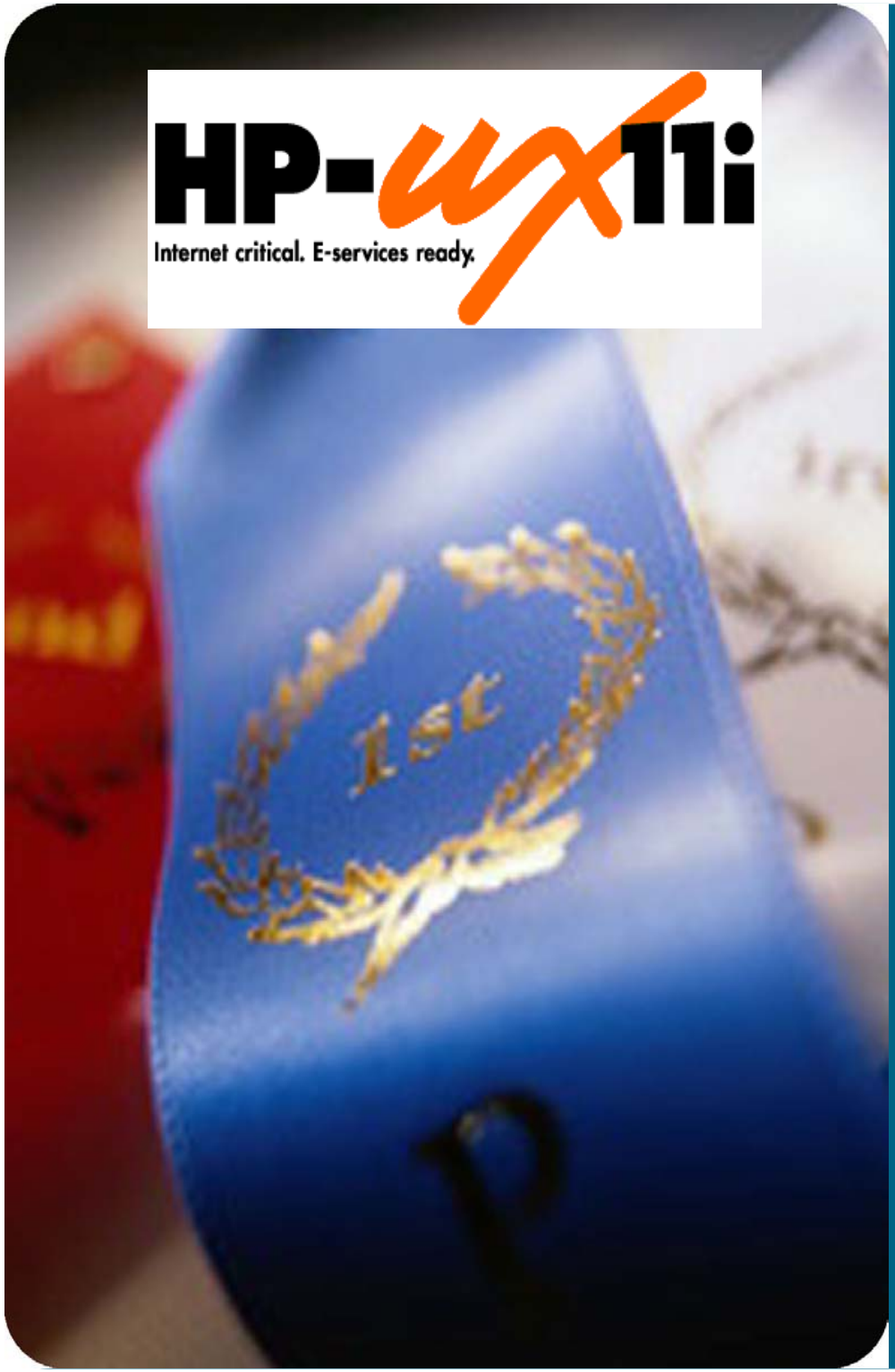
- MC/ServiceGuard
- HP-UX Workload Manager
- ServiceGuard NFS Toolkit
- Enterprise Cluster Management (ECM) Toolkit



## delivering values

- robust
- Integrated stack
- ease of mgmt.
  - installation
  - upgrades
  - support
  - global media
- no codewords
- simplified license management

★Install time reduced by 50%




D.H. BROWN ASSOCIATES, INC.

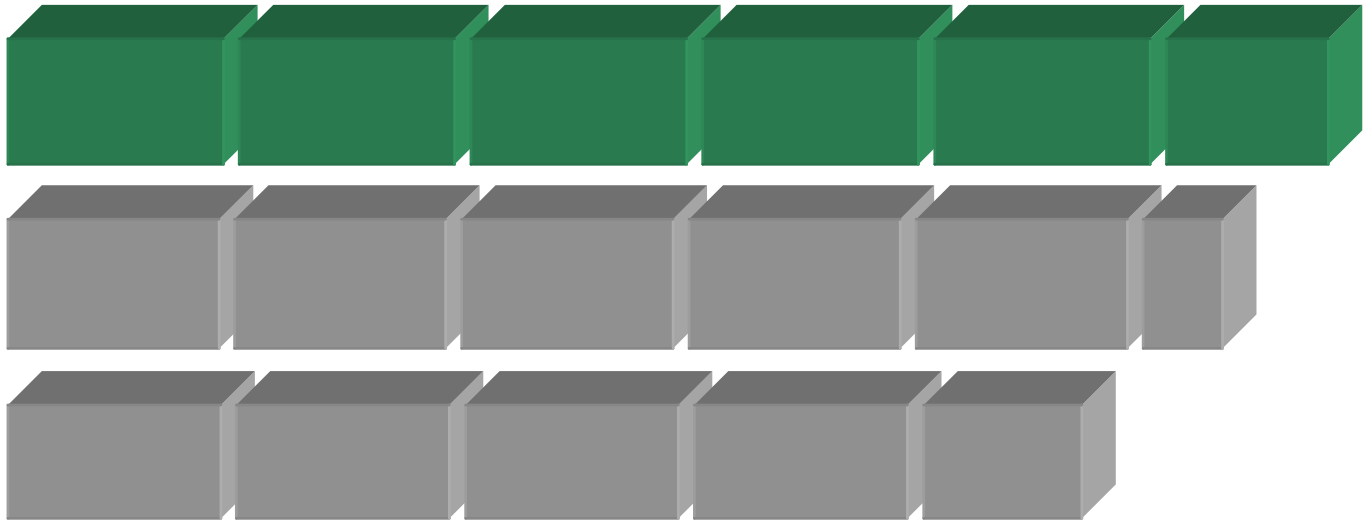
# 2002 UNIX function review

ranked #1 in all five categories:

- #1 scalability
- #1 reliability, availability and serviceability
- #1 systems management
- #1 internet and web application services
- #1 directory and security services

# hp-ux 11i: the #1 unix

DH Brown 2002 Unix Function Review




- #1in all 5 categories: (First time for any OS)
  - scalability
  - reliability, availability and serviceability
  - systems management
  - internet and web application services
  - directory and security services

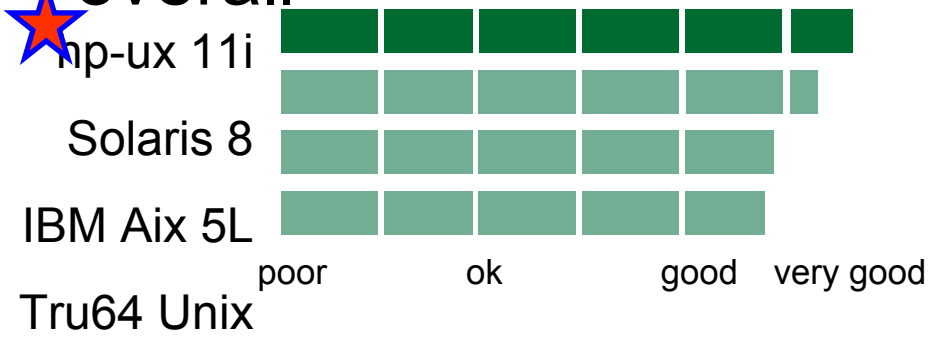
D.H. BROWN ASSOCIATES, INC.

overall ranking (160+ functions)

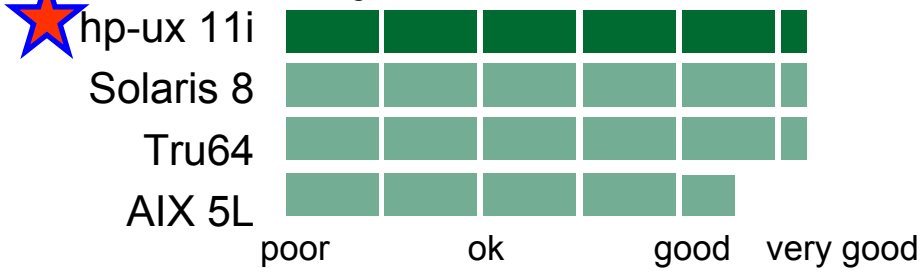
# D.H. Brown 2002 unix function review ratings summary

hp-ux #1 overall - hp-ux #1 in all categories - hp-ux clearly ahead of AIX and Solaris

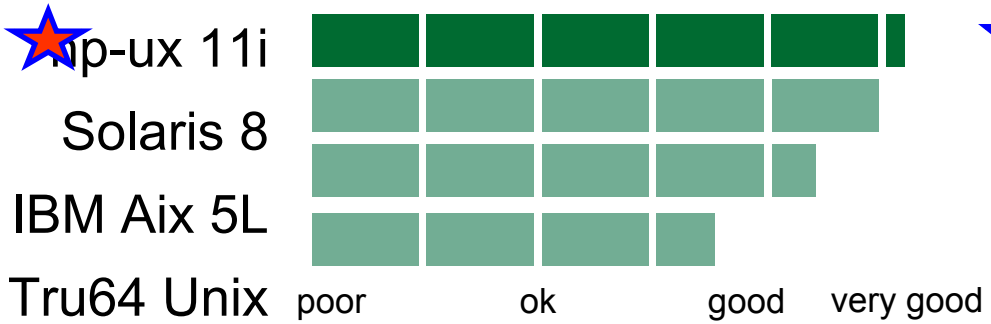
## overall



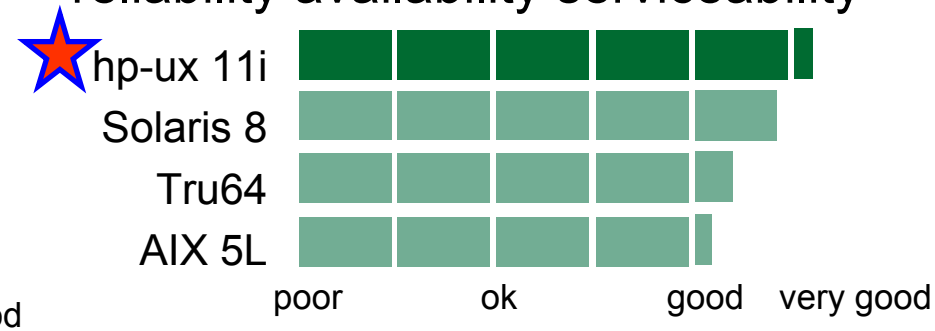

## scalability



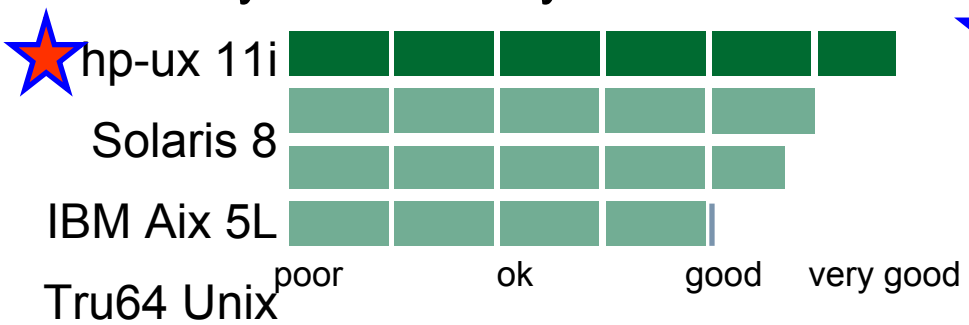

## internet and web application services



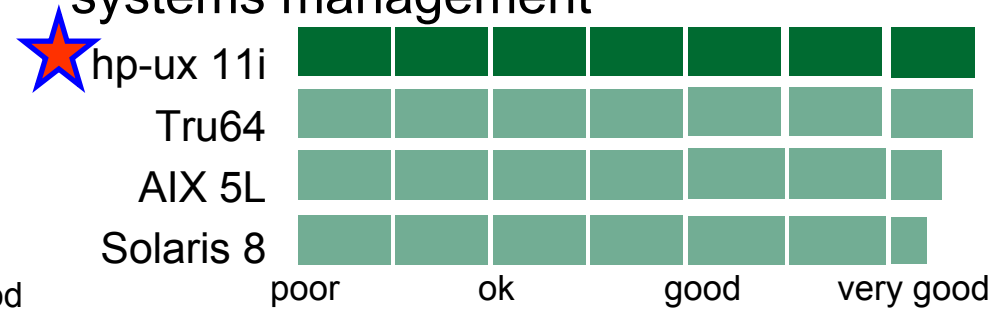

## reliability availability serviceability



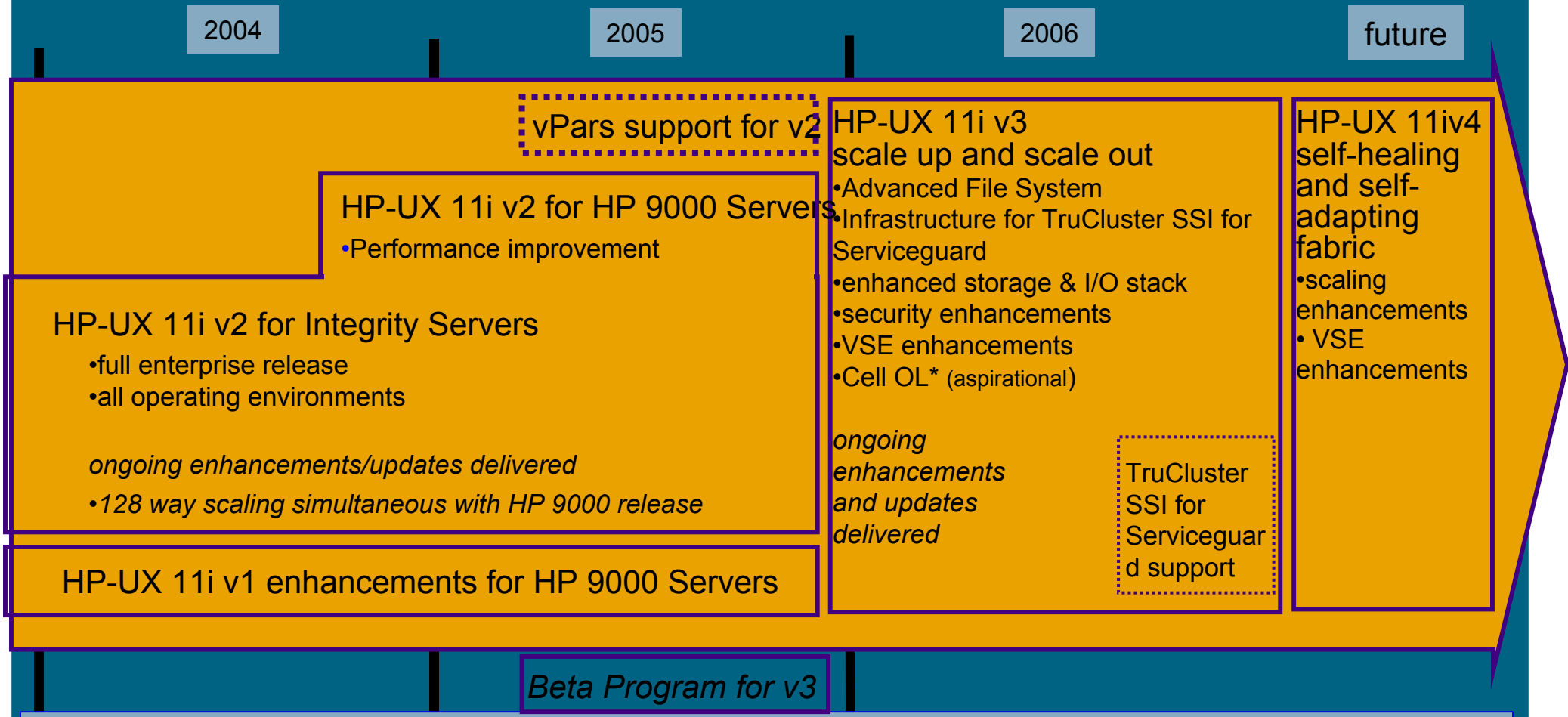

## directory and security




## systems management



# HP-UX 11i Roadmap:
# The UNIX® Foundation of the Adaptive Enterprise




HP-UX 11i is your operating environment for IT enterprise virtualization – flexibility is key

HP-UX 11i v2: full ecosystem accelerated making it the version of choice

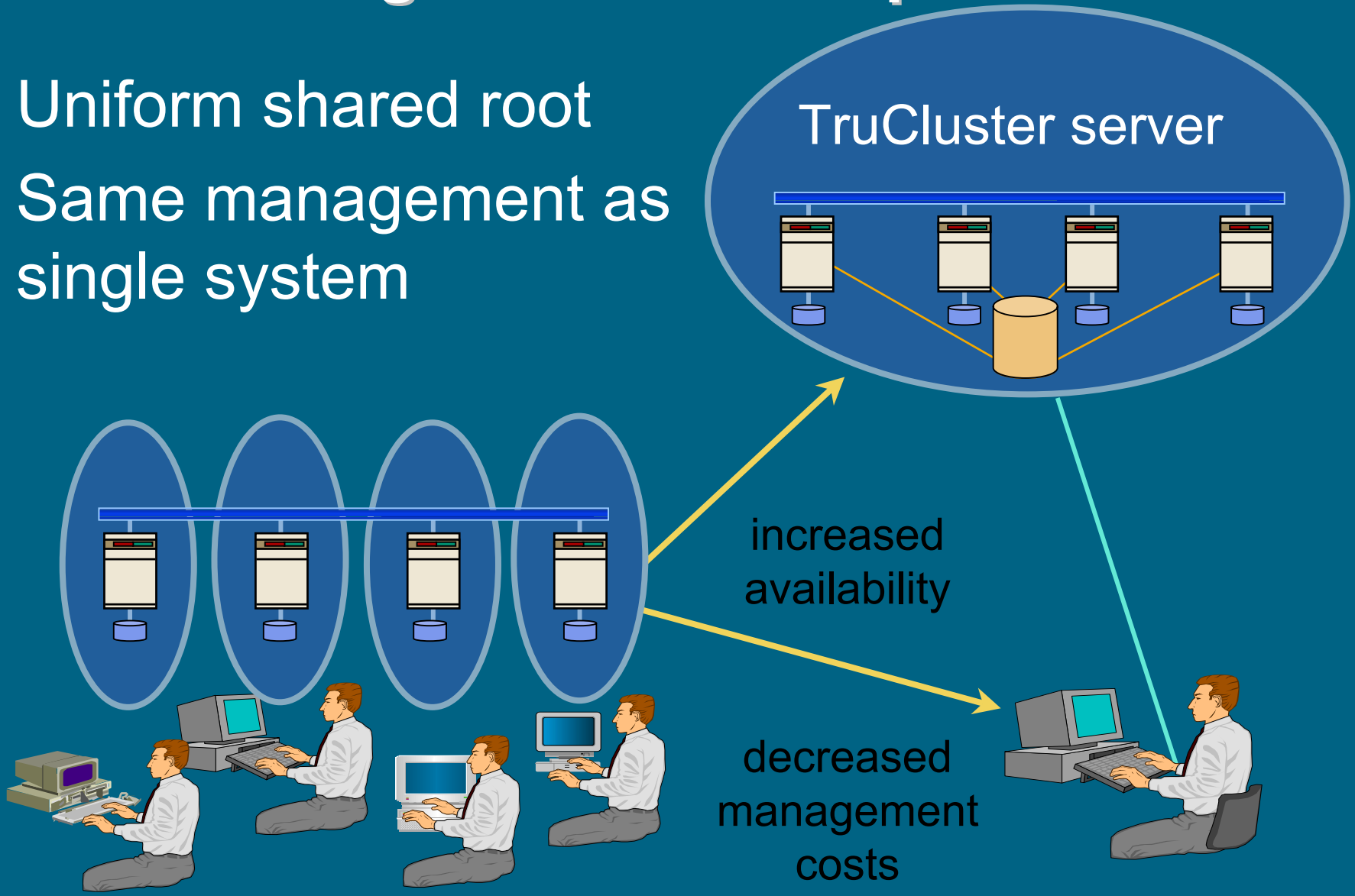
- simplicity with the common release for HP 9000 and Integrity servers (11.23PI)

HP-UX 11i v3: advances leadership in scale-up and scale-out

- HP remains committed to Tru64 UNIX customers bringing best technology from Tru64 UNIX into HP-UX 11i & Serviceguard (AdvFS and TruCluster Single System Image)

# TruCluster technology
# Slash management costs up to 80%

- Uniform shared root
- Same management as single system

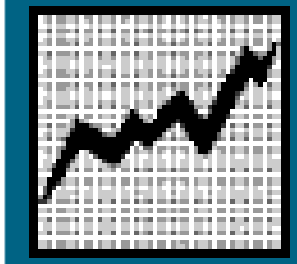


# Linux in the Enterprise

**hp.com/linux**
**1-888-hplinux**

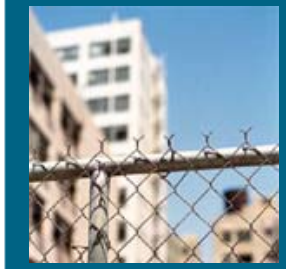
1) HP has huge success in Linux
2) HP is your single point of Linux support
3) HP's deep involvement with Linux such as maintaining 64-bit kernel
4) Full Indemnification with

# 1) Breakout year for HP and Linux



Overall Linux revenue $2.5B for 2003

- Strong shift from Sun UNIX to industry-standard Linux



Offers Linux indemnity

- Free customer protection from SCO litigation
- Strong customer interest (multiple large accounts already signed)
- Reducing customer risk

Expands portfolio

- Broadest industry-standard product range
- Leading manageability for Linux
- Enterprise-class Linux blades
- Comprehensive services

Global organization and GTM focus

- Strategic focus to drive Linux globally
- Leading partner and solutions initiatives
- Linux for the “Real World”:
  - Heterogeneous, not monolithic environments
  - Open source, not one source
  - Total solution and services, not just a hot box

# 1) HP Linux market and technology leadership

## Linux market leadership

Robust Linux server revenue growth for HP

| | |
|---|---|
| Full Year on Year Growth: | 34% |
| Quarterly Growth (Q303 vs. Q302): | 42% |
| Quarterly Growth (Q303 vs. Q203): | 10% |

**#1 Worldwide**

- Linux server units
- x86 Linux server units
- x86 Linux server revenue
- Itanium® Linux server units
- Itanium® Linux server revenue
- Cumulative Linux blades shipped (>20,000)
- Disk storage Linux revenue

## Linux technology leadership

HP is the clear Linux performance and price/performance leader

- First vendor to establish TPC-C Linux performance benchmark (138,300 tpm)[1] [2]
- New world record TPC-C benchmark of 1,184,893 tpm
  - HP Integrity rx5670 64P cluster
- Linux single system perform-ance leadership136,111 tpm
  - HP Integrity rx5670 (4CPU)
- Other leading price/performance metrics:
  - DualNode category, $325/BOPS, Java Enterprise Application Servers benchmark[3]
  - Best price/performance for MultipleNode category, $389.5/BOPS, Java Enterprise Application Servers benchmark [4]
  - Best Linux price/performance for Oracle Apps[5]


1 8, 4-way ProLiant DL580 systems with Oracle, Red Hat Advanced Server

2 www.tpc.org

3 SPECjAppServer2001, ProLiant DL 360G3 on Oracle 9iAS Release 2 (over Dell/Linux by 1/3 lower cost)

4 SPECjAppServer2001, ProLiant DL530, Red Hat Linux Advanced Server 2.1, Oracle9*i* Release 2 9*i*AS Release 2 (4x greater price/performance than 8-way Sun UltaSparc III)

5 OASB, ProLiant 2-node 4 way DL580G2 (53% less cost than Sun/Solaris for 9i and 31% better performance)

# 2) HP Care Pack Services for x86/IA32 Server Environments

## For Red Hat Enterprise Linux AS and ES

(RHEL Software subscription is Included with the purchase)

**Basic**
- 3 incidents per server
- Telephone support, 9x5
- Web/e-mail support
- **Media & user documentation**
- **Subscription services**
- **1 year Increment**

**Standard**
- Unlimited calls per server
- Telephone support, 9x5
- Web/e-mail support
- **Media & user documentation**
- **Subscription services**
- **1 or 3 year available**

**Premium**
- Unlimited calls per server
- Telephone support, 24x7
- Web/e-mail support
- **Media & user documentation**
- **Subscription services**
- **1 or 3 year available**

# 3) Participation & Contributions

## Pivotal member of Linux community

- Leadership for Linux Standard Base
  **{Geary, Taggart}**
- IA-64 kernel development & maintenance
  **{Mosberger & Helgaas}**
- Debian project maintenance
  **{Garbee}**
- Sponsoring or founding member:
  - Open Source Development Lab [OSDL]
    **{Fink, Geary}**
  - Linux International [since 1995]
  - Clustering foundry and handhelds.org
  - GNOME foundation and the KDE league
    **{Peters}**
  - The Gelato Federation
  - Pegasus Project
- Extensive support of Samba and Apache projects
  **{Allison}**

# 4) Linux Accountability

- HP offers indemnification to enterprises against potential damages resulting from SCO's copyright infringement suit
- Provides protection to enterprises that acquire Linux from HP and have a standard or premium service contract
- Covers enterprises using Linux binary code, not modified source code
- Existing HP Linux customers with support contracts may apply for coverage; those without may obtain Linux services from HP and benefit from the program

# HP Linux blades offer massive savings

Sun SMP architecture

Solaris to Linux migration

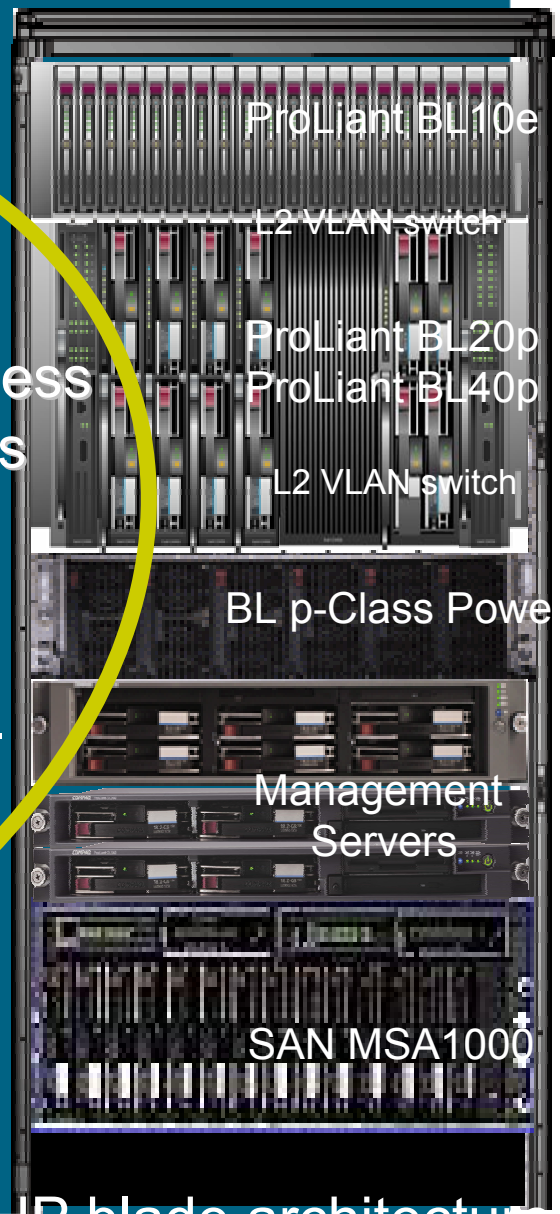
Increase business effectiveness

Improved service management

Resources on demand

Faster time-to-market

Reduce operational costs



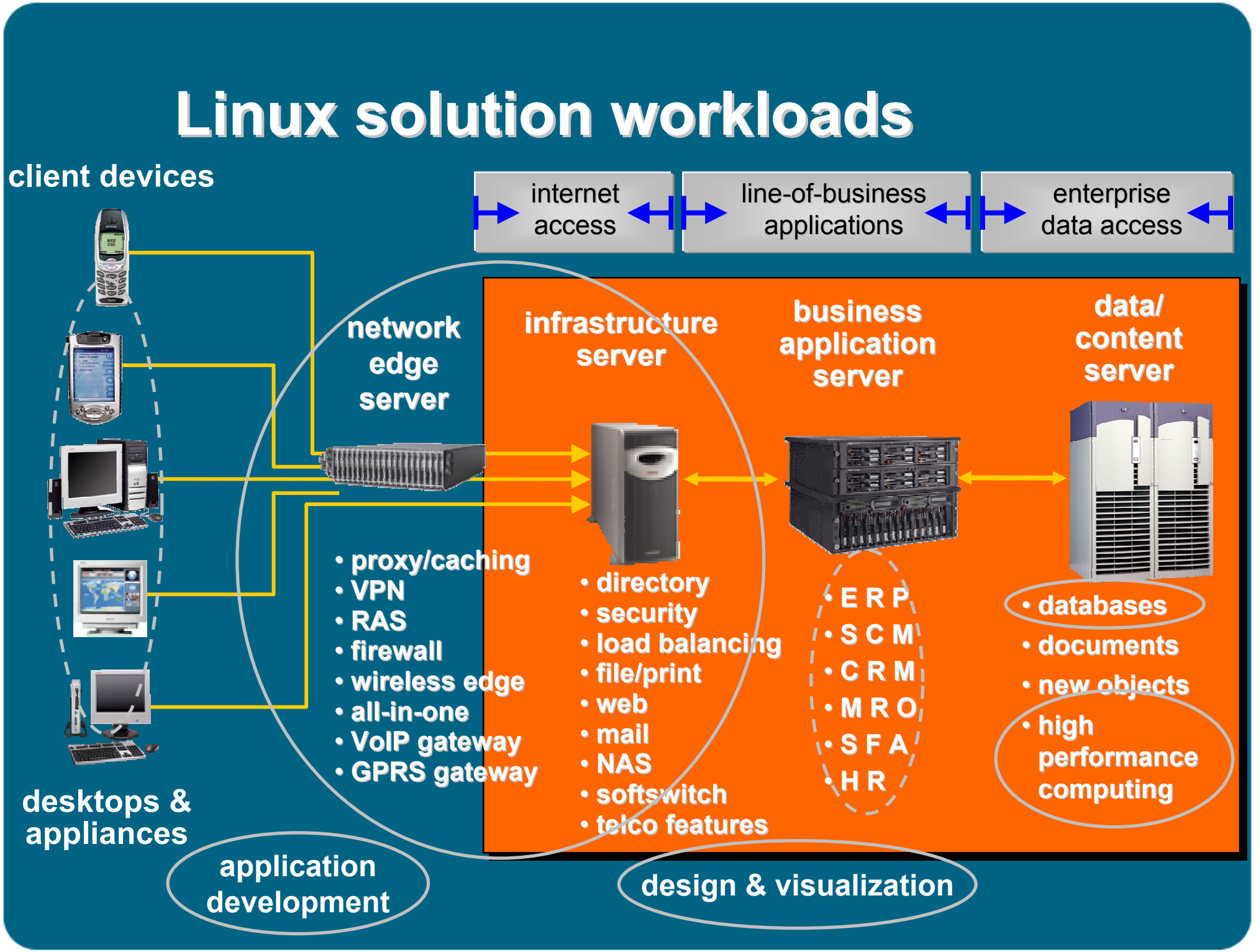

HP blade architectur

Order of magnitude cost savings (50-70%)

# Linux Platform Cost of Ownership summary

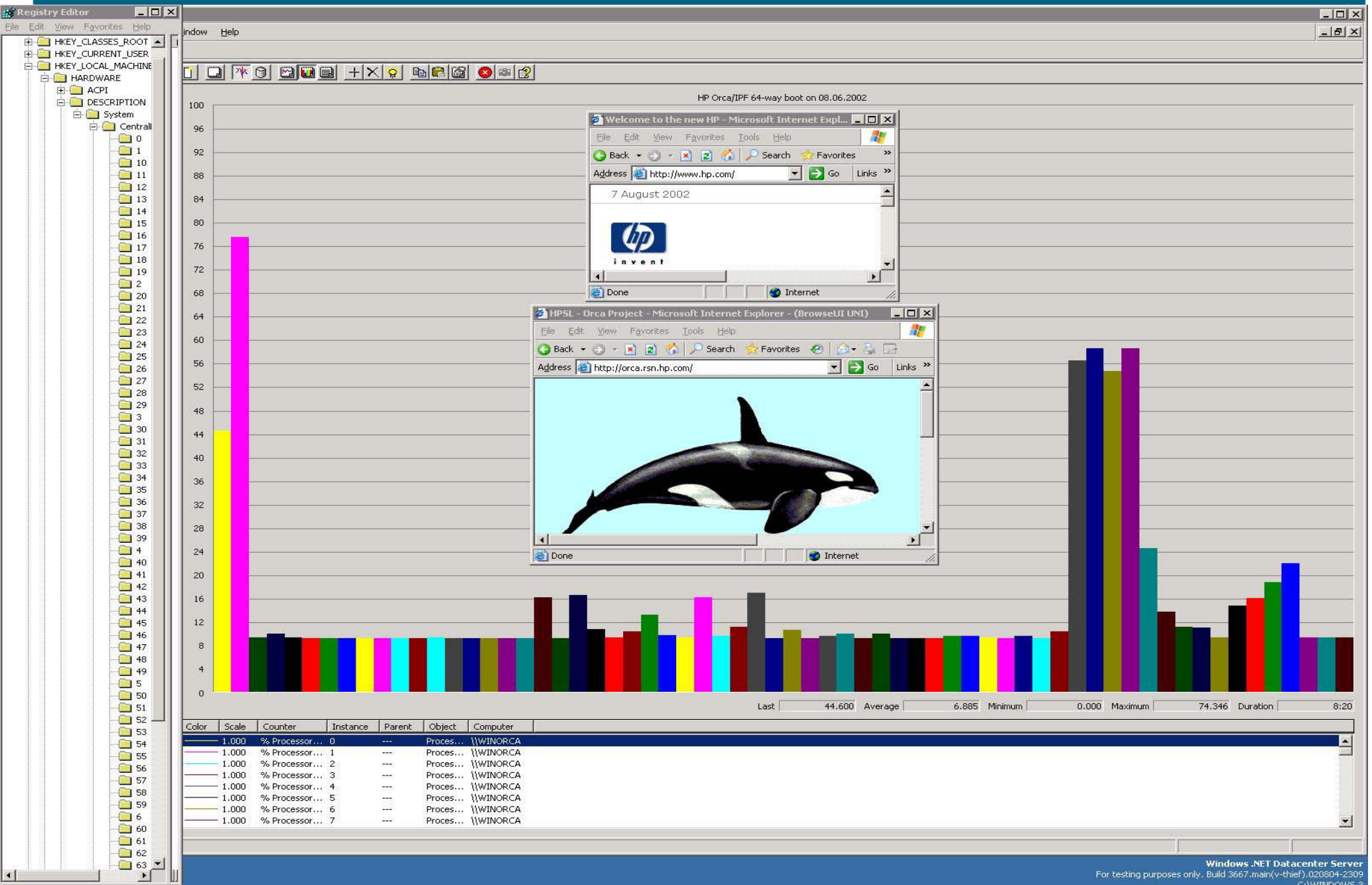
- Hardware savings
  - Intel [vs. proprietary] servers cost less to acquire and are denser in design, requiring less racking, cabling, etc.
- Software savings
  - Fewer servers/CPUs require fewer software licenses
  - Use of open source software eliminates software license fees
- Services & Support savings
  - Intel [vs. proprietary] servers cost less to service and support – fewer servers cost even less
  - Fewer software licenses equate to reduced software maintenance fees
- IT Staff savings
  - Strong leverage of existing UNIX knowledge base, as Linux is a UNIX derivative
  - Fewer systems yields potential to reduce # of IT staff based on extent of infrastructure consolidation
- Facilities savings
  - Fewer servers require less data center space, lower power consumption and reduced cooling

# Linux solution workloads




# Windows Server 2003 Update

# 64-way MP Win64 on Itanium2's



# Why HP for 64-bit Windows and SQL?

- 20 full-time Houston-based engineers for SQL benchmarks and proof points, customer white papers and tools
- 7 full-time Redmond-based engineers. Non-review write access to 64-bit kernel. Test & improve SLQ64 on HP servers and storage.
- 8 full-time engineers shared between Houston & Redmond. Enterprise application focus.
- 4 Superdomes in place at Redmond, 1 for the Windows Kernel/Dev Lab, 1 for the SQL Dev Lab, 1 for the Windows Perf Lab, 1 for the Windows Cert Lab, plus multiple rx2600's and rx5670's.h

# Windows Server 2003 on Itanium® -based Superdome - *Target Usage Scenarios*

- Database
  - Relational Database Management System (RDBMS)
  - Online Transaction Processing (OLTP)
  - Decision Support (Data Warehouse, Data Mart)
  - Data Mining (Business Intelligence)
  - Database consolidation

- Business Applications
  - Customer Relationship Management (C
  - Enterprise Resource Planning (ERP)
  - Supply Chain Management (SCM)
  - E-Commerce applications
  - Product Development & Design Autom
  - Industry-specific applications
    - Financial Services
    - Oil/Gas
    - Manufacturing
    - Science/Academia
  - Custom Line-of-Business (LOB) applicat

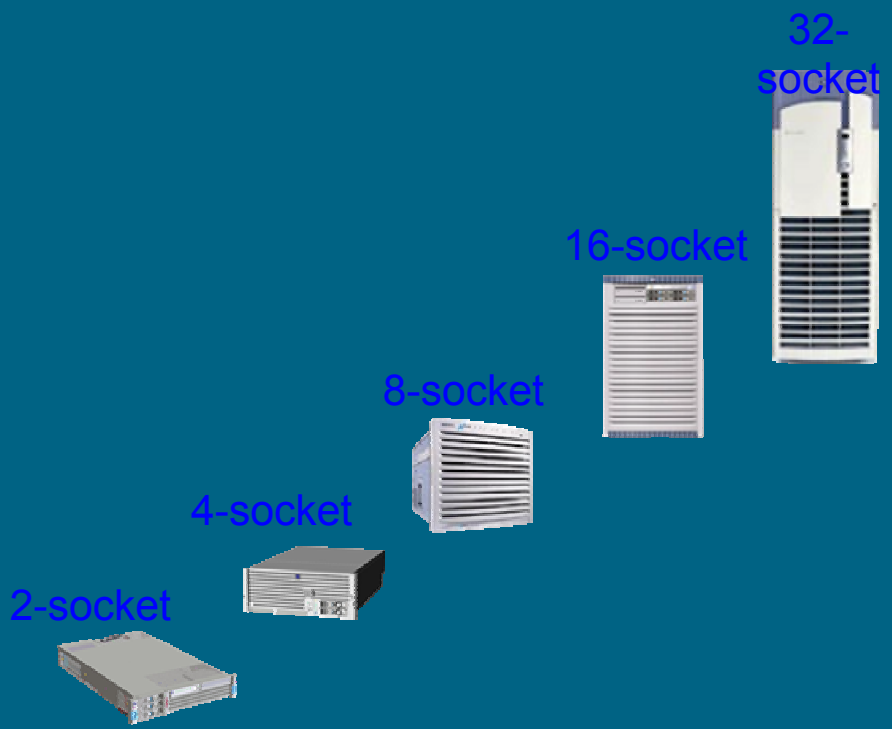
# HP customers win with Windows Itanium 2–based solutions

- **Data warehousing: SQL Server - Raymond James**
  - currently testing and planning to deploy HP Integrity Superdome for decision support for financial advisors. need highest levels of scalability plus price/performance and TCO of Windows solution
- **Business intelligence: SAS – Wells Fargo**
  - faster data mining for customer profiling and targeted marketing
- **Enterprise resource planning: SAP R/3-Multiyork**
  - linked complex front-end retail process to its manufacturing, finance, delivery and human resource functions on HP Integrity rx5670 with growth and scalability for future
- **High-performance computing: SQL Server – Johns Hopkins University**
  - required larger SQL Server database access for faster processing of large amounts of data to catalogue the observable universe
- **Database performance with mySAP.com: SQL Server -- VTG-Lehnkering** seamlessly moved to a high-performance 64-bit platform capable of handling its existing logistics applications while accommodating large-scale and rapid growth and future-proof technology.

**transition from 32-bit to 64-bit SQL Server seamlessly**

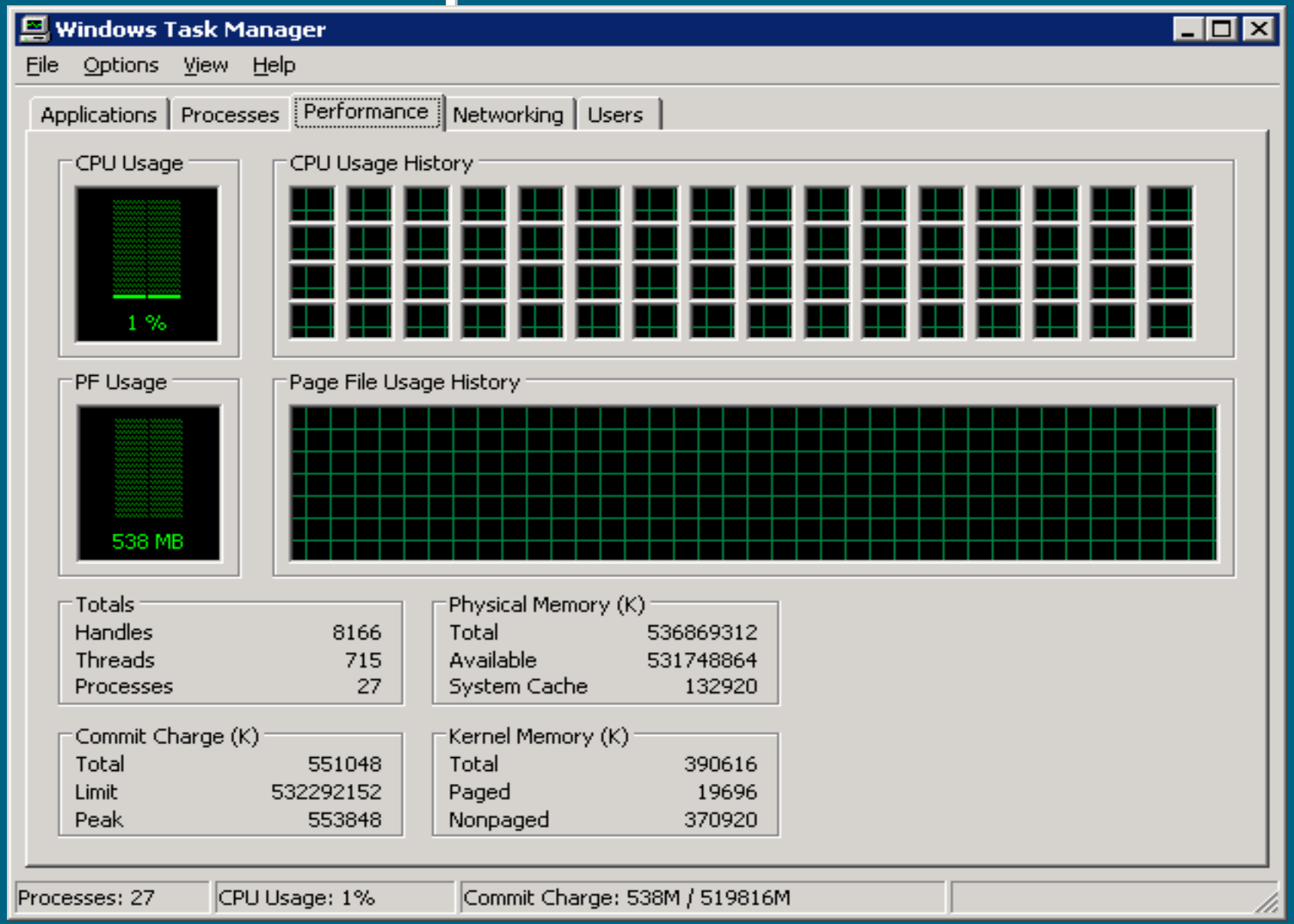
- plug in the disks and go!
  - issue command call "sp_attach_db“
  - on-disk structure is 100% the same
- if keeping IA-32 system
  - use backup from IA-32
  - restore onto 64-bit system
- networking layer of MS SQLServer accepts input from 32 bit clients just as with 64 bit clients
- run your 32-bit application on your 32-bit server with 64-bit database server and experience benefits of Itanium 2!

# hp Itanium commitment and leadership continues




– In 2003, HP's entire family of Itanium-based servers--- including the midrange 8-way and 16-way, and the high-end Superdome 64-way will support the 64-bit version of Microsoft Windows .NET Server 2003

# 64 way Windows Server 2003 on Superdome

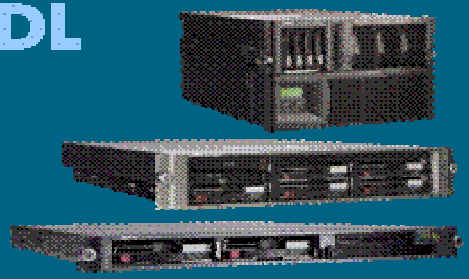


# ISS – Industry Standard Servers

*servers* | *options* | *solutions*

ML

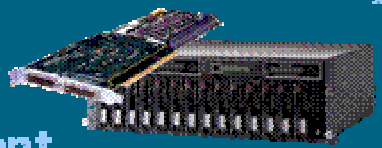
DL



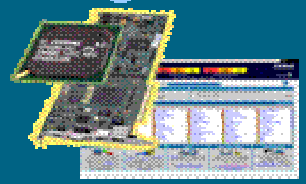
BL

options

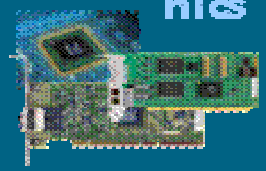
smart array

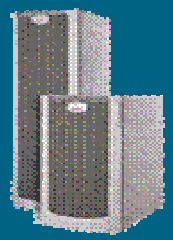


management



nics



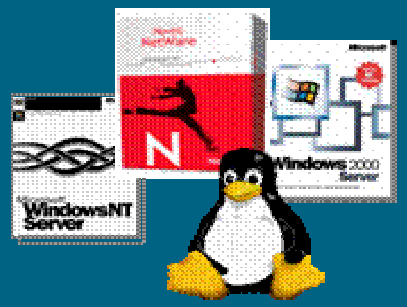


rack & power

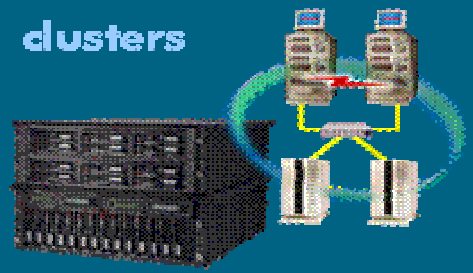
essential software

ProLiant Essentials Package

OS partnerships




clusters



activeAnswers

solutions

# New ProLiant Essentials Software

## ProLiant Essentials Foundation pack

- SmartStart
- Insight Manager 7
- Management Agents
- Value added drivers & utilities

SP2 Jan

delivered with every ProLiant server

## ProLiant Essentials value packs

### rapid deployment pack

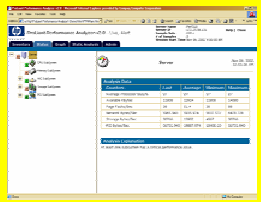
v 1.3 Jan

### workload management pack

### integrated lights-out advanced pack


### recovery server option pack

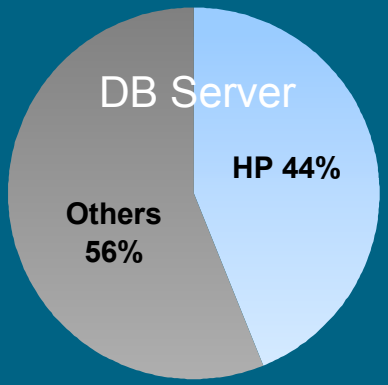

### performance management pack



w/PPA 2.0 Jan

# HP is the #1 partner for leading application vendors

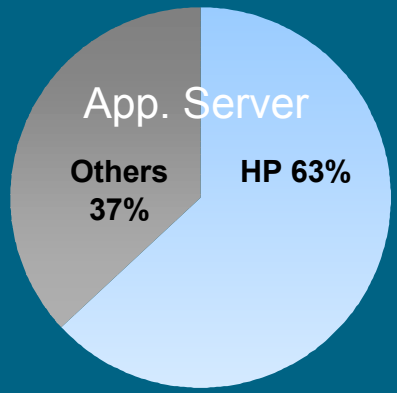
## Oracle*1



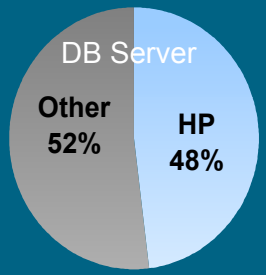

market share by OS

- Unix (26%)
- Windows (73%)

Leading Database Platform Partner

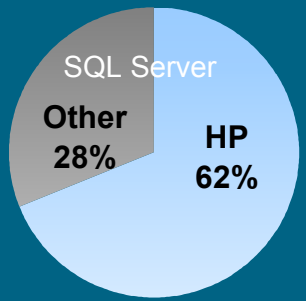


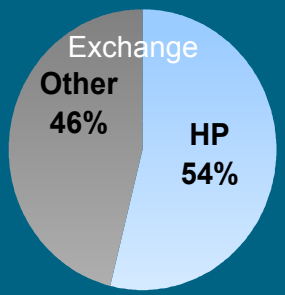

Growth Driver



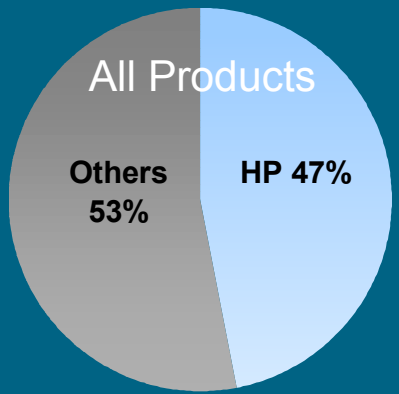

Leading share of application server license revenue in Q302

## Microsoft*2




## SAP*3




market share by OS

- Unix (35%)
- Windows (56%)
- Linux (48%)

HP leads in all product categories and OS for Q402 installations

Source: Based on available market share statistics as of February 2003 either primary market research or partner reported; ISS Solution market share contact Mary Peterson (CUP,CA). See notes page for detailed source information.

**1 Oracle - IDC 2003 report – confidential ; *2 SQL Server as of 12/01, Exchange as of 2/02; *3 SAP – partner reported Q403.*

## 1980's

| IBM | HP |
|---|---|
| Token Ring | Ethernet |
| Micro Channel | EISA |
| OS/2 | Windows |
| Mainframe | Client/Server |

## 1990's - Now

| IBM | HP |
|---|---|
| Token Ring | Ethernet |
| Micro Channel | EISA |
| OS/2 | Windows |
| Mainframe | Client/Server |

## Server Platforms

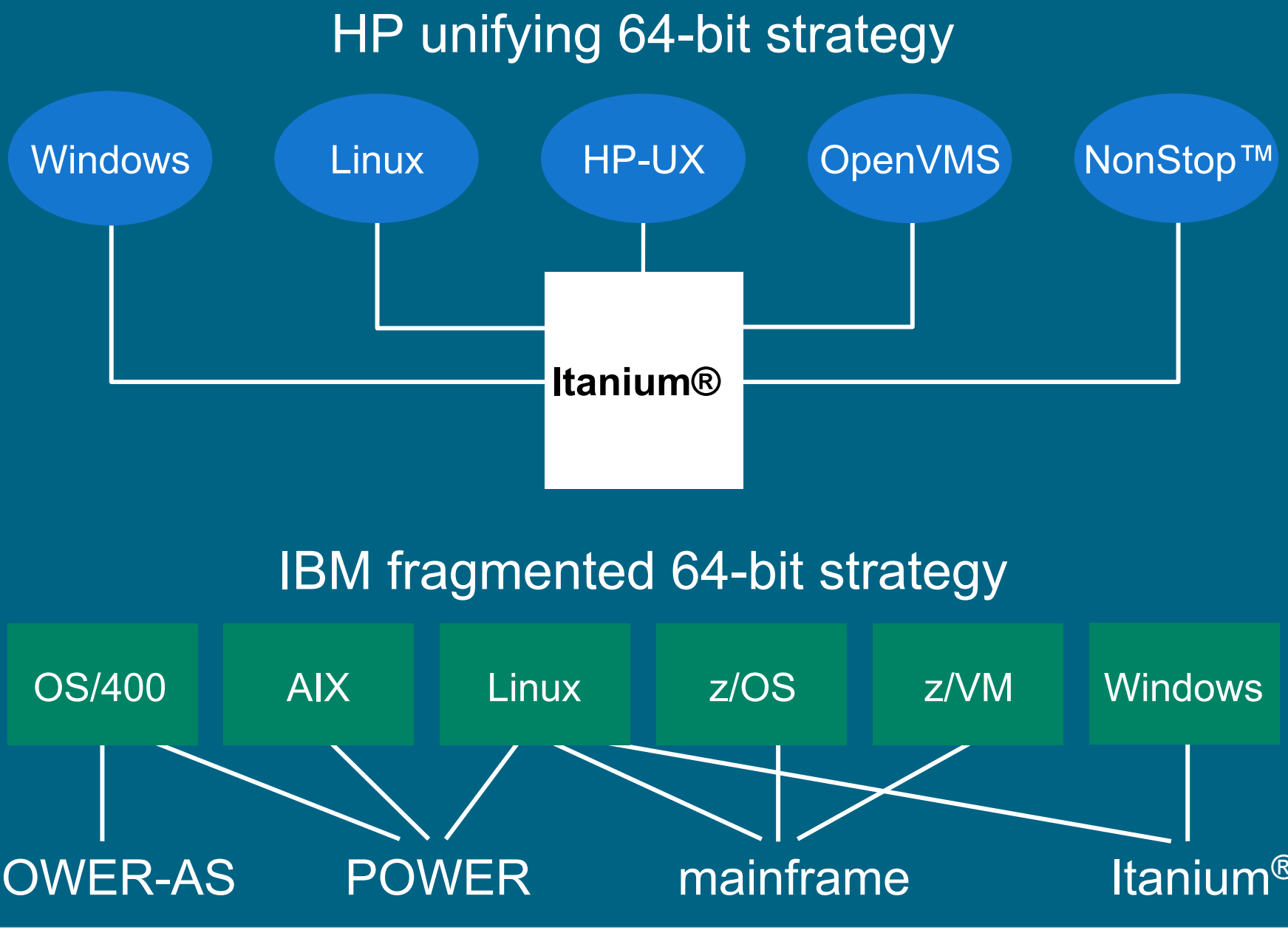
**IBM**

- X series - Windows/Linux – IA32
- P series - AIX/Linux - PowerPC
- I series - AS400
- Z series - Mainframe

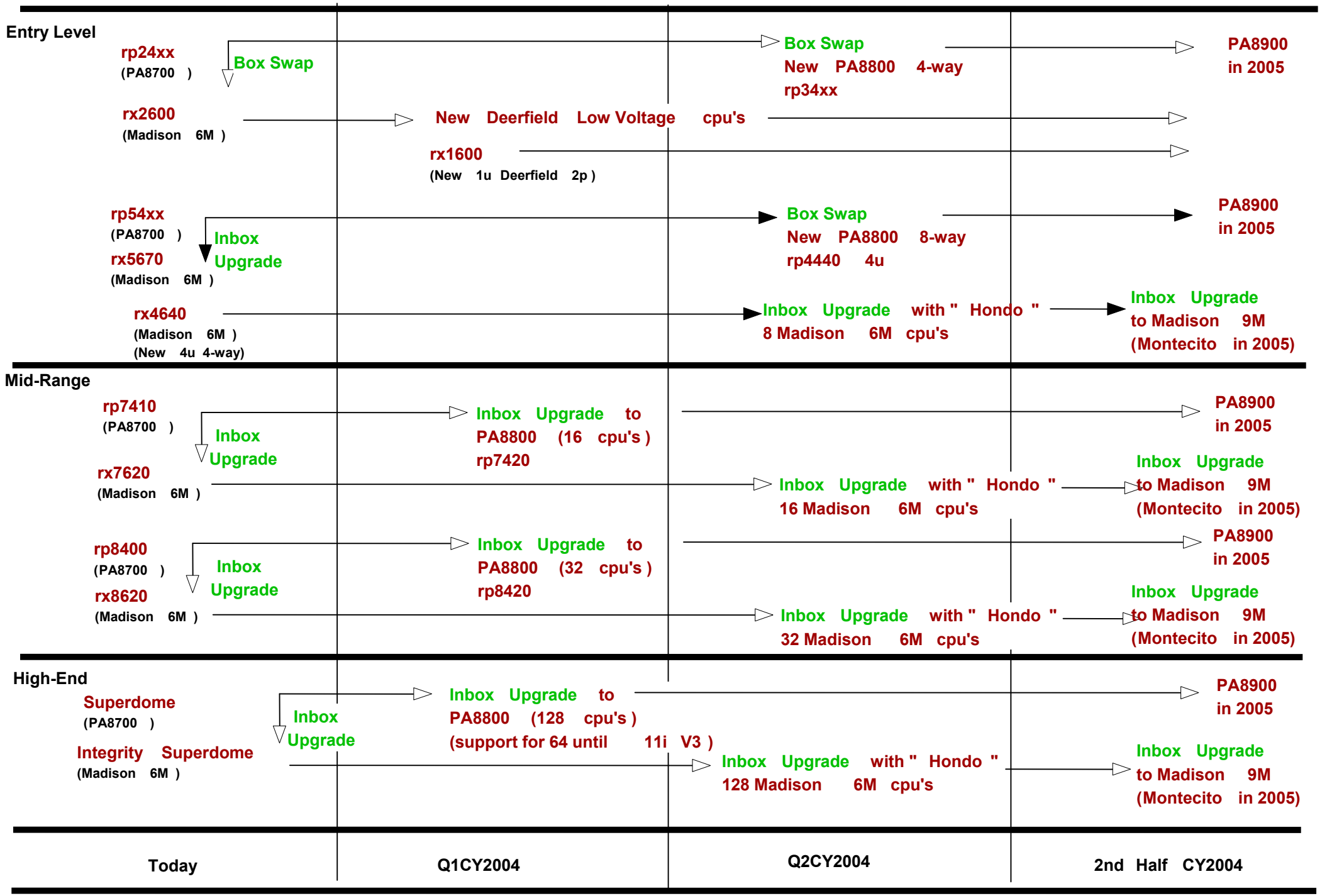
**HP**

- hp-ux 11i
- *OpenVMS*
- Windows Advanced Server
- 
- **NSK**

# HP unifying approach vs. IBM fragmented approach



# BCS Server Roadmap



# HP extends its x86 offerings: More performance & choice with 100% compatibility

New ProLiant servers with Opteron technology

- Ideal for:
  - Compute intensive and memory-hungry 32-bit applications
  - HPC clusters
  - Solaris to Linux migration
  - Data base
- Supporting:
  - Windows and Linux

- A portfolio of offerings:
  - ProLiant 100 series: HPC 1U 2P server
  - ProLiant 500 series: First to market 4P - 64GB RAM
  - ProLiant BL series: Performance & power efficiency
- Greater 32-bit performance: Increased maximum memory and improved processor-memory interaction
- ProLiant design consistency: Common design to each series - 100/300/500 and blades
- Transparent 32/64-bit capabilities: Mix 32-bit and 64-bit applications on the same platform
- Driving economics of standards and power of 64-bit into the volume market: Introducing 64-bit capabilities to transition on your timetable