Power On with HP for Technical Professionals – Multi-OS

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Power On with HP for Technical Professionals – Multi-OS

ESG10227SG10403

HP Training

Student guide

invent

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Student Guide 1
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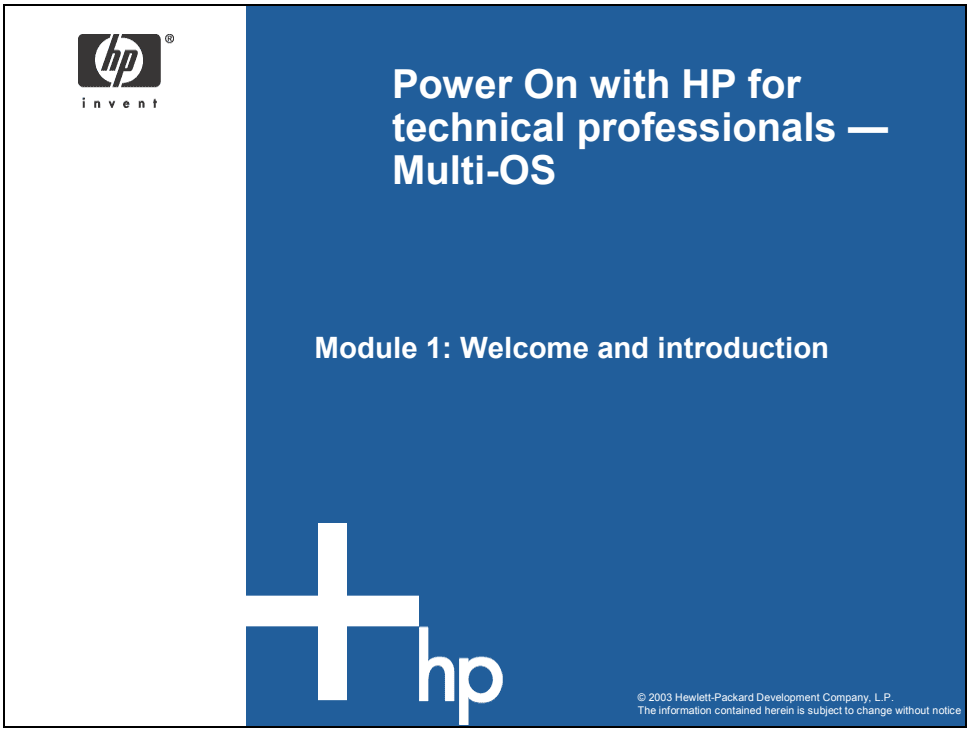
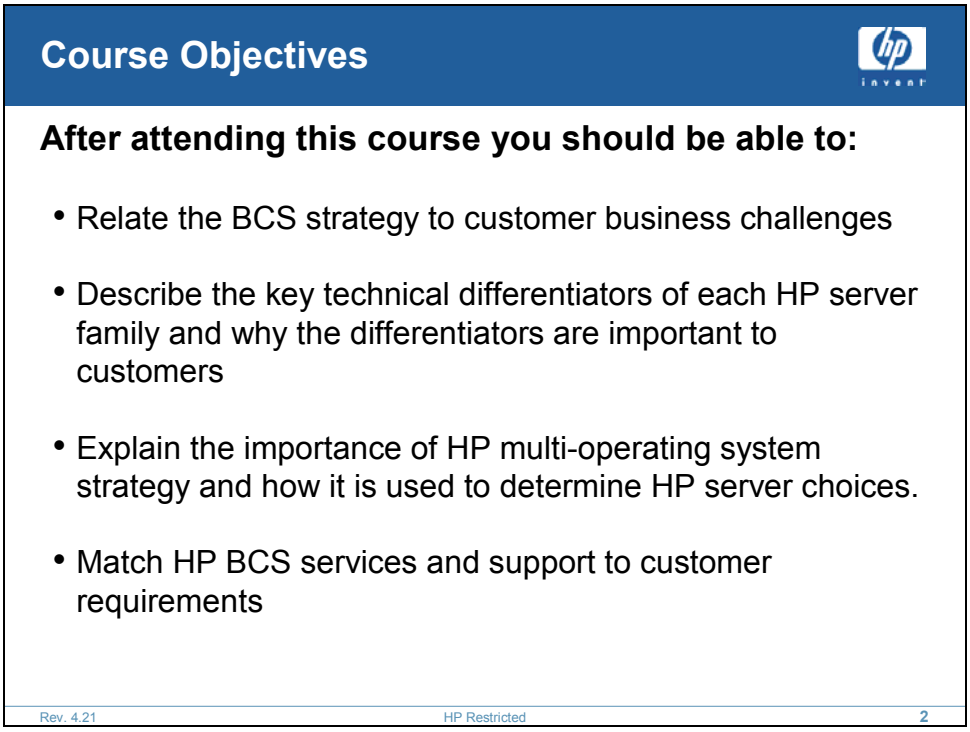
WELCOME & INTRO

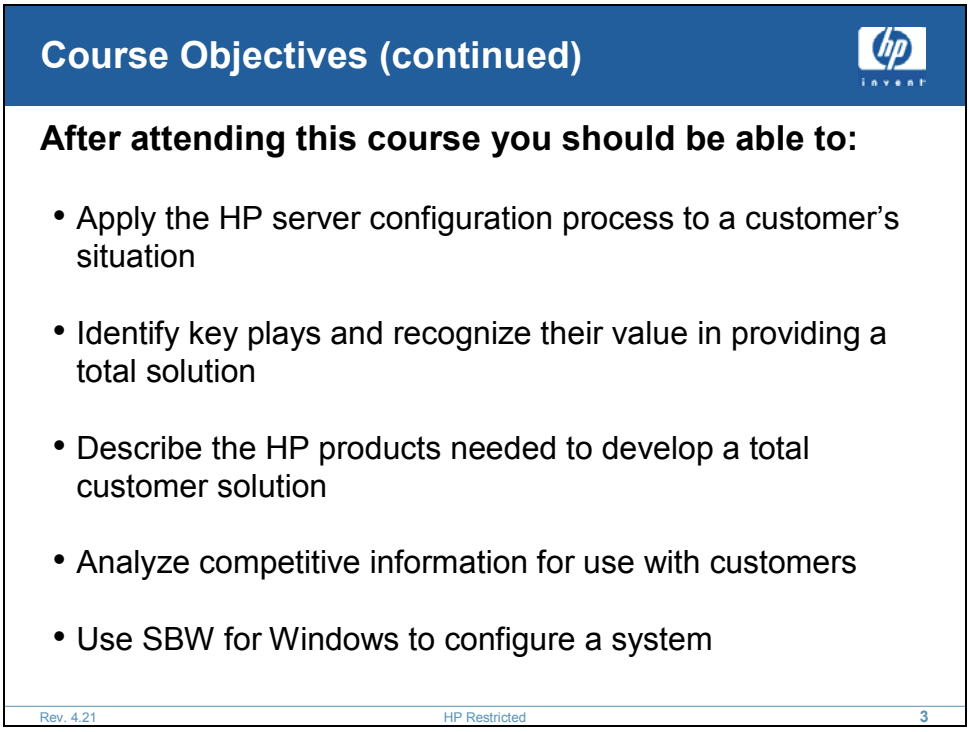


Welcome and introduction

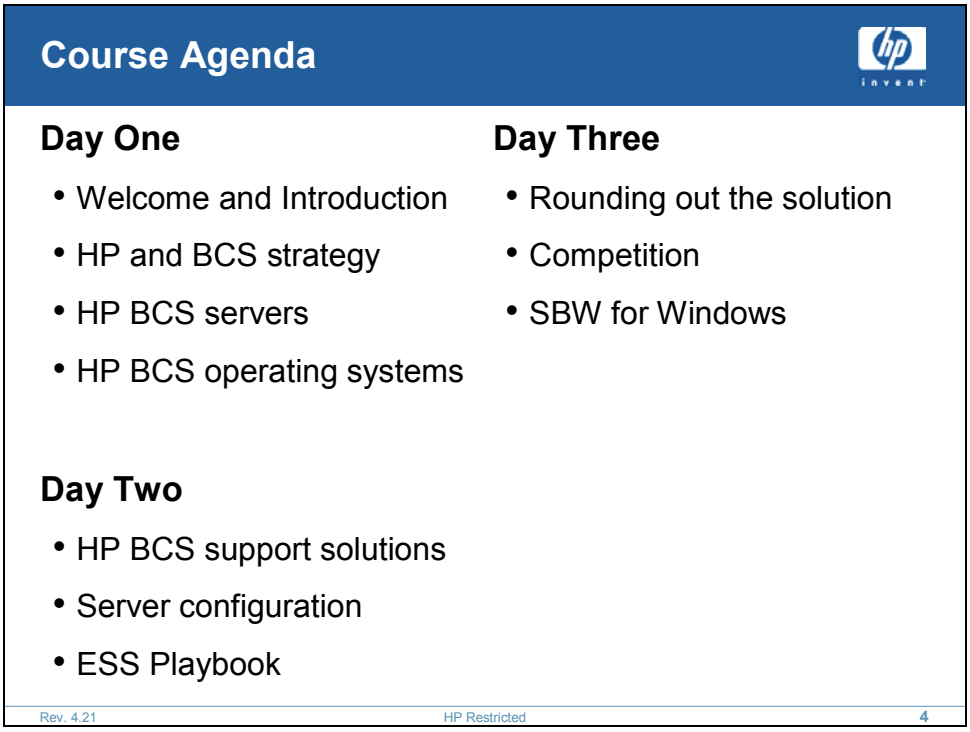


Course objectives

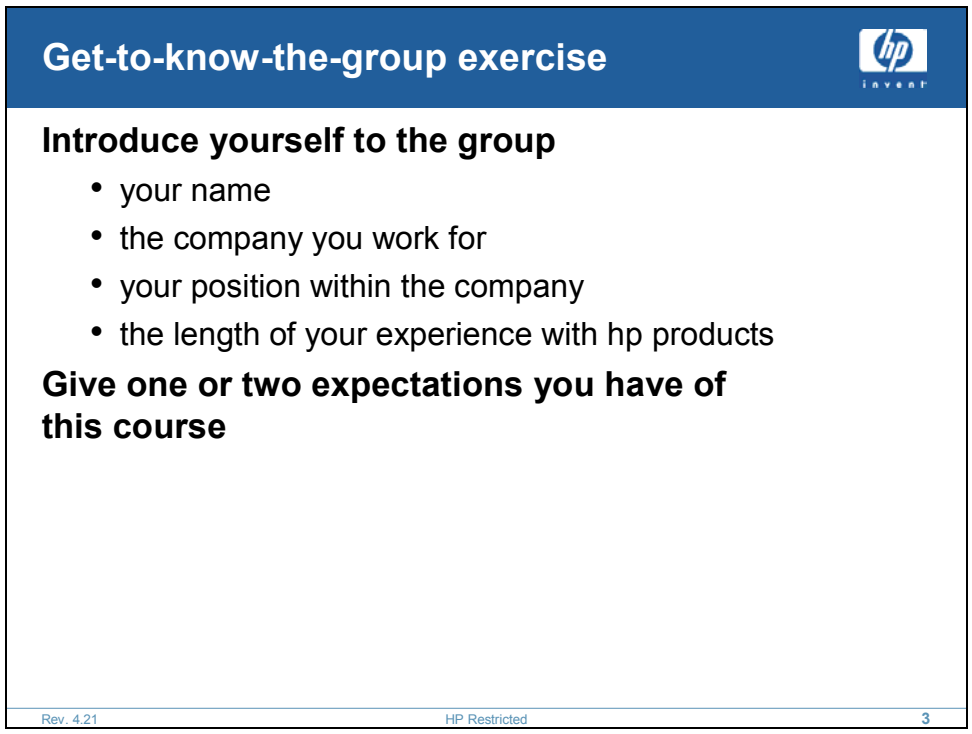
Staying ahead of today's fast-changing technology can be challenging. Your secret weapon is your up-to-date knowledge of what is happening in the marketplace. This course will give you the information you need to effectively determine your customer's business needs and provide the very best BCS solution. It will also give you the competitive edge in understanding and selling BCS products, technologies, and solutions.



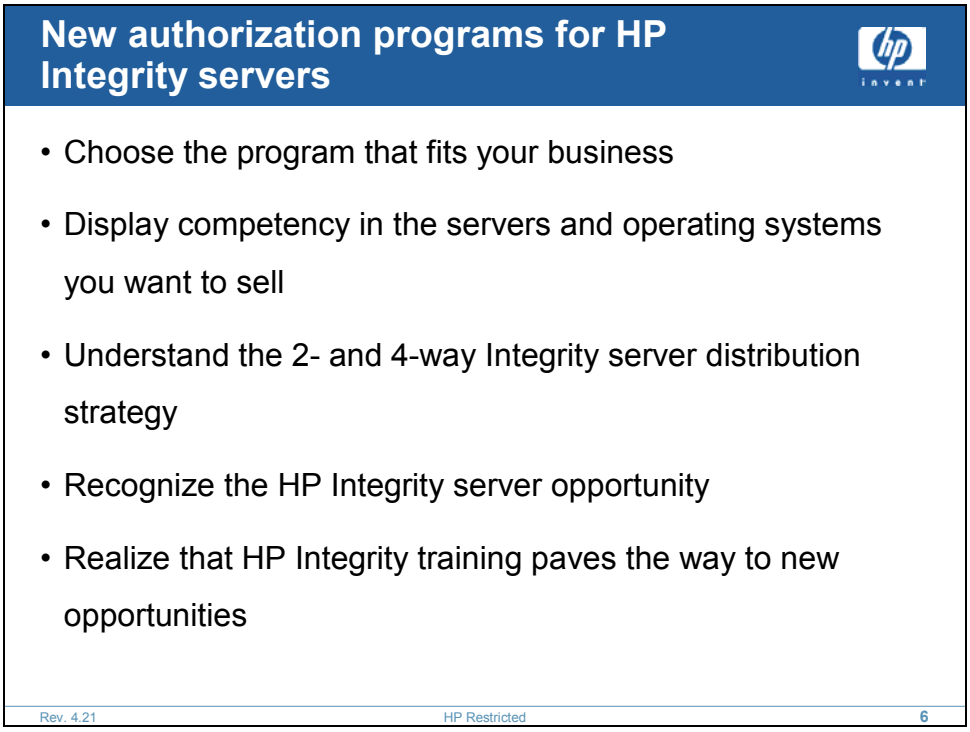
Course objectives (continued)



Course agenda



Get-to-know-the-group exercise



New authorization programs for HP Integrity servers

In addition to other requirements, resellers and distributors must possess specific skills and knowledge to qualify for HP Value-add Partner Authorization.

Requirements are defined by regional organizations with guidance from BCS Global and the HP Certified Professional program.

This information is from a global perspective. Regional programs may differ. Refer to your partner portal for regional requirements.

Choose the program that fits your business

- Full multi-OS market, including HP-UX, Linux, and Windows 2003
- Windows and Linux market
- Windows 2003 market only
- Linux market only

In addition to choosing the operating environment(s) you want to sell, you choose the systems you want to sell:

- Entry-level systems — 2 and 4-way
- Entry-level and midrange systems — 8 and 16-way
- Entry-level, mid-range, and high-end systems — Superdome

When qualifying to sell high-end systems, you can choose to participate in either the HP Superdome Consultant program, formerly known as the HP Superdome Always-on Gold program, or HP the Superdome Advanced Architect program, formerly known as the HP Superdome Always-on Platinum program.

The Superdome Consultant program enables you to focus on selling, consulting, and project management. HP executes the technical details of system design and implementation.

The Superdome Advanced Architect program enables you to control the entire design and specification process, and to directly bill your customer for the services you deliver.

Display competency in the servers and operating systems you want to sell

HP Certified Professional (HPCP) sales and pre-sales credentials are required for each program.

HPCP programs and credentials help you:

- Build and validate skills to compete, deliver configuration and/or detailed design services, and close sales
- Show customers that you have the competence to be their trusted advisor

As the technologies and services you choose to offer increase in complexity, such as choosing to participate in the Superdome Advanced Architect program, so do the certified skill sets you must have on staff. Because we have linked HP Certified Professional certifications to Integrity server authorization programs, you can be assured that your staff has the product knowledge and essential competencies needed to successfully compete, deliver the required services, and close the sales.

Check your regional partner program portal or documentation for the specific certification requirements you must meet. Also, check your regional HP Certified Professional website for the training and exams associated with each required certification.

Please be aware that HP may change requirements as new products and training is introduced, and will introduce requirements to keep an HP Certified Professional's knowledge and skills up to date.

Regional HP Certified Professional website:

http://www.hp.com/go/certification

Select your region on the global map.

Understand the 2 and 4-way Integrity server distribution strategy

Regional channel programs provide additional incentives and rebates through the HP Value-Add Partner program to partners who fully invest in multi-OS certification for 2 and 4-way Integrity Servers, including HP-UX, Windows 2003 Data Center, and Linux.

Recognize the HP Integrity server opportunity

Goals for enterprise resellers

- Expand the market with Windows and Linux
- Better differentiate against IBM and Sun resellers with Windows and Linux

Goals for commercial resellers

- Take advantage of the IA-64 entry channel business model
- Sell mid and high-end value-add solutions
- Participate according to your unique needs

Enterprise distributors should expand your market opportunities with the mid and high-end systems.

Commercial distributors should leverage the IA-64 entry channel business model for your customers, such as commercial resellers.

Realize that HP Integrity training paves the way to new opportunities

Updated and expanded curriculum

- Sales
  - Power On with HP for sales — Multi-OS
  - HP Integrity servers for sales — Linux and Windows
  - HP Superdome solutions for sales — Multi-OS
- Technical
  - Power On with HP for technical professionals — Multi-OS
  - HP Integrity servers for technical professionals — Linux and Windows
  - HP Superdome configuration for technical consultants — Multi-OS
  - HP Superdome advanced design services for technical consultants expected availability: May 2004

What we know about HP certified partners

HP Certified Professional Partner Program

- Best in class
- Stable and secure
- Provides greater business agility
- Reliable
- Provides a competitive edge

These qualities not only differentiate HP Business Critical Server solutions, they also describe people who have been trained and have earned HP Certified Professional business critical server solutions certifications.

As an HP Certified Professional, you obtain membership in an elite community and enjoy the accompanying recognition of achievement and status.

As a professional certified to HP standards, you enhance your credibility and find it easier to articulate your experience and skills on HP Business Critical Server solutions.

As an HP Certified Professional, your customers are assured that you are equipped with the knowledge and skills necessary to make them successful.

For additional information about the HP Certified Professional Program go to http://www.hp.com/go/certification and on the map provided, click your region.

Certification statistics

The "2002 Global Training and Certification Study" sponsored by Prometric and CompTIA, and conducted by independent research firm Thomson Marketing Resources, , found that certification is highly beneficial to individuals advancing their careers.

Source: www.prometric.com/PressRoom/KnowledgeCenter/industryResearch.htm.

- Fifty-four percent of the certified IT professionals who participated in the study received a reward at work. This percentage is up 20% from 2001. This reward included salary increases at 18%, new responsibilities at 20%, and promotions at 9%.
- Seventy-four percent felt that their certification had a significant impact on getting their reward. The survey found that the average certificant in the United States received a certification-related raise of 10.2%.

Personal benefits

The strongest agreement between the test candidates and already-certified professionals in the survey were the personal benefits derived from achieving certification.

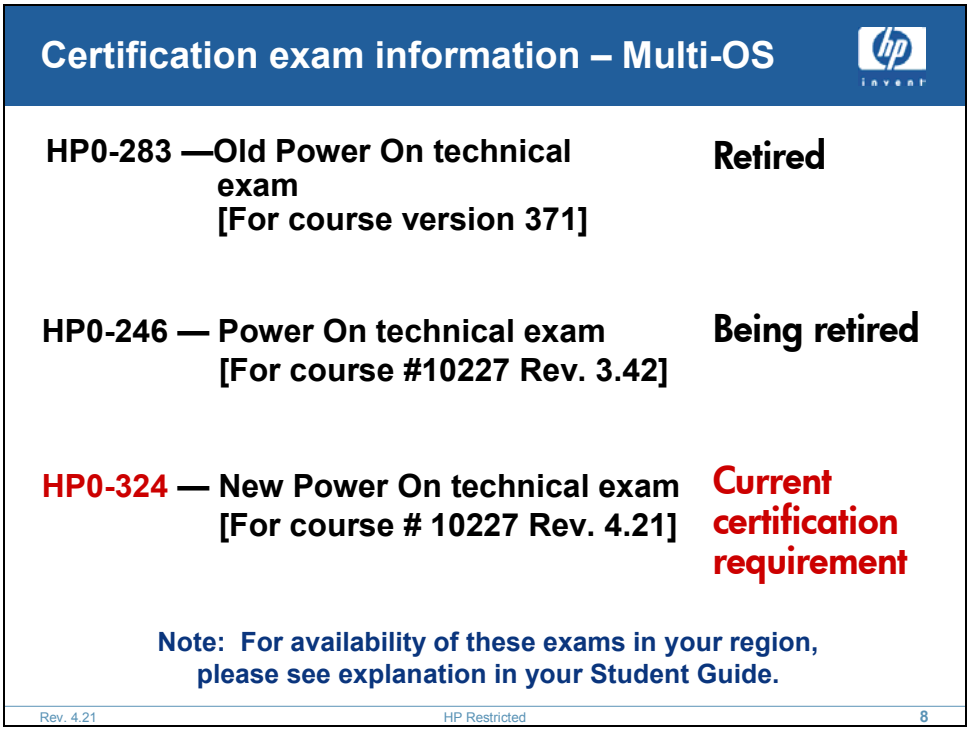
These include:

- The actual achievement of the credential—the result of hard work and personal sacrifice—along with the self-confidence boost and resulting professional growth.
- The positive emotions felt at work once the certification journey was complete, including empowerment, respect from colleagues, and increased credibility.

These emotions can grant you a competitive advantage, providing job security and job freedom.

Certification — A framework

Certification is an excellent framework and supporting structure in the lives of IT professionals. It provides the roadmap for career direction and the future of your professional journey. Many of the test-takers surveyed agreed that a main benefit of achieving certification providing job mobility and acting as a powerful navigation tool for career advancement.



Certification exam information — Multi-OS

HPO-283

This exam has been retired or will soon be retired in your area. Candidates who have taken the course version associated with this exam but have not yet taken the exam will need to test out before the exam is retired.

HP0-246

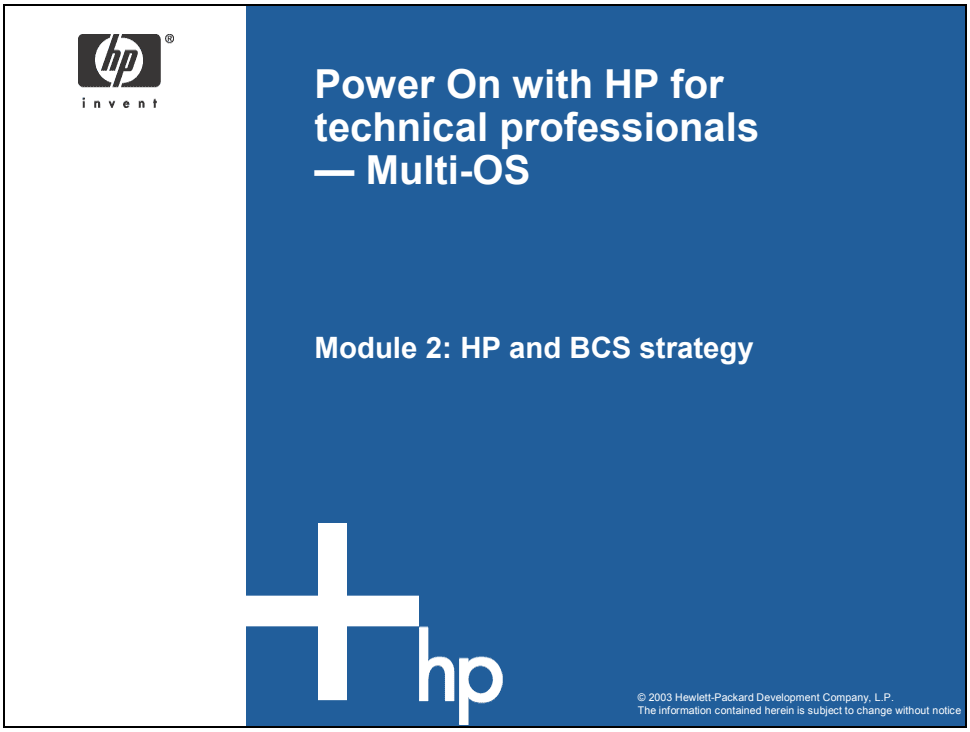
Exam HP0-246 will be retired when exam HP0-324 is available in your country. The retirement of exam HP0-246 will be posted on your certification program web page, along with a grace period during which the exam will still be accepted for certification.

HP0-324

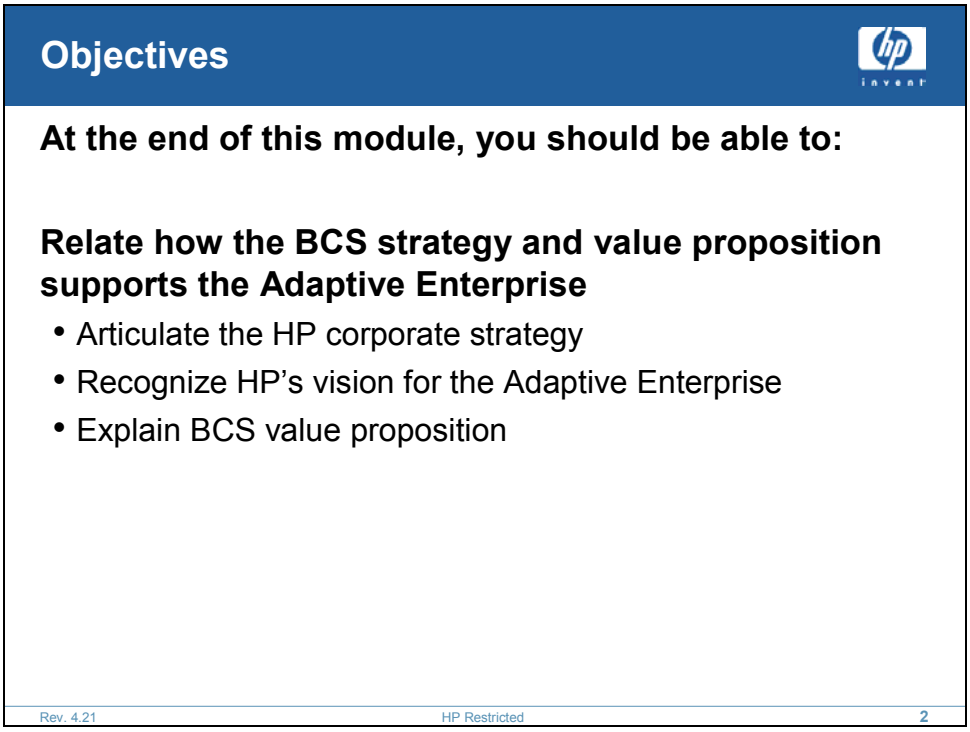
This is the exam for this course, **version 10227 revision 4.21**, and the exam you should take after completing this course. If you take this course before exam HP0-324 is available for download, you must wait for the exam to become available.

Always take the exam that is associated with the version and revision of the course that you take.

STRATEGY

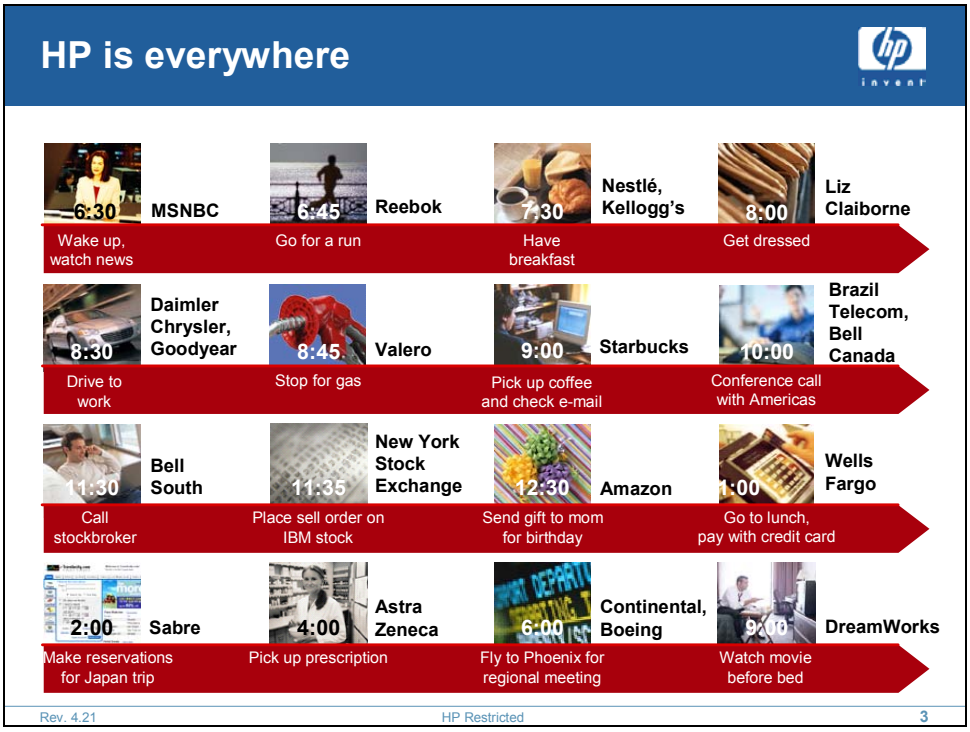


HP and BCS strategy



Objectives

- HP has long-term, extensive knowledge about enterprise customers.
- HP's change +HP initiative is about customer changes and adapting their processes to meet new needs. HP partners need to understand and support this with ability to build adaptive enterprises.
- You can use the HP experience and strategy to support the development of relationships with your customers, identify opportunities, and win deals.



HP is everywhere

With employees working in every time zone on earth, HP is 142,000 strong. We do nearly 60 percent of our business outside the United States, having capabilities in 176 countries, and doing business in 43 currencies and 15 languages.

Our portfolio runs from desktop to print shop, from palmtop to Nonstop, from printers that sell for $49.99 to multi-million dollar enterprise systems. And we think the depth and breadth of our portfolio not only serves our customer's needs, we think it is reflected in our customer base.

For the first fiscal quarter ending Jan. 31, 2004, revenue was $19.5 billion, an increase of 9% year-over-year.

"HP delivered a solid quarter," said Carly Fiorina, HP chairman and chief executive officer. "In a seasonally weak period we demonstrated HP's earnings potential with our most balanced profit performance since the merger.

"Our Enterprise Systems performance was fueled by strong revenue growth in our key hardware businesses. We also improved profitability by $190 million from last year while continuing to strengthen our software portfolio with strategic investments and acquisitions.

"HP Services grew 6% year-over-year despite intensifying pricing pressure in customer support and weakness in the consulting and integration industry. Meanwhile, momentum in managed services continued, with year-over-year growth of 27%. We expect our operating margin performance to improve throughout the year as we continue to reduce our cost structure.

We are in a lot of places that you see every day

HP powers more than 100 stock and commodity exchanges, including 14 of the world's largest. We support 95 percent of the world's securities transactions. We help process two out of every three credit card transactions worldwide and three out of every four electronic funds transfers. We handle 80% of the mobile billing and customer care traffic in Europe and Asia. And we help control 65%of the world's energy infrastructure.

As systems supplier for companies as diverse as Adidas, Kellogg's, Starbucks, Levis, Daimler Chrysler, Verizon, AOL, Nokia, Home Depot, and GlaxoWellcome, we are also in many places that you may not realize. Because we supply servers to Sony and we power Nike's supply chain, we are there when you hit your alarm clock in the morning and when you put on your running shoes.

In similar ways, we are there in the cereal that you pour, the coffee that you drink, the jeans that you wear, and the car that you drive. We are there in the back office when you call your stockbroker, check your email, order books online, or call a friend on your cell phone. We are there in the package you send overnight, the hammer you buy, the prescription you pick up at the pharmacist, and the plane ticket you purchase online. We are there in the tires that get you home, and we will be there tonight when you check game scores on ESPN.com.

HP has four principle business segments

"Our competitive position is strong in each of our core markets: consumer, small and medium business and enterprise. We have good momentum across our businesses, a compelling portfolio and confidence in our ability to increase growth, profitability and shareowner value." Carly Fiorina, 19 February 2004.

Personal Systems Group

Personal Systems Group (PSG) focuses on supplying simple, reliable, and affordable personal-computing solutions and devices for home and business use, including:

- Desktop PCs
- Notebooks
- Workstations
- Thin clients
- Smart handhelds
- Personal devices

PSG is also responsible for HP's emerging businesses in embedded software, embedded computing, home networking solutions, and personal storage.

Talking about 1st quarter 2004 results, Carly Fiorina said, "In Personal Systems we grew revenue in both desktops and notebooks almost twice as fast as our nearest competitor for the second quarter in a row, achieved the No. 1 market share position worldwide and generated record profits."

Personal Systems revenue totaled $6.2 billion in the quarter, up 20% year-over-year and 3% sequentially. Units increased 23% year-over-year, fueled by notebook growth of 52%. On a year-over-year basis, notebook revenue increased 42%, desktop revenue increased 11% with improving average selling prices, and handheld revenue grew 25%.

In the fourth calendar quarter, HP achieved worldwide share leadership in PCs. HP retained its leadership position in notebooks and extended its lead to over 2 points of share. In Europe, HP extended its lead in PCs by gaining almost one point of share year-over-year.

Personal Systems reported an operating profit of $62 million in the quarter, compared with $33 million in the prior year period and $22 million in the fourth quarter. This represents the highest quarterly profit in the Personal Systems business since the merger with Compaq Computer Corporation.

Enterprise Systems Group and HP Support (HPS)

Enterprise Systems Group (ESG) focuses on providing the key technology components of enterprise IT infrastructure to enhance business agility, including enterprise storage, servers, the software division, and a variety of solutions. **BCS resides in ESG.**

- Revenue in Enterprise Systems, which includes the hardware division (enterprise storage and servers) and the software division, grew 5% year-over-year to $3.9 billion. Operating profit for the quarter totaled $108 million, or 2.8% of revenue, a $190 million profit improvement over the year ago quarter. Enterprise storage and servers reported an operating profit of $154 million, or 4.1% of revenue. HP continued to strategically invest and acquire capability in software, which reported an operating loss of $46 million.
- Industry-standard server revenue increased 15% year-over-year to record quarterly revenues, driven by unit growth of 23%. During the most recent calendar quarter, HP extended its share in the x86 server market to almost 33%, the company's highest level in four quarters, fueled by sequential share gains of 3 percentage points in EMEA. HP has 43% market share in Europe and exceeds 50% share in 12 European countries, including the UK, where HP achieved its highest market share since the merger.
- UNIX revenues declined 13% year-over-year, reflecting intense pricing pressure, particularly in the high-end and low-end. Alpha revenue declined 32% year-over-year, and HP 9000 revenue was essentially flat over the prior year period. Momentum in Superdome continued, with unit orders up 52% year-over-year. Revenues from Itanium®-based Integrity shipments continued to ramp, with a sequential increase of 60%.
- Storage growth in high-end and midrange arrays was 14% year-over-year, led by strong customer acceptance of the midrange HP StorageWorks Enterprise Virtual Array, which grew 112%. This was offset by weakness in the high-end and a 5% decline in the tape business, reflecting HP's decision to exit the OEM library business. Total storage revenue declined 2% year-over-year.

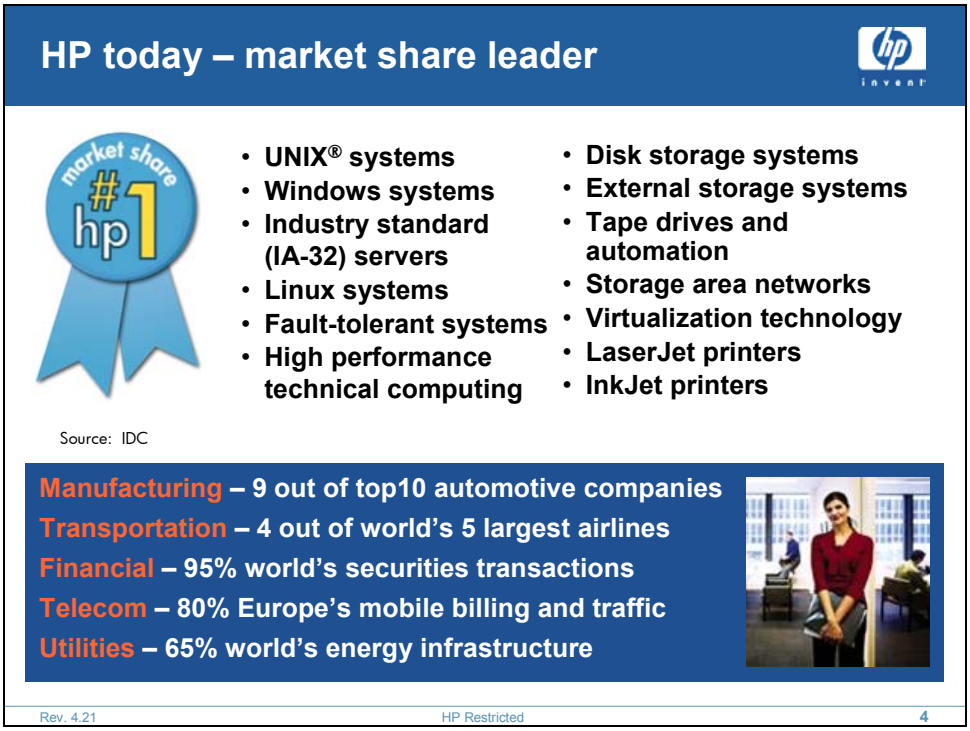
HP Services (HPS)

- Software revenue grew 9% year-over-year to a new first quarter record, with HP
- HP Services revenue was $3.2 billion, up 6% year-over-year. Operating profit was $258 million, or 8.2% of revenue, down from 11.4% in the prior year period. This reflects the lengthening of customer procurement cycles, intensified pricing pressures, continued weakness in consulting and integration revenues and utilization rates and the initial investments associated with some of the large managed services deals won in the past 12 months.
- HP's managed services momentum continued with year-over-year growth of 27% or four times market growth rates. Customer support revenue increased 7% year-over-year. Revenue in consulting and integration declined 10% year-over-year, reflecting continued industry weakness.

Imaging and Printing

Imaging and Printing posted record first quarter revenue of $5.9 billion, an increase of 6% year-over-year.

- During the first quarter, Imaging and Printing shipped 14.4 million hardware units, or over 1 million units a week, an increase of 12% year-over-year. Personal LaserJet unit shipments increased 22% year-over-year, while color LaserJet units grew 27%. Business inkjet shipments increased 28% over the prior year period. All-in-one and photo printers shipments grew 84% and 41% year-over-year, respectively, while digital camera unit shipments increased 42% over the prior year period.
- Digital imaging revenue grew 5% year-over-year as strong camera and photo printer unit growth was offset by declining scanners and lower ASPs. Home hardware revenue grew 6%, reflecting solid holiday sales and the continued shift to all-in-one products. Supplies revenue grew 8% year-over-year against a tough compare and despite lowering channel inventory in the United States given supply chain improvements.
- Operating profit was $968 million, another first quarter record, and represents 16.4% of revenue. Operating profit increased 6% year-over-year.



HP today — market share leader

Every small to medium-size business customer is also a consumer, every enterprise customer is responsible for supplying individual employees with technology, as well as building out data centers.

By hosting all of this customer insight and technology expertise under one roof, HP is able to leverage innovation across its business segments. For example, HP's leadership in digital printing for consumers enables the aggressive targeting of enterprise-wide digital publishing.

The HP corporate strategy

The HP corporate strategy draws on these beliefs:

- Invention is the soul of innovation, and only those companies that make R&D a priority today will continue to lead markets tomorrow.
- Technology should be affordable, intuitive, available to everyone, and should deliver the highest possible value for the money.
- How we do things is as important as what we do. Whether customers are using our products, getting information from the website, calling our support line for help or engaging you, our consultants and engineers, on major IT consolidation projects, that experience should be outstanding.

High tech

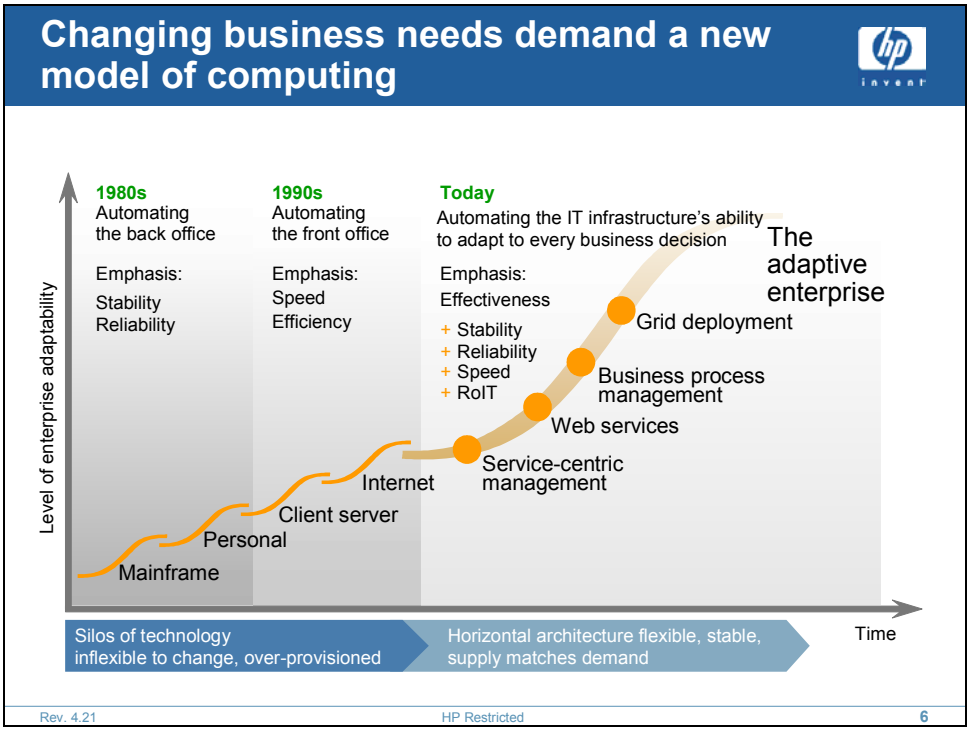
HP has been a leading innovator for nearly seven decades. We invest almost $4 billion annually on R&D where we believe we can make a unique contribution and lead, and we partner for the rest, leveraging more than $10 billion of our partners' R&D investments. We are proud of the fact that we have now achieved the fastest rate of innovation in our company's history as measured by output of new patents and new products.

Low cost

HP's size and scale allow us to offer customers not only competitively priced products, but also a lower cost of total ownership over a solutions lifecycle. Our $52 billion supply chain—the largest in the technology industry—allows us to achieve world-class cost structures and to pass savings on to customers.

Best customer experience

Because we have a unique view into a wide range of customers, we are in a great position to deeply understand their needs and then mobilize our resources to develop technologies, solutions, and services to deliver a uniquely rewarding experience. We are focused on improving how we interact with customers at every touch point—from how they learn about HP and purchase our products, services, and solutions to how they use and manage them.



Changing business needs demand a new model of computing

At HP, we see the current economic and business environment as creating an inflection point for the computing industry, which is leading to a new era of computing that will be driven by business imperatives more than by technology capabilities.

Whereas the last decade was fueled by the possibilities of technology—personal computing, client server computing, and the Internet—this new adaptive era will be driven by a business focus on increasing the value and return from your information technology.

In this new "adaptive enterprise" environment, the total enterprise technology infrastructure will increasingly be viewed as a business asset rather than an expense line. This will shift the job of the CIO and the role of IT from being a cost center to being a service provider for the enterprise, and that in turn will place new demands on the providers of technology.

We call this the "adaptive era," where the IT foundation for a corporation becomes a flexible, utility-like service to the business that is increasingly vital to the operation and increasingly an enabler of new opportunities and competitiveness.

In the future, we believe that:

- Business will be real-time and agile, informed by an immediate view of all core business operations
- The service and technology infrastructure will be adaptive—a shared resource, local and distributed, that can be dynamically tapped to provide services and computing resources as the business requires
- The link between business and IT will be instinctive and responsive, based on service level agreements, automated rules, and intelligent management.An adaptive infrastructure from HP lays the foundation today to realize this future.

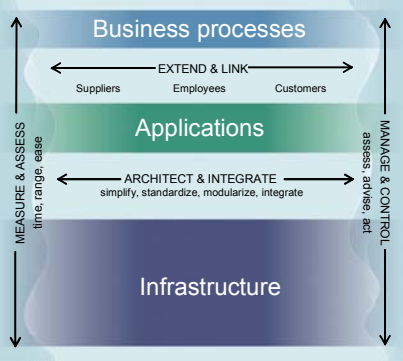
The Adaptive Enterprise

What is it?

It is business and IT synchronized to capitalize on change, allowing companies to execute business decisions more quickly, broadly and easily than ever before.

Implementing Adaptive Enterprise requires four key factors:

- **Simplify**
- **Standardize**
- **Modularize**
- **integrate**



The ultimate state of fitness in a world where every business decision triggers an IT event.

Rev. 4.21 HP Restricted 7

The Adaptive Enterprise

An Adaptive Enterprise is the ultimate state of fitness in a world where every business decision triggers an IT event. HP Adaptive Enterprise is part of HP's new change+HP strategy. It is the umbrella term for HP's vision, strategy, and offerings for the enterprise.

The slowdown in the economy and in technology over the last couple of years is slowly being supplanted by the continued need to provide Value – the best return on IT and technology investment – but has been joined by the concepts of Agility and Simplicity. Agility –the ability to adapt to real-time business needs, and Simplicity – reducing complexity and making it easier to implement changes – are key concepts for customers and ones that HP is ready to implement.

Even with accelerating requirements of business agility, simplicity, and value, your customers still want to know some pretty basic things:

- How do I lower the cost of acquiring technology?
- How do I lower the cost of operating my environment?
- How do I make sure that the investments I make in technology flex with my business requirements?
- Can I choose the technology pieces I want?
- Can I make sure that I stay in control of my environment and in control of my investment?

- How do I stay in control of what is core to my business? The last thing I want to do as a customer is hand the keys of my business over to someone else.
- How do I make sure I have freedom of choice?

The HP adaptive enterprise vision leverages IT to not only support change but to embrace and assert change. It is about driving business strategy and business processes into the underlying applications and infrastructure to fuel business success. For example, how can a car manufacturer move from two new model introductions per year to six without sacrificing quality? How can an entertainment company double its production of animated features without doubling costs? How can a retailer get real-time supply chain insights to solve problems before they happen without risking data leakage?

Four key factors to implement an adaptive enterprise

1. **Simplify** — Reduce the number of IT elements in your network. Eliminate customization. Automate change. Simplify everything and you are prepared for anything.

   Simplification provides a combination of benefits to the enterprise. In addition to reduced management complexity, server consolidation also results in better performance for many everyday tasks, such as backup and restore. In the event of an emergency recovery, for example, a faster time-to-restore translates into less downtime for the business and a smaller financial impact on the enterprise.

2. **Standardize** — Use standard technologies and interfaces. Create reusable components. Implement consistent processes. Interact with any system, anywhere, always. Standardization of IT infrastructure, for example, can be achieved in several ways:

   - Adopting industry-standard interfaces, which reduce communications overhead and speed adaptiveness
   - Establishing common processes and policies for managing change
   - Aligning expectations between IT staff and the businesses they support
   - Ensuring the use of off-the-shelf applications, technologies, and components
   - Defining common requirements for manageability, security, collaboration, configuration management, capacity, and performance management

3. **Modularize** — Build architectures modularly. Break down vertically stacked IT. Virtualize systems. Change one element without affecting the entire network.

   When designing infrastructure architectures, modularity can be achieved in a number of ways:

   - Systems can be grouped based on like business needs.
   - Systems can be constructed to connect and disconnect in near real-time.

- Any group, configuration, or component can be modified without changing the others.
- Outsourcing can occur easily for all IT functions or specific functions, such as a call center or billing.

4. **Integrate** — Build a dynamic link between business and IT. Connect applications and processes inside and out. Watch everything work together. And see change coming a mile away. Integration facilitates ease and change throughout a uniform system that is easy to understand, manage, and modify.

   When complex portions of an IT infrastructure are not optimally connected, and when business systems and applications remain disjointed, attempts to move, reconfigure, or reengineer can be exceedingly difficult and might require the development of costly custom connections.

Business and IT synchronized to capitalize on change

HP recognizes that companies face unprecedented and continuous change. While change is often unexpected and disruptive, those firms that adapt quickly can gain a competitive advantage. These change drivers can be summarized into three primary customer benefits, **simplicity**, **agility**, and **value,** all gained from an adaptive enterprise.

Simplicity

- Reduce complexity
- Implement change quicker and easier
- Ensure resources are working together

Agility

- Adapt in real-time to the business
- Drive change (time, range, ease

Value

- Unlock the value of assets
- Free up resources for innovation
- Create competitive advantage

The HP Adaptive Enterprise strategy

The HP Adaptive Enterprise strategy and vision helps customers increase business agility through a phased approach that identifies where agility can be improved one step at a time. Just like you cannot pull a few bricks out of a wall and hope it remains standing, you cannot immediately break through the rigid infrastructure and hope for an immediate cure for lack of flexibility.

Sounds good, right? The challenge, however, is to bring the solution to an organization without the "rip out and replace" strategy employed by IBM. Instead, the HP Adaptive Enterprise strategy and vision is designed to leverage investments our shared customers have made in past technologies—your customers' technologies, services, and solutions. Your job with the HP Adaptive Enterprise strategy and vision is to help customers leverage and extend their past investments and the powerful knowledge base that is their IT and business professionals.

For the customer, this means that they do not need to invest in different technologies, perform massive migrations, and experience a new learning curve.

For you, our partner, this means that customers will continue to use your products and services without a disruption in your revenue stream.

It also means that, for new solutions, we can present our customers with the best solutions available in the industry today—solutions that meet THEIR requirements as opposed to matching customer requirements to what we have to deliver.

This approach enables all of us as partners to better serve our customers, helping them to improve on their best-of-breed decisions. And with many of these customer/vendor/partner relationships in place, it provides us with the opportunity to identify new solution selling points to increase our value to the customer through new, collaborative offerings.

An Adaptive Enterprise, delivered by a flexible partner that can work within customer parameters to close the gap between business and IT, will help customers be more cost effective, get the most out of their investment, and achieve a strong overall return on their long-term IT investment.

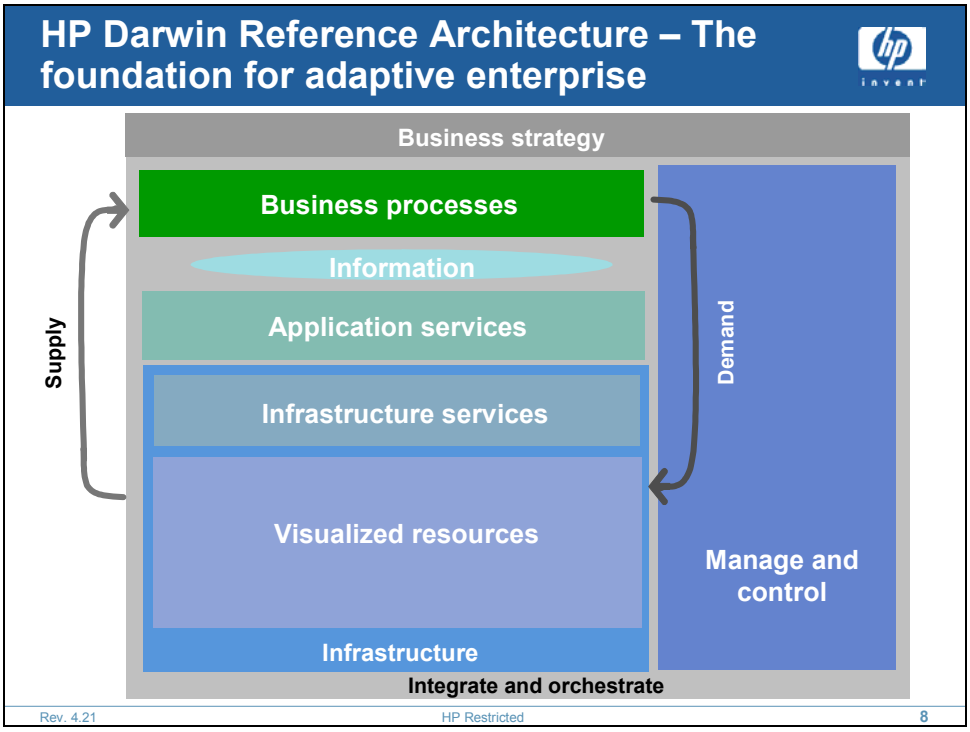
How is our approach different from IBM and Sun?

According to Nora Denzel, Senior Vice President of Adaptive Enterprise, HP:

"The fundamental difference is in the execution and the map that each company uses to help customers realize greater adaptability. IBM says the best way is with a pure IBM solution. Sun says the best way is with a pure Sun environment. HP is taking a different route, a more realistic approach. HP embraces heterogeneity.

For example, we are using industry-standard chipsets that can run multiple operating systems on the same server. We have management software that can manage in a Sun Solaris, UNIX and Windows environment. We have made choices that do not lock customers into certain stacks of hardware and software. We partner with the companies that our customer chooses to partner with.

The other big difference is our focus on enabling customer agility. We define agility as the time it takes to make changes that are mandated by the business. We will actually help a customer assess their own agility, then provide the architecture, products, and services to help them improve it."



HP Darwin Reference Architecture — The foundation for adaptive enterprise

HP Darwin Reference Architecture is a standards-based framework that leverages technology, components, services, tools, disciplines, and practices to:

- Provide a new level of integration between business and IT
- Lower IT acquisition and operating costs, because industry standards drive efficiency and economies of scale
- Provide an evolutionary path to the adaptive enterprise, not a revolutionary path

The Darwin Reference Architecture demonstrates the relationships among business strategy, business processes, and the IT environment required for an adaptive enterprise.

When looking at the Darwin Reference Architecture, think about the whole enterprise horizontally instead of vertically as a set of business processes that link customers to the company, employees to one another, and in many cases, customers and suppliers to all of the above.

Business Processes — a series of actions, changes and functions extended and linked across a value chain to accomplish a business result.

Information — transactional information exchange between business processes and application services to extend and link value chains, and information analysis to motivate new business directions.

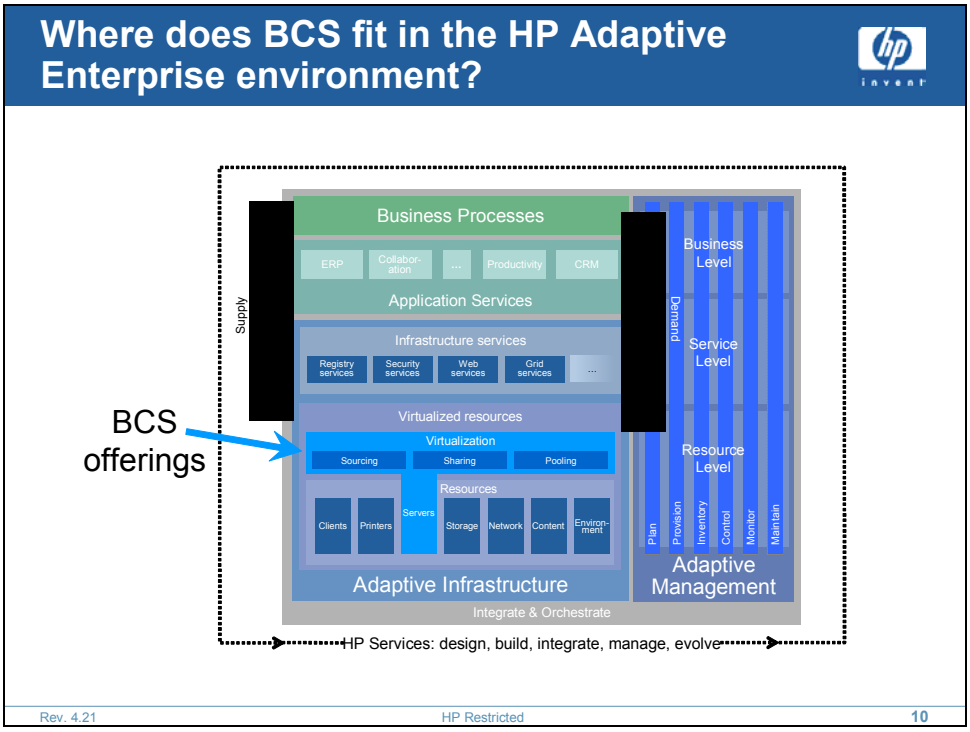
Application Services — applications that act as services to manage information for multiple business processes.

Management and Control — capabilities to synchronize business and IT by managing and controlling information services to support business goals and policies.

Infrastructure Services — capabilities shared by multiple applications that provide basic IT environment functionality.

Virtualized Resources — shared hardware, software and network systems and components that collectively enable information, application and/or infrastructure services.

HP Adaptive Enterprise in the news



Where does BCS fit in the HP Adaptive Enterprise environment?

HP Adaptive Infrastructure includes services, products, and technologies that help customers improve the adaptability of their infrastructure, and includes application services, infrastructure services, and virtualized resources.

BCS offerings include HP 9000 servers, HP Integrity servers, HP ZLE, and HP AlphaServer systems, and fall within the Adaptive Infrastructure of the Adaptive Enterprise.

BCS strategy

Driven by deeper strategic customer partnerships, BCS creates innovative products and solutions that provide the following in your customer's business:

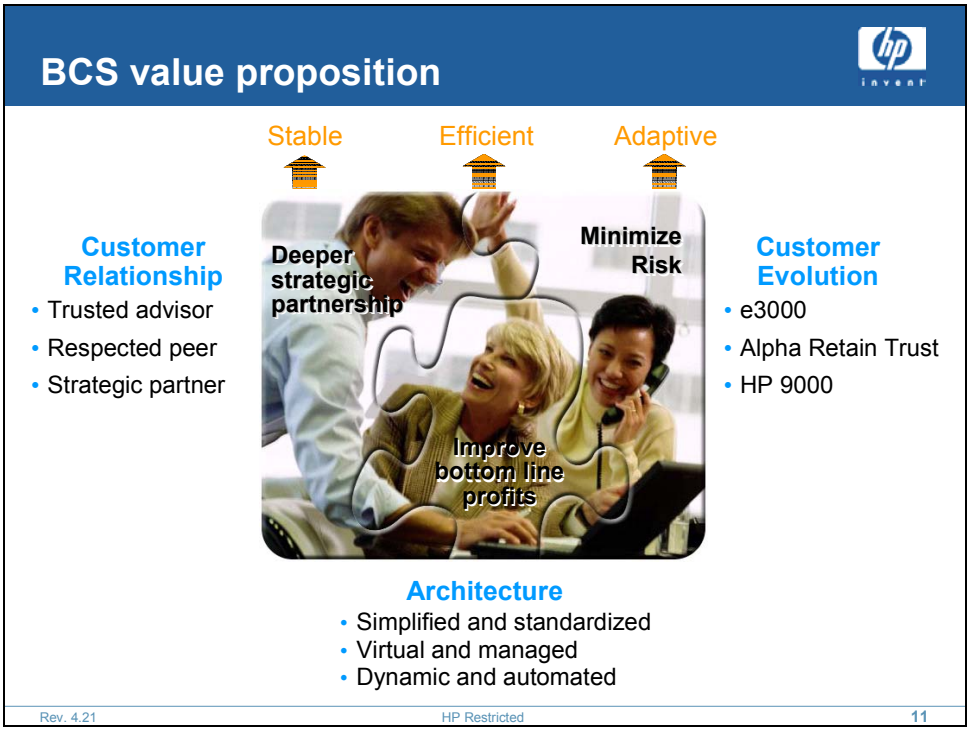
- The lowest total cost of ownership
- Better choice and flexibility
- Assured stability and security

What does this mean to you?

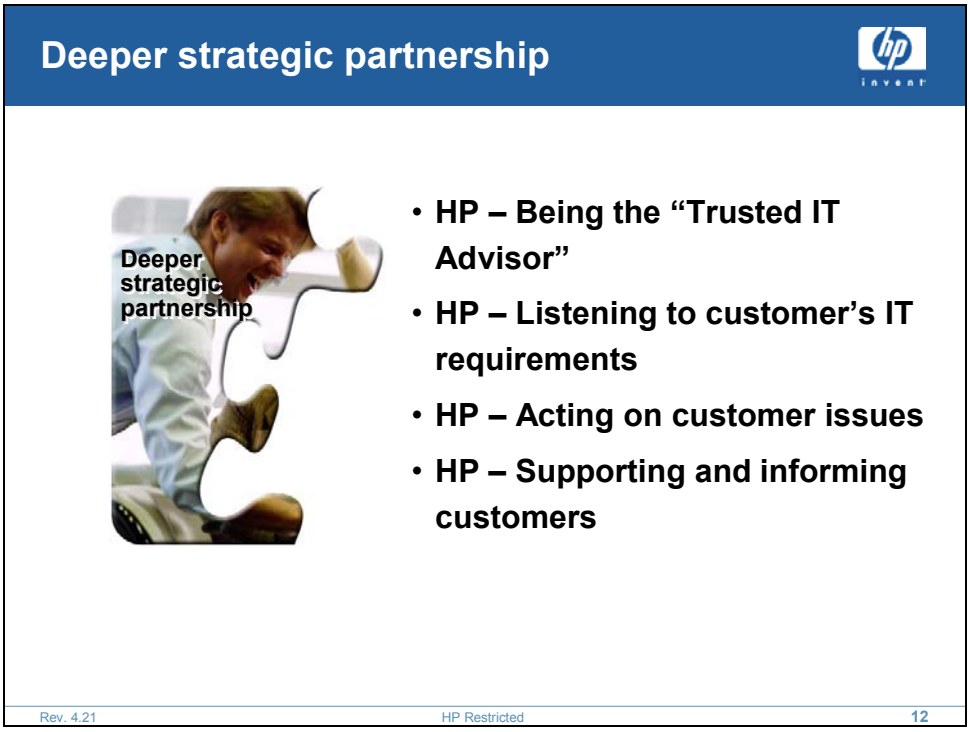
You have a selection of servers, operating systems, and technologies that are built to meet customer business challenges and IT imperatives. Yes, you must know more, but you have a competitive edge because you have the right products and technologies to solve customer problems. If your customers require Linux-based web servers, you do not have to talk them into something else—you can offer them what they want plus the HP value-add outside the box.

Examples of where BCS offerings are making the difference

- Driving the crash test simulation systems for the world’s top automotive manufacturers
- Powering flight operations, disaster recovery, and reservations systems for the world’s top airlines to keep things running smoothly and on time
- Serving as core network elements for the industry's top wireless and wireline operators worldwide
- Providing leaders in online retailing with the infrastructure for data warehousing and server consolidation
- Powering the fastest operational, unclassified supercomputer in the U.S.
- Providing the IT infrastructure for the world’s most powerful supercomputer dedicated to public research
- Integrate 100+ ERP instances into a ZLE integration hub with multi-million dollar savings
- Powering the largest online trading company



BCS value proposition



Deeper strategic partnership

HP — Being a "Trusted IT Advisor"

- Customer relationship programs that help facilitate two-way communication between customers and HP
- Solutions to make opportunities out of challenges facing your customers every day

HP — Listening to IT requirements

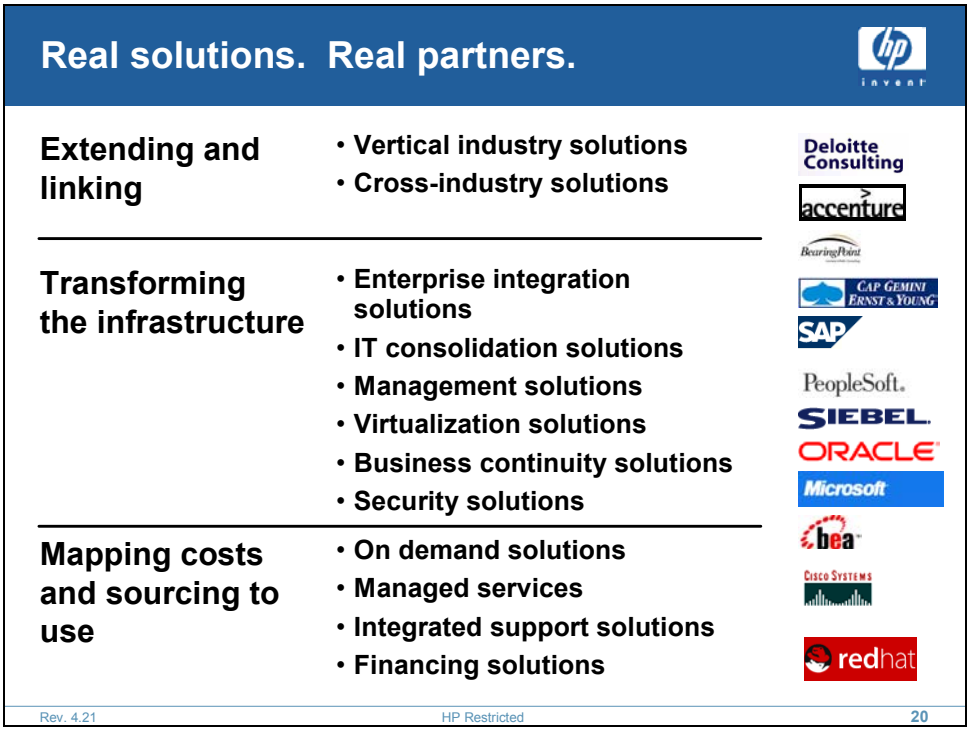
- Executive-level customer advisory councils between CIOs and HP, benefiting from customer experiences worldwide
- Technical Director-level forums and workshops between MIS Directors and HP

HP — Acting on customer issues

- Worldwide User Groups
- Online advocacy with worldwide groups through Advocacy and User Group websites

HP — Supporting and informing

- BCS headquarters resources working together with HP representatives to provide world-class support for our customers
- Customer Times newsletter to provide information and news on all aspects of the enterprise environment

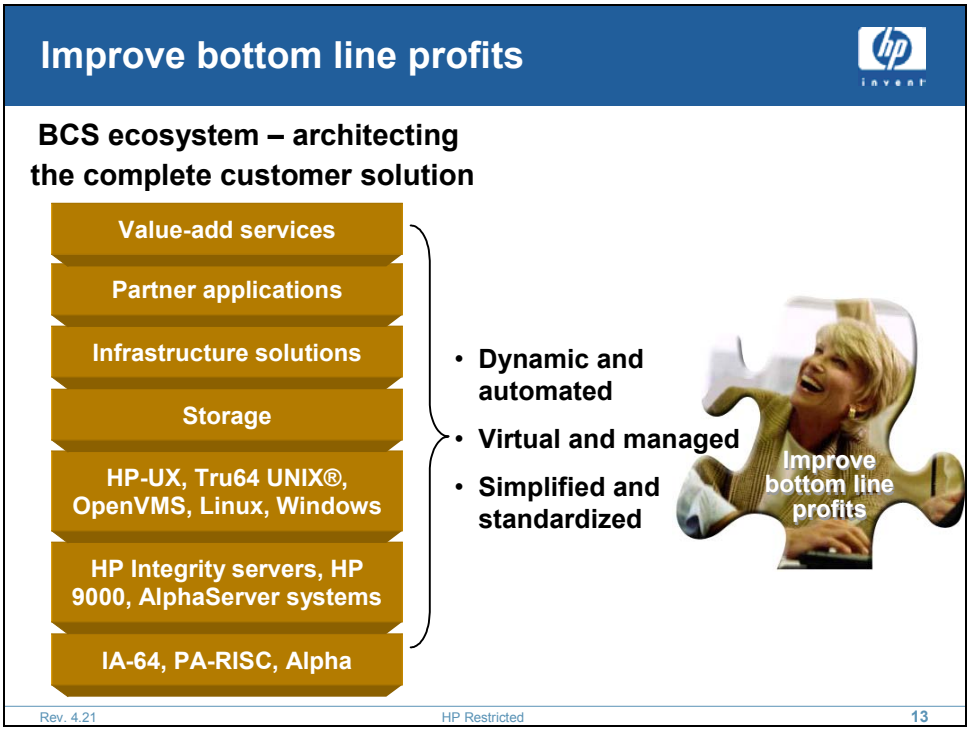


Real solutions. Real partners.

Customers ask how to do the following:

- Identify critical business agility needs?
- Design a blueprint for business agility?
- Integrate diverse applications to gain a cross-functional business view?
- Simplify and reduce the complexity and cost of my IT resources?
- Gain control and insight into applications and resources from a service viewpoint?
- Ensure that my server and storage environment can be shared and pooled for maximum use?
- Build a solid and secure foundation?
- Source and deploy technology so that its use best matches my financial outlay?

Building an adaptive enterprise is a step-wise process, which progressively builds a more adaptive IT infrastructure and increases business agility. It requires a portfolio of solutions consisting of products and services that individually—or together—will progressively transform the enterprise to become more agile. HP has the real solutions and real partners to deliver the adaptive enterprise.



Improve bottom line profits

Customers will ask a couple of different key questions:

1. I want to have an Adaptive Enterprise – where do I start?

   A customer can not go out and buy an 'Adaptive Enterprise'. But it is something they build with our help, often using the components and partners they already have. What the customer does not have is an objective to shoot for – the Adaptive Enterprise – and the knowledge on how to get there. The path a customer takes depends on their particular environment and business priorities – but it is a focused, step-by-step approach.

2. You have been selling me product for years, how is the Adaptive Enterprise different from what you told me yesterday?

   The products that HP is selling today is not that fundamentally different that what was sold last year. What has changed – or better yet become more refined – is HP's vision. This has been the result of talking to customers and HP's own experience with the Compaq merger. What it has helped do is refine the vision of the Adaptive Enterprise, and even better, a measure of Agility that can help customers plan their path to become more adaptive.

The point is that HP can back its strategy with products, services and solutions to help customers simplify, standardize, modularize and integrate their environment. HP is in the one company that can do this without forcing a customer into proprietary products, overt and expensive customization, or dramatic vendor dependence.

Simplify and standardize: HP 9000 and Integrity servers

Dual paths of investment allow customers to pick the solution and timeframe that is right for them. Because PA-RISC and Itanium-based processors share a common chipset across the product lines, evolution through in-box upgrades is simple, which translates into superior investment protection for the customer. And HP provides the tools, partners, and services available to help customers evolve.

PA-8800 puts two CPU cores on a single chip to boost speed, density, and performance

Benefits

- Doubles number of CPU cores in servers across the product family
- Almost doubles performance
- Almost doubles performance density
- Runs the same proven HP-UX 11i operating environment

Significant market momentum for HP Integrity

- Wide deployment of HP Integrity systems at customer sites
  - The Presidential Administration of Chuvashia deployed Windows for greater performance in creating an e*government portal in Russia.
  - First Trust implemented Oracle on Linux for better RoIT.

  - Bell Canada integrated BEA on HP-UX 11i with existing HP servers.
  - Papst-Motoren in Germany implanting mySAP on 64-bit Windows and HP Integrity servers
- Leadership position in 32 new benchmark categories
- 100% of top 30 ISVs committed

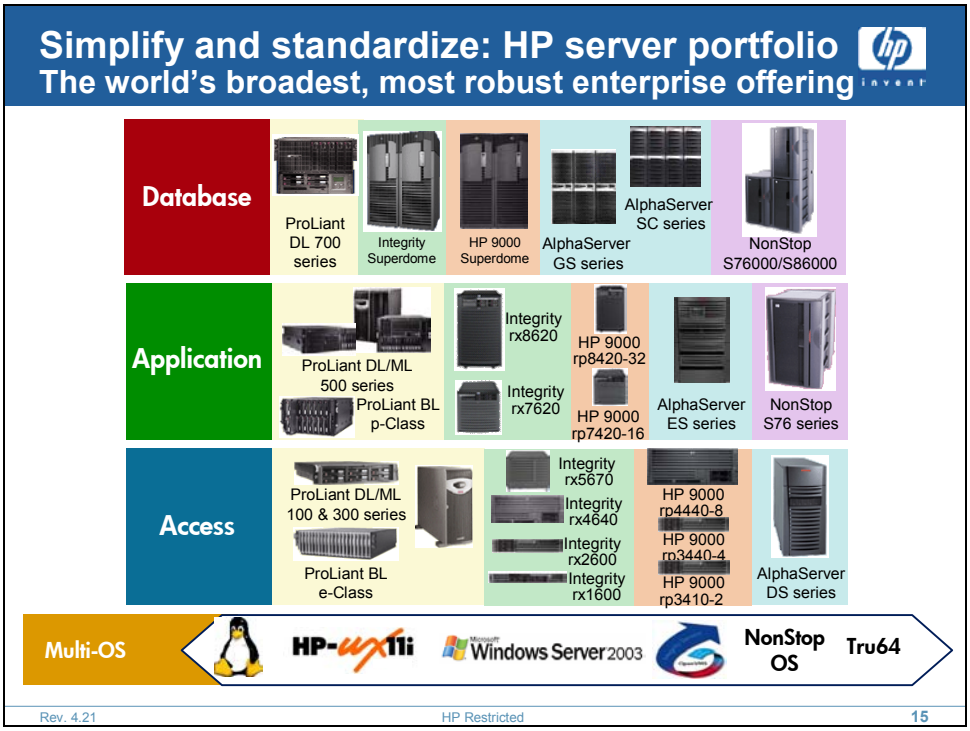
Itanium architecture terms

- EPIC — Explicitly Parallel Instruction Computing, the foundation of the Itanium instruction set architecture jointly developed by HP and Intel
- Itanium processor — Intel branding of the new 64-bit microprocessor
- IPF — Itanium processor family, referring to all processors of EPIC design
- Itanium 2 processor — Intel branding of the second processor of EPIC design

"Customers who have deployed BEA solutions on HP 9000 servers with HP-UX 11i 1.0 will benefit from superior investment protection as they upgrade to take advantage of the new PA-8800 based systems. The combination of BEA's integrated application infrastructure platforms and the proven HP-UX 11i 1.0, with its virtualization and mission-critical capabilities, enable enterprises to respond quickly to the most demanding business needs.

With no change to BEA's software, customers can gain substantial improvements in performance and scalability—all at a lower price than any other option—and still make the move to industry-standard HP Integrity servers when they are ready. The bottom line is better IT service levels, improved business flexibility and greater IT choice."

Rick Jackson
VP Product and Solutions Marketing
BEA Systems

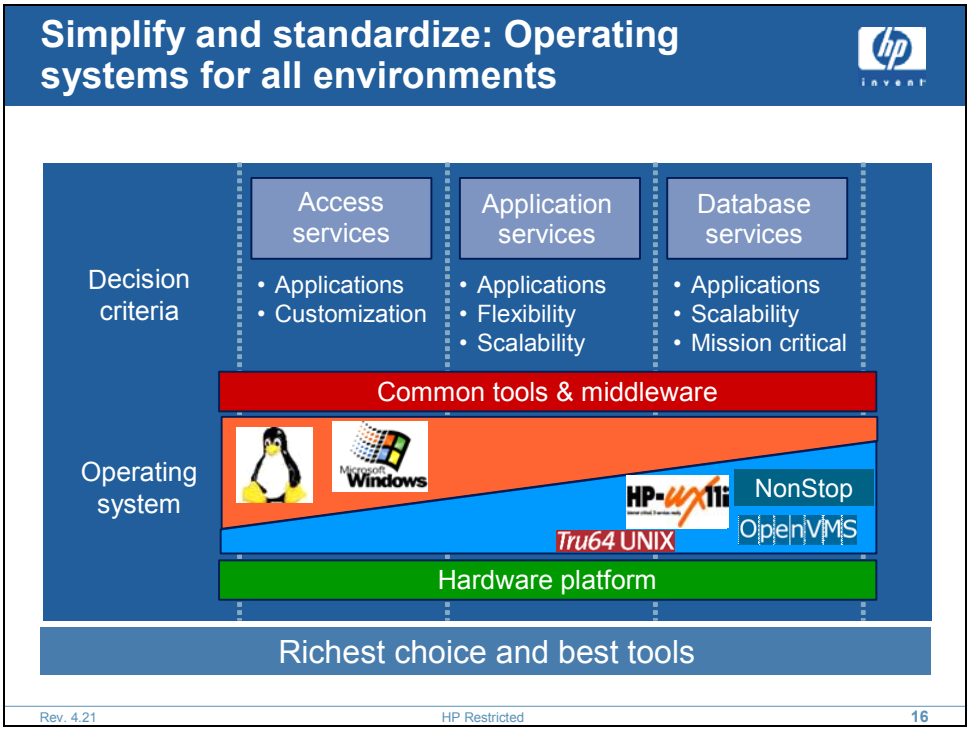


Simplify and standardize: HP server portfolio

Business Critical Systems combines leading technologies and products from both HP and Compaq, including the UNIX server business, NonStop business, OpenVMS, and servers for High Performance Technical Computing (HPTC).

- HP fault-tolerant NonStop servers are unmatched in the market place. The combination of our NonStop and high-end UNIX product lines give us a high-end, high-availability offering that is second to none.
- HP continues to enhance the performance of HP 9000 servers and HP AlphaServers for the UNIX market with supported transition to HP Integrity.
- The HP Integrity servers now cover the entire spectrum from entry-level servers like the rx1600 up to the HP Integrity Superdome with up to 128 processors, world-leading TPC-C and TPC-H benchmarks, and the ability to run three different operating systems – Linux, Windows, and HP_UX.

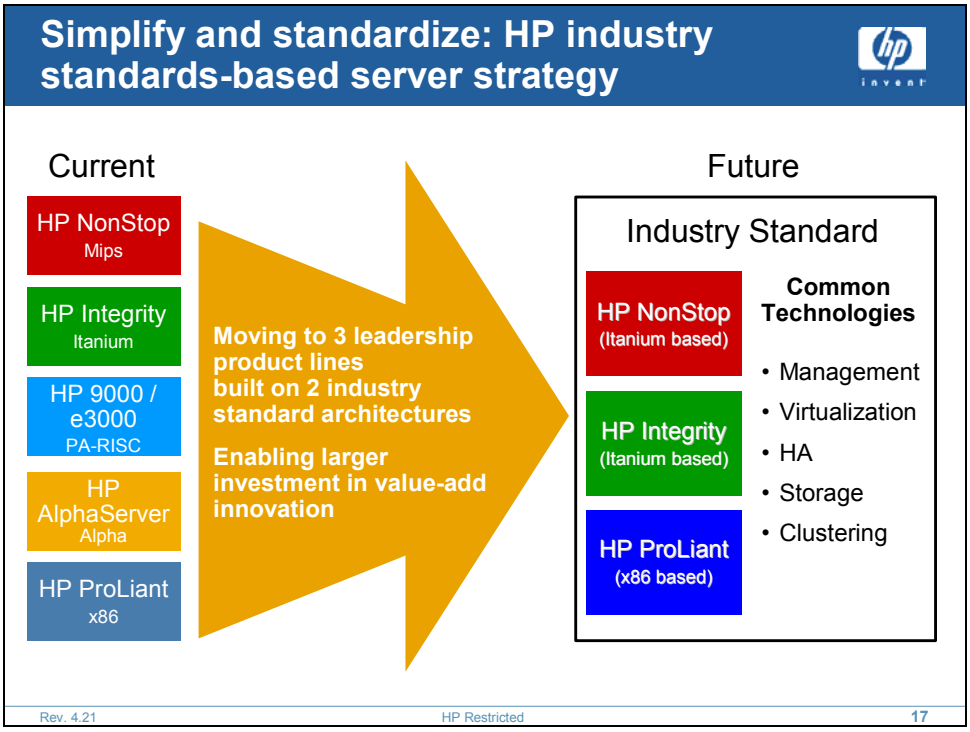
HP is a front-runner in major enterprise markets and dominates the world's most business-critical markets. It is your job to take advantage of HP's position in the marketplace and capitalize on the momentum created by HP.



Simplify and standardize: Operating systems for all environments

By adopting a multi-OS approach, HP ensures that it can provide the right choice for your customers' individual needs. Supported by a robust hardware platform, operating systems are easily integrated through the use of common tools and middleware.

- As HP integrates Linux and Windows, we are able to provide the full spectrum of choice that customers need.
- Our mission-critical operating systems, such as UNIX, NonStop, and OpenVMS, are proven in the most demanding application areas.



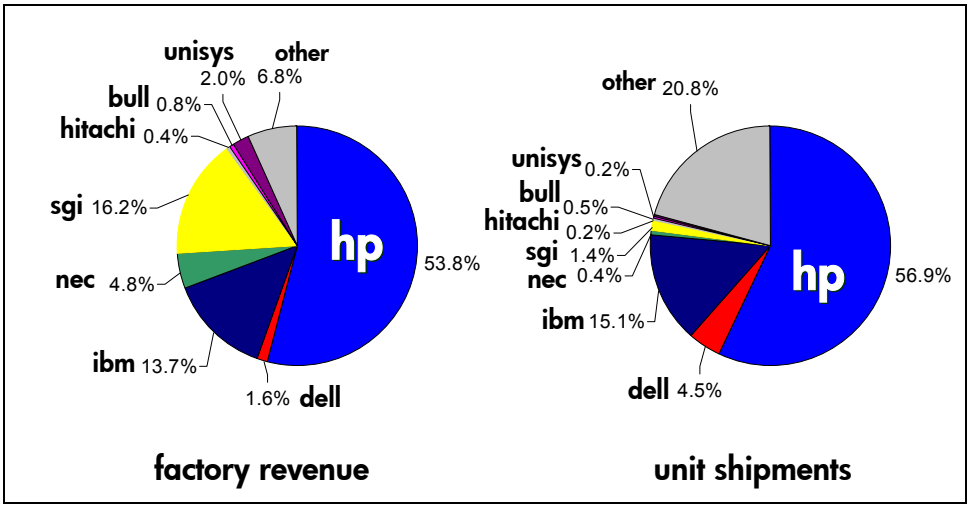
Simplify and standardize: HP industry standards-based server strategy

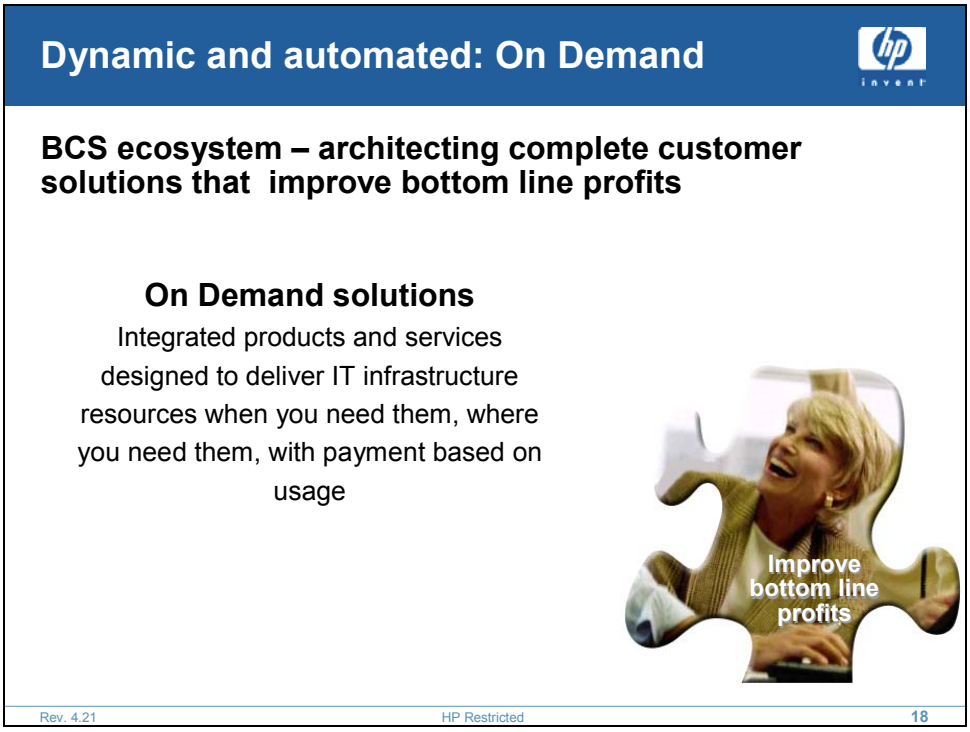
- HP industry server strategy offers choice and flexibility through industry-standard technologies and multi-OSs:
  - Run any combination of HP-UX, Linux, Windows, and OpenVMS on the same system.
  - With partitions, run multiple operating systems concurrently on the same system.
- Obtain higher performance and lower costs through economies of scale, leveraged costs, and next-generation technology.
- Competitors invest hundreds of millions in proprietary processor architectures, inflating the cost of their products to you and your customers.
- The economies of scale of deploying industry-standard processors across all our server product lines will translate into lower-cost systems.
- HP's Itanium-based servers are proven price/performance leaders
  - Best 4-way TPMC, 4-way SAP – SD and ATO – Specweb 99 SSL, Spec JBB 2000
    - SD = The Sales and Distribution (SD) Benchmark, the most popular SAP benchmark, is usually reported on either 2-tier or 3-tier configurations and is measured in number of users.

- ATO = The Assemble-to-Order (ATO) Benchmark is the second most popular benchmark, and integrates process chains across mySAP Business Suite. The ATO scenario is characterized by high volume sales, short production times (from hours to a day), and individual assembly for each order. Examples include PCs, pumps, and cars.

- The overall capability and affordability of Itanium-based systems is supported by strong adoption in technical computing and the growing adoption in commercial markets:
  - All major technical ISVs ported to Itanium.
  - Installations include the world's largest Linux supercomputer.

Worldwide EPIC/Itanium-based servers by vendor revenue and shipments in q4 cy2003





Dynamic and automated: On Demand

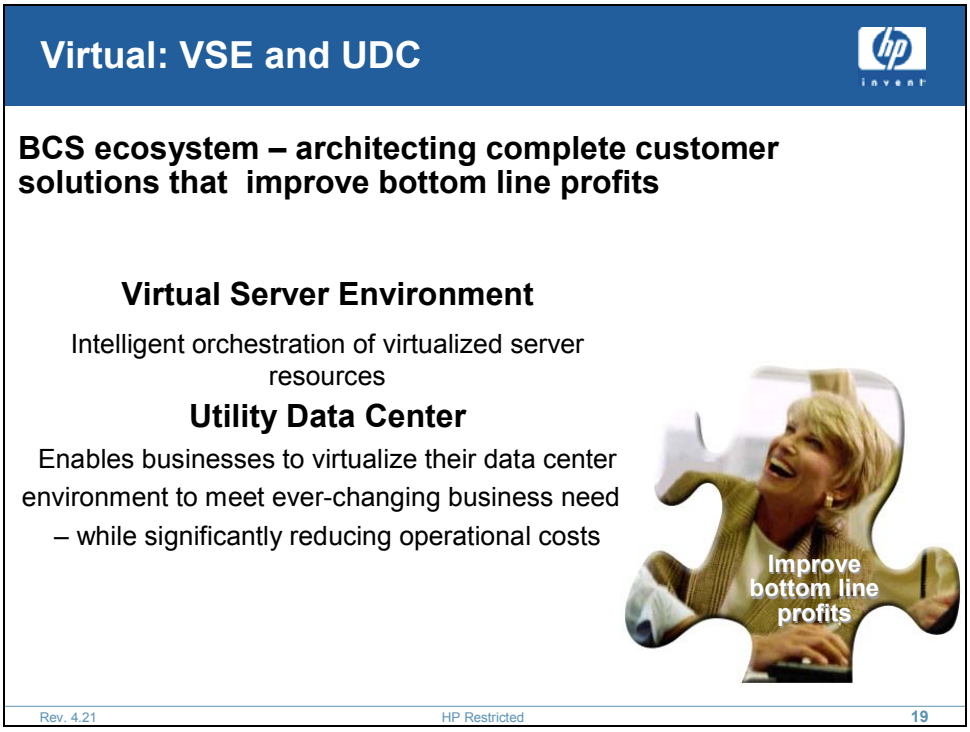
Your customer needs solutions that will change as their business needs and demands change. That is what HP On Demand solutions are all about.

HP On Demand solutions are IT solutions with more control, flexibility, and choice.

An alternative to traditional IT ownership and support, On Demand solutions give your customers more control over usage and costs without sacrificing performance. By offering a payment plan based on actual or planned usage, HP solutions help customers respond quickly to change and opportunity without depleting their budget. Integrating products, services, and financing to deliver IT resources their way, HP offers several practical, cost-effective approaches that make aligning IT resources with fluctuating demand remarkably simple. Think of a utility—like any utility, you have the flexibility to adjust your IT infrastructure as needs change.

By offering this innovative way to buy and manage IT, On Demand solutions deliver total business value, with benefits that include:

- Reduced total cost of ownership
- Mitigated risks
- Wider flexibility
- Faster time to solution
- Higher return on investments



Virtual: VSE and UDC

HP Virtual Server Environment

HP Virtual Server Environment (VSE) is an integrated server virtualization offering for HP-UX servers that provides a flexible computing environment maximizing usage of your server resources. VSE consists of a pool of dynamically sizeable virtual servers. Each can grow and shrink based on your service level objectives and your business priorities.

The HP Virtual Server Environment enables you to:

- Achieve better RoIT through optimized resource use
- Increase business agility through the ability to allocate resources on the fly
- Ensure service levels through continuous real-time assessment, advice, and action

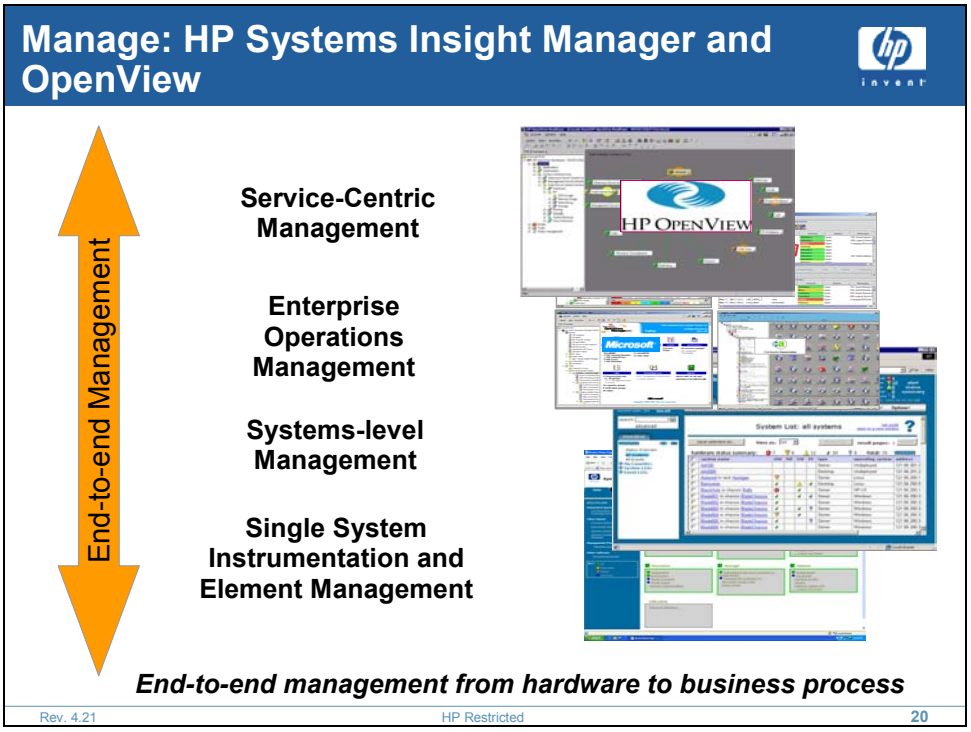
Utility Data Center

HP Utility Data Center solutions enable businesses to virtualize their data center environment to meet ever-changing business needs while significantly reducing operational costs.

Through the consolidation and standardization of data center resources and the automation of data center activities, you can virtually design, configure, and dynamically allocate and reallocate resources with drag-and-drop simplicity via a Web-based interface. The result: huge savings in time, staffing, and equipment costs throughout your organization.

The HP utility data center enables customers to:

- Dynamically shift resources among applications optimize capacity use.
- Build an adaptive architecture designed to meet needs today and tomorrow
- Boost business agility and reduce operating costs up to 50%.



Manage: HP Systems Insight Manager and HP OpenView

One of the most important steps to becoming an adaptive enterprise is to make sure IT is aligned with the needs of the business. To do this, people, process, and technology must be integrated to automate the link between business and IT. HP management solutions provide simplified synchronization between business processes, technology resources, and the people who run them so that businesses can proactively meet their needs.

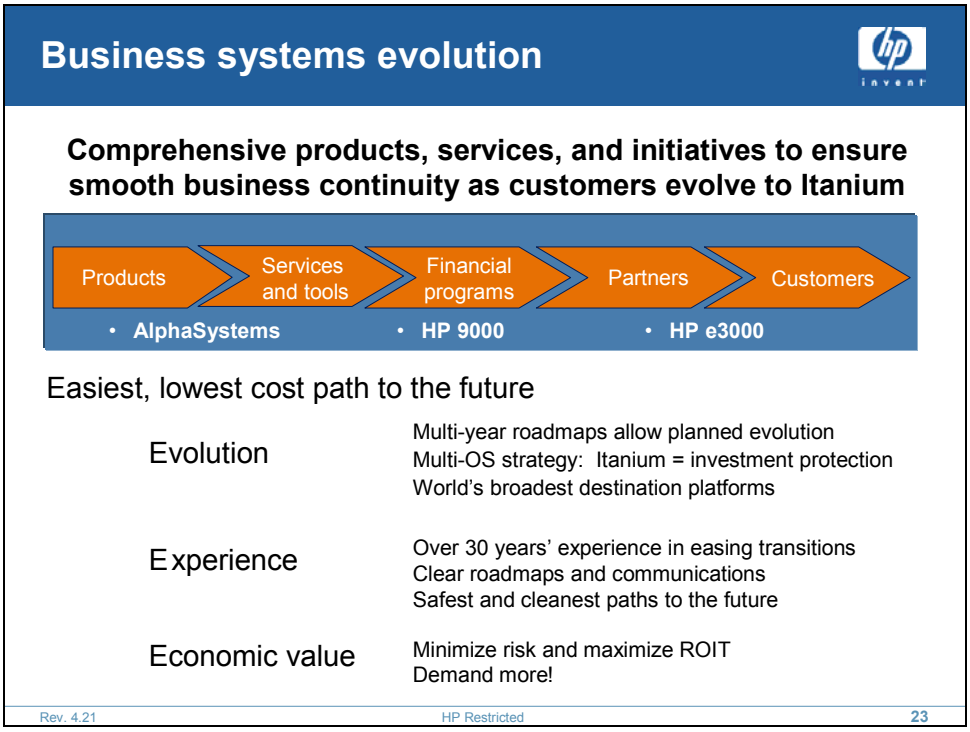
Product Features

HP OpenView	HP Systems Insight Manager
▪ Multi-vendor systems management ▪ Network topology discovery and monitoring ▪ OS and application performance monitoring, event notification, and trend analysis ▪ Service-level availability and resources dependency monitoring ▪ IT process automation ▪ Multi-platform support	▪ In-depth hardware lifecycle management ▪ Hardware status and fault monitoring ▪ Systems configuration data ▪ Software version control ▪ Inventory data collection reporting ▪ Extensibility with lifecycle management plug-ins ▪ Hosted on Windows, HP-UX, and Linux

Minimize risk

In response to our customer's wants, HP ensures a smooth evolution:

- Time and pace of evolution set by the customer
- HP applies knowledge gained from previous technology evolutions
- One-on-one approach to build custom evolution plans to transition from HP 9000 to HP Integrity servers
- ISV program that ensures availability of the customer's full ecosystem on Integrity as well as on HP 9000 through the transition
- Predictable and consistent product roadmaps to facilitate reliable transition planning
- Complimentary and fee-based services to meet their needs



Business systems evolution

Our goal is to help customers achieve a smooth transition to the future by leveraging proven expertise and integration experience in many essential areas. There are four major approaches most customers are using to evolve their IT environments to new HP Integrity servers:

- Integrate servers into existing infrastructure
- Consolidate multiple systems
- Transition by replacing existing servers
- Re-architect the environment

When talking with customers about technology and platform changes, it is important to emphasize that we are not talking about "migrating" in the painful use of the word. Most customers will evolve toward their goal of a flexible IT environment and they will do so at their own pace. Through planning, and by leveraging the tools, programs, and services available through HP, customers can incorporate new technology in a way that preserves their investment in current technology and enables them to control costs and manage risks.

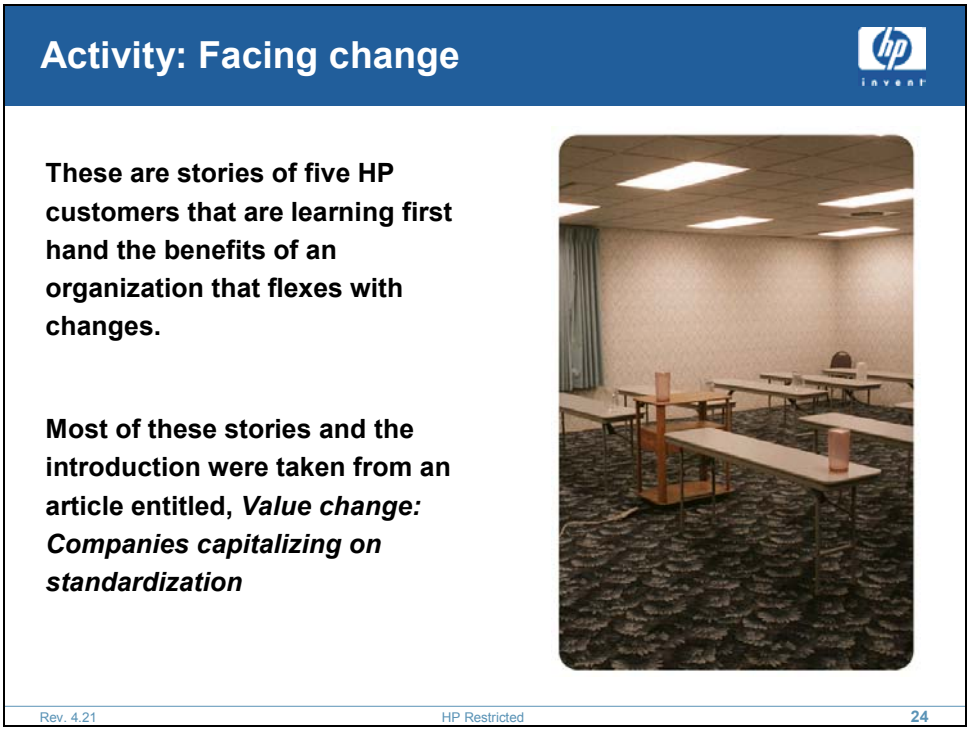
The e3000 Transition Program — New system sales through 10/31/04 with HP support through 12/06

- Flexibility — Delivering on and beyond storage and support roadmap commitments along with listening and responding to needs of the community
- No-charge education, advice, training — Webinar and white paper series, web-based training, transition assessments

- Application ISVs — Partnering with application ISVs for loaners, consulting, and benchmarks to ensure solutions are ready on other HP platforms
- Extensive migration service offerings — Choice of HP Services, Platinum partners, and tool or service transition partners
- Compelling investment protection programs — Software license transfer, loaner program, hardware conversion kits, investment protection program, and more

The Alpha Retain Trust program business value through evolution

- Comprehensive customer initiatives — Keeping you informed and knowledgeable about our current and future plans
- Excellent products — Delivering leadership products on the key attributes you have relied on for yearsStrong partner support — Working proactively with our ISVs to ensure continued support for customers' applications
- Extensive service offerings — Enabling joint transition planning at their own pace
- Compelling business practices — Offering a suite of investment protection choices



Activity: Facing change

Your Task

1. Read the introductory section and your assigned customer story.
2. In teams, read and complete the worksheet at the end of the article for your assigned customer.
3. Select a presenter for your team to report back to the class.
4. Think about how standardization can move your customer toward a more adaptive enterprise.

Introduction

What is the most effective way to manage change and reduce the risk of adapting to rapidly emergent business dynamics? What is the best way to deliver a high level of business agility? Start with industry-standard architectures, reusable components, and consistent implementations as the approach to the IT infrastructure.

Response to business changes requires more than just a few lines of code from IT. It is vastly more complex than adding a few servers or a new database. Instead, each new business change contains multiple requirements for people, process, and technology that run as numerous, horizontal layers throughout the enterprise. These requirements emphasize the need for a standard approach to business and IT that easily adapt to rapidly changing business needs, requiring a framework that breaks down monolithic structures and promotes reuse of components throughout the enterprise. This framework enables customers to deploy new resources at their own pace, adhering to their own standards and procedures that support how work gets done.

Adaptive Enterprise Design Principles

Using best practices developed with thousands of customers, our design principles of simplification, standardization, and modularization are applied consistently across business processes, applications, and infrastructure.

Industry-standard architectures — Move to a standards-based environment across technologies, interfaces, architecture, and processes to lower costs and facilitate collaboration with partners, suppliers, and customers.

Reusable components — Convert monolithic application structures into modular, reusable components and virtualize IT resources through sharing and pooling to dynamically balance IT supply and business demand.

Consistent implementation — Remove complexity from the business and systems wherever possible by reducing the number of business processes, applications, and interfaces, as well as eliminating customization and automating change

With an IT infrastructure that flexes with business requirements and provides customers with the benefit of easily altering, mixing, and matching existing and new services, products, and solutions based on their tactical and strategic business requirements, they will be able to embrace change and enable IT to become an increasingly competitive asset of the corporation.

That's what our customers and our partners around the world have learned. Here are their stories:

Customer Stories

PlanetGov and the Internal Revenue Service Seek Simplification and Integration

HP partner PlanetGov has been chosen by the Internal Revenue Service (IRS), a branch of the United States Department of Treasury, to implement an industry-standard server and network storage solution that will enable the IRS to modularize, simplify, integrate, and remotely manage its information systems. Under the terms of the agreement, the IRS expects to replace a percentage of the 4400 IBM and Dell servers and approximately 30 storage area networks currently in use with approximately 3000 industry-standard HP ProLiant servers, including blade servers, and 30 HP Storage works storage area networks.

Says Steve Baldwin, CEO of PlanetGov, "HP assisted us in meeting the IRS requirement of a 'partnering solution.' Together, we are providing the IRS with a blueprint for the implementation of emerging technology through the consolidation of servers, while providing maximum storage capabilities and efficient system management tools and practices for network enterprise solutions."

KCM SA: Immediate ROI After Moving From Proprietary Mainframe

When a slow economy saw the price of nonferrous metals drop to near-historical lows, KCM SA in Bulgaria, a leading producer of these metals, sought a means to reduce costs and make more informed business decisions. Not only did the company need to adapt quickly to current market conditions, it needed to lay the groundwork for strategic change and future rapid adaptation. To help improve its competitive edge, KCM decided to replace its proprietary mainframe with open-industry standard technologies, implementing SAP solutions running on Windows Server 2003 and 64-bit SQL Server 2000—solutions powered by HP Integrity servers based on Itanium 2 processors.

"We're modernizing our IT infrastructure to deliver consistent business and technical information across KCM and reduce the cost of production," says Dimitar Nestorov, head of IT, KCM SA. "The combination of technology from HP, SAP, and Microsoft gives us an industry-standard solution with superior price/performance that positions us well for the future."

KCM began to achieve a return on investment in the early stages of its implementation by using Itanium-based HP Integrity servers and SAP R/3. The extreme speed of the HP Integrity servers and excellent performance of SAP software on the new systems allowed tuning of these Microsoft and SAP solution components to be completed ahead of schedule, saving money and time that would be put toward additional testing to improve the overall quality of the solution. Once deployed, the HP Integrity servers' performance enabled faster processing and reduced query time, enabling improved decision support and increased productivity.

"Itanium-based HP Integrity servers are so fast that we have more time to spend ensuring a successful implementation," says Nestorov. "It's a great luxury to have more time to think and test within the project timeframe to help maximize our long-term return on investment." The move from a proprietary mainframe to open, industry-standard HP systems running Windows is expected to result in additional ROI. The open solution will be less expensive to maintain, changes will be faster and easier, and software development resources will be less expensive and more readily available.

Commonwealth Bureau of Meteorology

Founded in 1906, the Commonwealth Bureau of Meteorology (BOM) is the national meteorological authority for Australia. Headquartered in Melbourne, its role is to observe and understand Australian weather and climate, and provide meteorological, hydrological, and oceanographic services that support Australia's national interests and overseas obligations.

The BOM's main service offerings are climate data, forecasts, warnings, observations, numerical weather predictions, and satellite and radar images. The organization has many objectives it needs to fulfill but, ultimately, the most important is the safety of life and property.

According to the BOM's Peter Gigliotti, the Assistant Director of Central Operations and Systems, by its very nature as a scientific service organization, the BOM has made extensive use of IT over the last 30 years. Its ability to continue to meet its objectives has become heavily dependent on the standard of its computing and communications infrastructure.

The BOM's existing IT infrastructure consists of two supercomputers jointly owned by the BOM and the CSIRO that are based at the organization's head office in Melbourne. There are 30 HP N-class UNIX mid-range servers located there, with 40 other servers or workstations spread among the regional offices throughout Australia.

Because most databases cannot handle the BOM's requirements and the timeframe in which they need information, they operate a separate database called the Naval Environmental Oceanographic Nowcasting system, developed by the US Navy, which holds data in a compressed format while metadata is stored in an Oracle relational database management system. The Bureau designs and develops its own software solutions, with some assistance from a number of universities here and overseas. This visualization software has to be tailored to handle complex text, tables, and maps.

When the decision was made to consolidate and align the IT infrastructure in the BOM's major research groups with current operational systems, a number of solutions were needed that were flexible and capable of handling its extremely complex operations.

"We were looking to make sure both Centres moved to the same operating systems, this would streamline the transfer from research to operations and reduce management and direct costs," explained Gigliotti.

"The new rp8400 addressed our requirements nicely, and we want to take advantage of the increased power and reliability the rp8400 possesses. The HP rp8400 allows us to begin the consolidation of the number of servers in use at the Bureau. Not only does one single HP rp8400 replace five machines, but can also support instant processor upgrades as capacity needs to be increased."

"It's hard to go past a machine with a 16-processor server, powered by 750 megahertz chips. Memory capacity has also increased with a number of self-monitoring and recovery features. The hardware and software partitioning, and workload-management functions are also impressive."

The Texas Learning and Computation Center: Catalyst for Research

The Texas Learning and Computation Center (TLC2) was created through a partnership between NASA's Johnson Space Center, state government, and the University of Houston. It is a catalyst for research and home to many of the most successful researchers on the campus of the University of Houston. Accessible to all University departments, TLC2 has been chartered with advancing areas of education, training, and research related to computational and computer sciences. It has also enhanced the integration of computer-related technologies into multiple university disciplines, such as environmental studies, petroleum exploration, biology, biomedicine, chemistry, and physics through its state-of-the-art computational, storage, visualization, and networking facilities.

"It was very apparent that an increasing number of relevant application solutions would benefit from a 64-bit architecture," elaborated Professor Johnsson Director of the Advanced Computing Research Laboratory (ACRL) and TLC2.

"Throughout the evaluation, it was very evident that HP's interest and commitment to the Itanium platform was far ahead of any of its competition, and we were very aware of HP's reputation for excellent customer care and support."

The selection of HP as the preferred solution provider was swiftly followed by purchase of the necessary equipment. Initially, ACRL acquired 20 nodes with an additional 41 nodes soon thereafter. The ACRL cluster now consists of 60 HP zx6000 workstations with dual 900 MHz Itanium 2 processors and an HP Integrity rx5670 4-way server with 1GHz processors, all running the Linux operating system. ACRL's research is focused on new and innovative ways to harness computational resources for scientific and engineering applications. In November 2002, ACRL announced a record-breaking cluster interconnect performance by surpassing data transfer rates of 385MB per second and latencies of four micro-seconds using the HP Itanium 2-based cluster with SCI interconnect and Scali software.

About a year after ACRL's first procurement, TLC2 procured a 152-node HP Integrity rx2600 system based on server nodes with dual 1.3GHz Madison processors. The selection of the Itanium-based platforms and the Linux operating system has provided the ideal environment for ACRL and TLC2 to conduct leading-edge computer and computational science research and actively participate in the global open-source research community.

Professor Johnsson reflected on the initial successes of the research groups using the Itanium-based cluster and the experience with HP as solution provider. "Thanks to HP and its commitment to Open Standards and software and the power of Itanium-based solutions we are firmly convinced that our choice maximizes the impact of our research in addition to providing a cost effective solution to our needs. We have blurred the barriers of time, distance and learning styles to create a world class facility that contributes significantly to the many programs, institutes and research groups affiliated with TLC2."

PAPST-MOTEREN Turns Up the Heat on Manufacturing

PAPST-MOTOREN GmbH & Co. KG is a leading global manufacturer of state-of-the-art thermal management solutions for the electronics industry supplying many leading IT vendors, including HP. Innovation is a company-wide theme and, many years ago, PAPST began to view IT as a component of corporate success.

After running SAP R/3 in parallel with the SAP mainframe system in use since 1984, the decision was reached to migrate all functionality to the R/3 system and shut down the mainframe. Says Gerhard Eberbach, head of organization and IT at PAPST, "Supporting two different architectures was proving both costly and inefficient. We needed to streamline our IT operations and focus our energies. The way forward lay in a homogenous, cost-efficient environment based on industry standards."

PAPST decided to build its new, standardized platform around Intel-based HP servers running Windows NT. The migration to R/3 was completed in 2001 and the mainframe switched off in 2002. Shortly afterward, the company accomplished seamless integration across the enterprise by linking its computer-aided design/product lifecycle management solutions to the SAP system and by 2002 had more than 50 Intel-based HP servers in operation, eight of which were used by SAP R/3.

But PAPST was far from finished. Consistent growth saw the number of R/3 users leap from 150 to 600. The decision was reached to upgrade to SAP R/3 Enterprise.

With HP partner Bestcom, an analysis revealed that IT consolidation would generate significant cost efficiencies and provide a solid protection of investment. A consolidated landscape replacing all eight servers supporting the SAP system called for massive computing power. Bestcom proposed two HP Integrity rx5670 servers, both equipped with four 1.3GHz Intel Itanium 2 processors and 12GB memory. PAPST was particularly interested in the increased performance offered by 64-bit Itanium 2 processors. Given that HP Integrity systems are designed specifically for demanding enterprise execution tasks, PAPST was confident that the new platform would improve process efficiency across computationally intensive design and enterprise resource planning tasks. Equally important, high availability ensured that customers could place orders without fear and upgraded capabilities for remote monitoring and automated tools allowed Bestcom to tackle all operating issues within five minutes. To top it off, key batch jobs ran about 25% faster, ensuring quicker access to critical business information.

Activity Worksheet

Company name: _____

Product/service: _____

The challenge: _____

_____

_____

The solution: _____

_____

_____

_____

_____

The outcome: _____

_____

_____

_____

_____

Why they chose HP: _____

_____

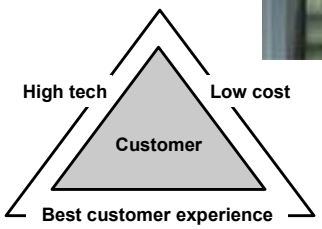
_____

_____

_____

Why HP

- Proven technology innovation that drives real business results
- Affordable technology that offers the best return on investment
- Dedication to customer satisfaction that creates a superior customer experience



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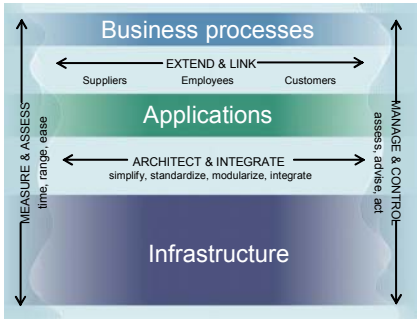
Why HP

Summary

- HP is everywhere
- The HP corporate strategy
- The adaptive enterprise
- BCS strategy and value proposition



BCS Strategy

Driven by deeper strategic customer partnerships, we create innovative products and solutions that provide:

the lowest total cost of ownership, better choice and flexibility, and assured stability and security

where it matters most in your business

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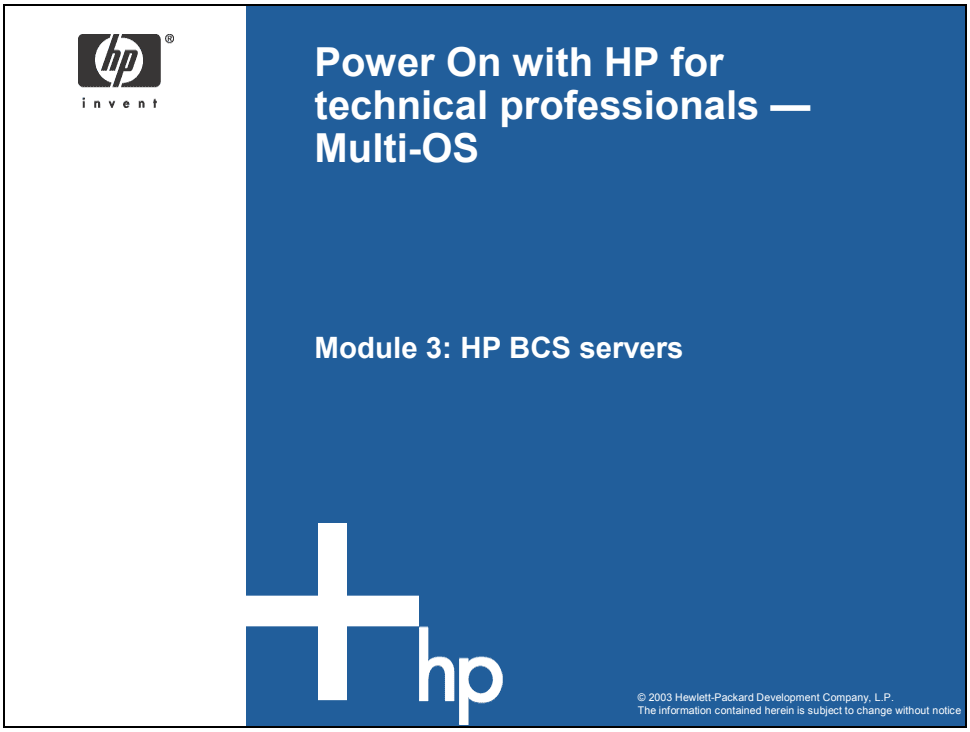
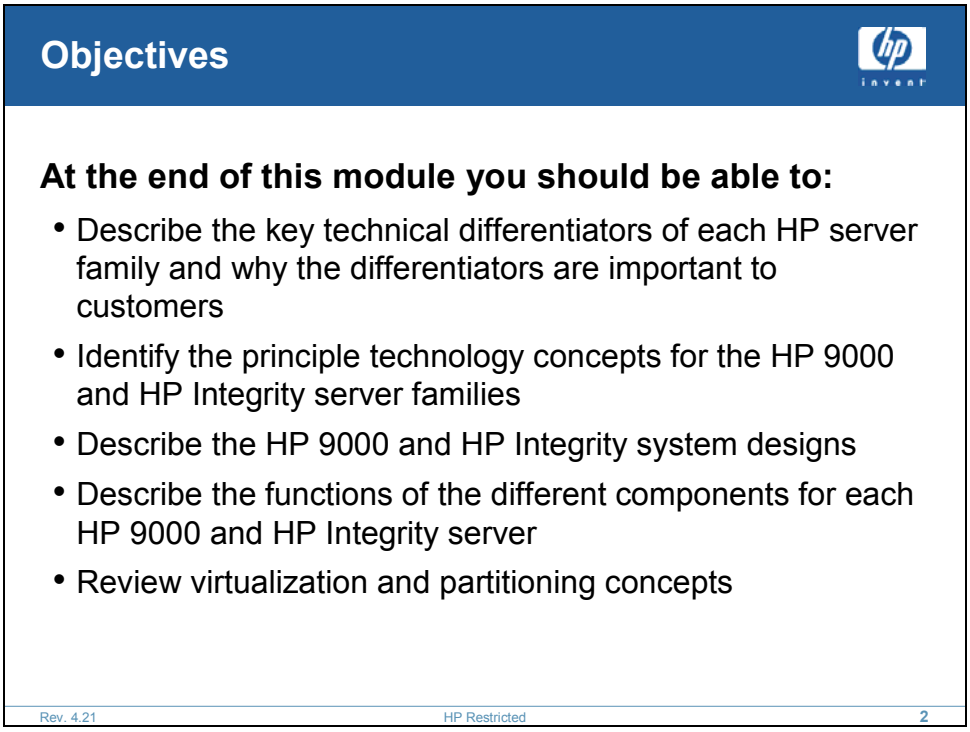
Summary

SERVERS



HP BCS servers



Objectives

> "Driven by continued strong customer demand for its ProLiant servers, HP (NYSE:HPQ) today reaffirmed its #1 position worldwide in the markets for x86, blades, Linux and Windows servers—the fastest growing segments of the server market—both in terms of factory server revenue and unit shipments, according to figures released today by IDC."[1]

HP also continued its strong position in the UNIX server market and remained #1 in terms of worldwide total server shipments, with 30.8 percent market share for the second calendar quarter of 2003.

HP held the following market leadership positions according to numbers released by IDC:

- HP is #1 in the worldwide x86 server market, both in terms of factory revenue and unit shipments, driven by its industry-standard Intel-based HP ProLiant servers.
- Capitalizing on the continued strong growth of Linux, HP held a firm lead in worldwide server revenue for the Linux market with 28.9 percent market share.
- HP ProLiant BL blade servers lead in worldwide revenue and shipments for the x86 server blades market, with 31 percent market share in terms of unit shipments and 32.9 percent of factory revenue (an increase of more than 10 percentage points from the previous quarter).

[1] IDC Worldwide Quarterly Server Tracker August 2003, based on factory revenue.

- Driven by brisk HP Superdome server sales, HP leads in worldwide revenue for high-end enterprise servers (servers priced US$500,000 or more[2]) with 29.7 percent. HP also tied for the lead in the UNIX midrange enterprise server market (servers priced from $25,000 to $500,000) with 33.7 percent share of factory revenues worldwide.
- HP is #1 in the worldwide Windows server market segment with 33.6 percent share of factory revenue, based on record ProLiant server sales worldwide during the second calendar quarter of 2003.

"HP ProLiant systems remain, quarter after quarter, the world's best-selling industry-standard servers, which shows that customers demand standards, value and innovation," said Scott Stallard, senior vice president and general manager, HP Enterprise Storage and Servers. "Together with the new 64-bit Integrity systems, HP offers the strongest industry-standard based server lineup of any vendor in the marketplace today."

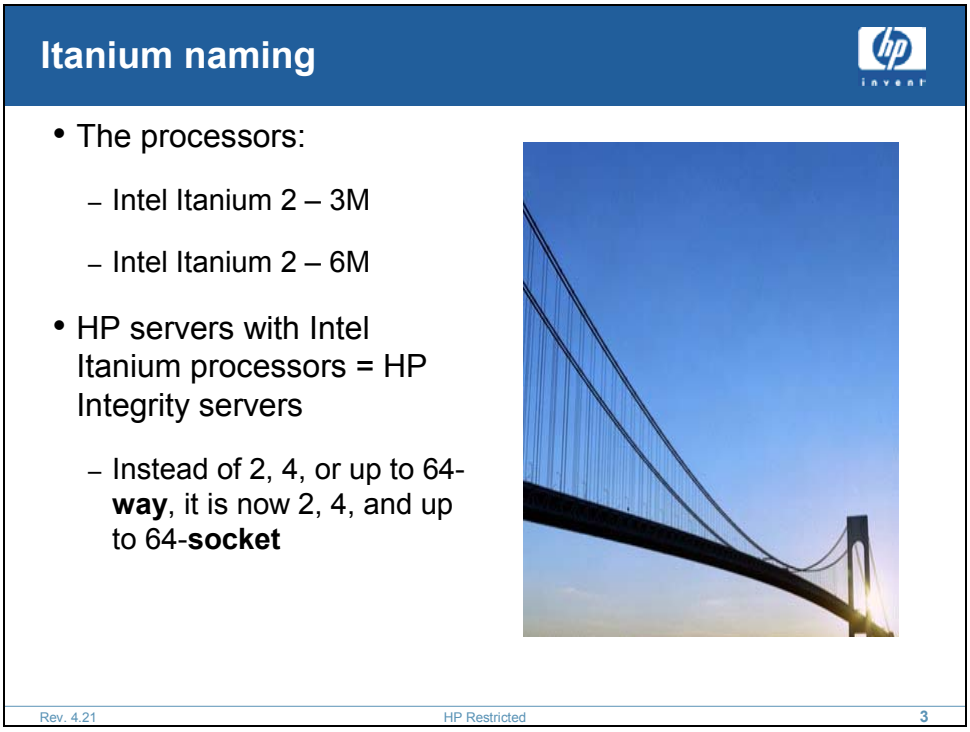
“From the industry-standard ProLiant and Integrity servers, to the high-end Superdome and NonStop systems, HP offers enterprise customers the broadest server portfolio in the industry, along with the industry's leading storage and management solutions.”

— HP Press Release

Agenda

- HP PA-RISC and Itanium-based servers overview and architecture
- HP Server Portfolio
  - Entry-level
  - Mid-range
  - High-end
- HP NonStop servers overview
- Components and Their Functions for HP 9000 and HP Integrity servers
- Virtualization

2 IDC's new Server Taxonomy uses the following price ranges to differentiate servers into "Volume servers" <25K$, "Midrange Enterprise Servers" 25K$–500K$, "High-end Enterprise Servers" >500K$.



Itanium naming

Itanium architecture terms

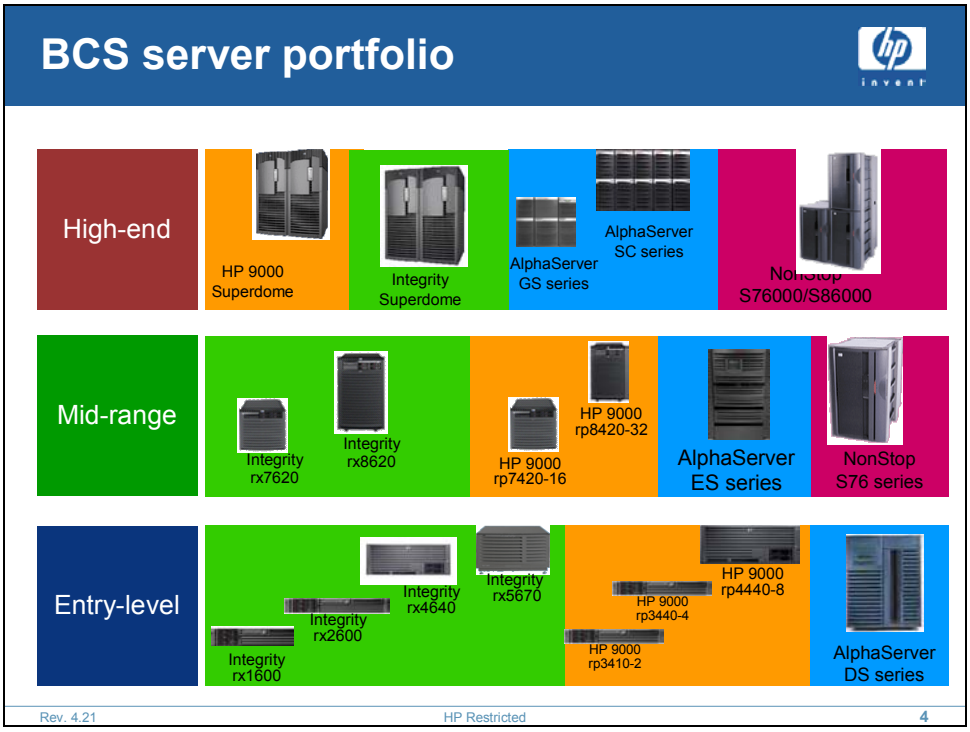
- EPIC (Explicitly Parallel Instruction Computing) — The foundation of the Itanium instruction set architecture (ISA) jointly developed by HP and Intel
- Itanium processor — Intel branding of the new 64-bit microprocessor
- IPF — Itanium processor family; refers to all processors of EPIC design
- Itanium 2 processor — Intel branding of the second processor of EPIC design

Why HP Integrity

- Integrity is a descriptive term meaning: "…2) soundness, 3) completeness, unity" (American Heritage Dictionary, 2001)
- Top ranked, available and useable name
- Creates a unique identity
- Characteristics:
  - Simple, short
  - Fits well with Itanium family attributes
  - Fits well with other families: ProLiant, NonStop
  - Keeps its meaning over time
- Desirable, positive connotation with customers

What customers are saying

- “Sounds good and reliable. [It will] bring stability to existing environment.”
- “Good use of soft word. Assumes system will be reliable and perform as expected.”
- “Solid, foundation, required characteristic.”
- “Plain, reliable, solid performer.”
- “Essential ingredient, core to successful platform, high uptime, bullet-proof.”
- “Projects stability. Good word, catchy, reputable.”



HP server portfolio

Business Critical Systems combine leading technologies and products from both HP and Compaq, including UNIX, NonStop, OpenVMS, and MPE on e3000 and servers for High Performance Technical Computing (HPTC).

- HP fault-tolerant NonStop servers are unmatched in the marketplace. The combination of our NonStop and high-end UNIX product lines gives us a high-end, high availability offering that is unsurpassed.
- The PA-8800-based rp3410, the rp3440 and the rp4440 demonstrate the HP commitment to continually enhancing our product offerings to meet changing customer needs and stay ahead of the competition.
- The rp7420-16 and the rp8420-32 together form the strongest mid-range UNIX offering available.
- The rx2600, the rx1600, the rx4640 and rx5670 servers are the entry-level HP Integrity servers and use industry-standard technology to deliver unprecedented performance. They support the four most strategic operating systems for HP servers — HP-UX, Linux, OpenVMS, and Windows — providing customers with choice, investment protection and flexibility.

  All of these servers will support OpenVMS in the future. In June 2003, HP released HP Integrity rx2600 and rx5670 servers containing the Intel Itanium 2 6M processors. The rx4640 was introduced in October 2003 while the rx1600 was introduced in February 2004.
- The rx7620 and rx8620 mid-range Integrity servers provide significant performance advantage over RISC-based systems enabled by powerful 64-bit Itanium processors and the sx1000 chipset. Both support four different operating systems: HP-UX11i, Linux, Windows Server and OpenVMS.

Superdome's momentum continues. It is selling better than ever and has the world-leading TPC-C and TPC-H Oracle benchmarks, as well as many other outstanding benchmark numbers. In June 2003, HP released HP Integrity Superdome implementing the Intel Itanium 2 6M processors for record levels of high-end server performance and the simultaneous HP-UX, Linux and Windows Server 2003 operation in different partitions. OpenVMS is under development as a fourth OS.

HP BCS plans to simplify its product offerings in the future, focusing on Itanium as its only processor architecture. Server products will be simplified into two types: HP Integrity servers and fault-tolerant NonStop servers with ongoing support for our installed base of customers running AlphaServer systems.

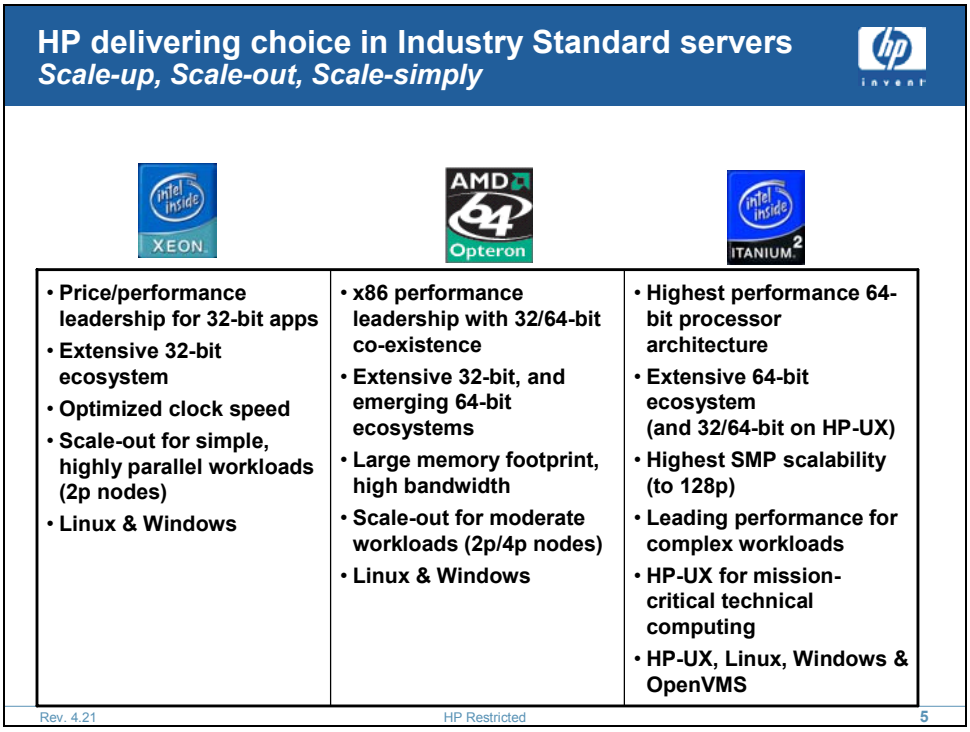
AlphaServers will not be covered in this course. If your customer has an installed AlphaServer base, it is an indicator for you to begin talking with them about developing a transition plan. While AlphaServers will remain part of the HP server portfolio through 2006, there is currently no plan to continue selling them beyond that time. Customers have one of two choices:

- Migrate to HP 9000 now
- Continue with AlphaServers and plan to transition to HP Integrity before 2006. AlphaServers will cease to be sold in 2006 but will be supported until 2011, so the transition should occur before 2011

HP is a front-runner in major enterprise markets and dominates the world's most business-critical markets. It is your job to take advantage of the new HP position in the marketplace and capitalize on the momentum created by the new HP.

Here is a brief overview of the server families and their corresponding operating systems and processors

Server family	Operating System(s)	Processor
AlphaServer	OpenVMS, Linux, Tru64 Unix	EV68 and EV7
HP9000	HP-UX 11i, Linux, Windows, OpenVMS	PA-8700+, PA-8800
HP Integrity	HP-UX 11i, Linux, Windows, OpenVMS	Itanium and Itanium2



HP delivering choice in Industry Standard servers

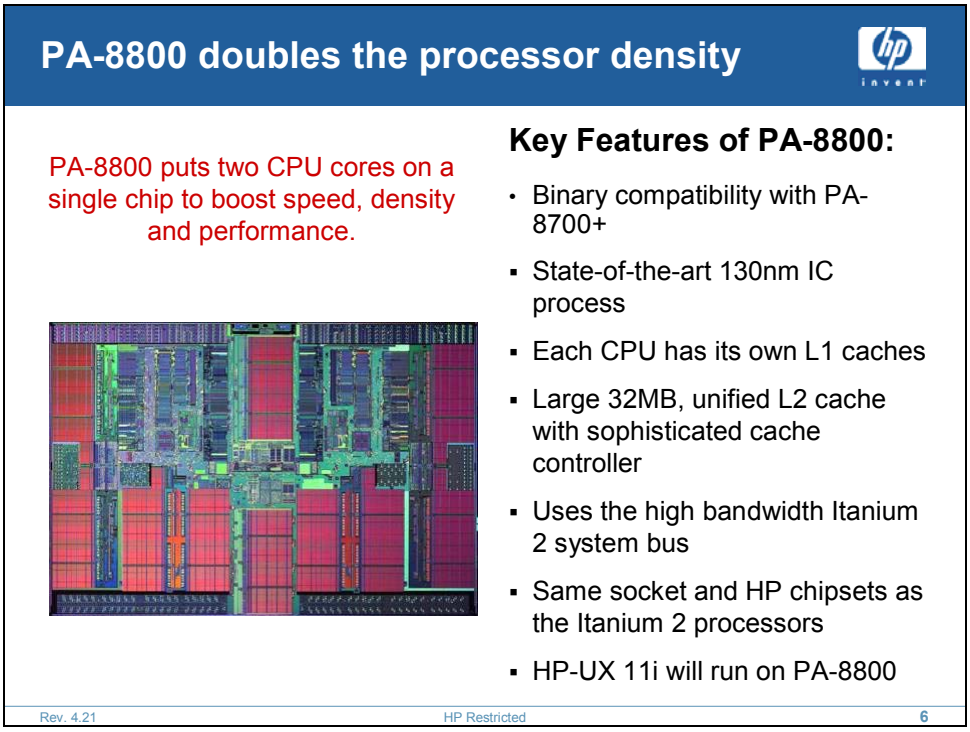
HP and AMD have announced an expanded collaboration to broaden the HP standards-based server portfolio with the introduction of AMD Opteron processor-based systems in the HP ProLiant server family. The companies have agreed to work together to drive next-generation server capabilities through a multi-year purchasing, marketing and technology collaboration agreement.

"HP's Adaptive Enterprise strategy assures customers that they will have the broadest choice of industry standard-based platforms to meet their evolving business needs," said Brad Anderson, senior vice president and general manager, Industry Standard Servers, HP. "The AMD Opteron processor is an evolution of current x86 architectures that can provide immediate performance advantages in 32-bit environments, accelerate ISV adoption and further advance the future of 64-bit ecosystems."

HP introduced new industry-standard ProLiant servers featuring the AMD Opteron processor, including the ProLiant DL145, a two-processor server, and DL585, a four-processor workhorse, as well as plans for future blade servers.

Producing HP ProLiant servers using the 64-bit extension technology is merely an extension of the existing HP ProLiant portfolio and part of the strategy to offer the best choice of the best components to customers – from 32-bit to 64-bit – always based on industry standard architectures.

Opteron offers enhanced performance and pathway to full 64-bit computing and enables an evolutionary step from ProLiant to Integrity. It allows customers to address the change to 64-bit computing in increments.



PA-8800 doubles the processor density

New terms

The PA-8800 introduces a whole new set of terms.

One of these terms is **dual-core processors**. With dual core processors, a socket holds either one CPU before the PA-8800, such as PA-8600, PA-8700, or PA-8700+, or two CPUs with the introduction of the PA-8800.

A **socket** is a descriptive term for the way certain processors plug into a computer motherboard so that it makes contact with the motherboard's built-in wires or data bus. The number of sockets is fixed at four per cell board. With the new PA-8800 there are two CPUs per socket or eight CPUs per cell board. The same size cell board, and thus the same size server, supports twice the number of CPUs.

Features

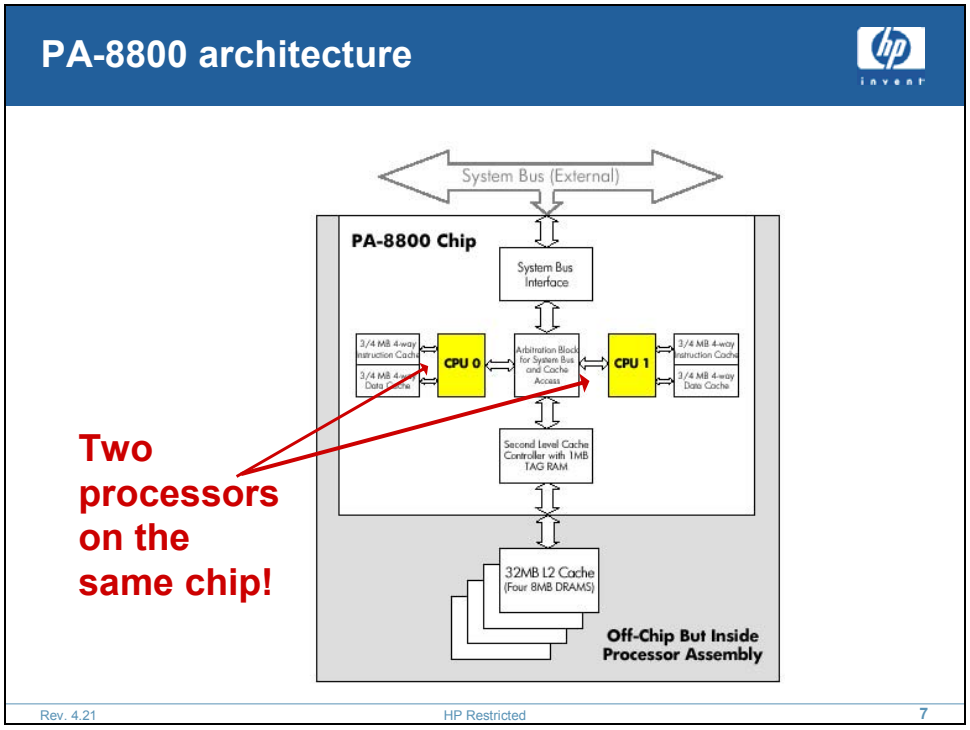
A dual-core PA-8800 processor delivers more than twice the compute power of a PA-8700. The new servers with the PA-8800 processor are the HP 9000 rp3410-2, rp3440-4, and rp4440-8.

Key advances:

- Greater compute density
- Higher-bandwidth system bus
- Large second-level cache
- Powerful error detection and correction systems

The PA-8800 processor also provides significant advances in high availability and lower power requirements compared to the previous generations of PA-RISC processors.

HP microprocessor designers re-engineered the on-chip cache units and the floating-point unit to eliminate unnecessary power consumption. They achieved this by adding logic that detects when a particular functional unit is idle and shuts down extraneous switching activity, such as clocks. Heavily loaded buses that were previously driven unconditionally are now only driven when they are transmitting useful data. Thus, each PA-8800 core will deliver more performance than the PA-8700+ processor while consuming less power—about 35 watts per CPU core. This allows the HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers to reach higher levels of performance within the same thermal envelope. For customers, this means being able to double the number of processors in a system without expensive machine-room upgrades to power or cooling systems—or extra floor space.



PA-8800 architecture

Dual CPU cores

The PA-8800 is a true dual-core design. Each CPU core is an enhanced PA-8700 processor running at a higher frequency than its predecessor. A dual-core PA-8800 delivers more than twice the compute power of a PA-8700 without requiring additional “bus interface glue chips ” that slow down system performance. Each CPU core has their own pair of L1 instruction and data caches. The cores share access to a large second level cache as well as the system bus interface. Access is guaranteed to be “fair” so that each CPU core gets an equal share of the cache bandwidth. The dual-core architecture was chosen over other alternatives, such as symmetric multi-threading (SMT), due to its ability to deliver higher performance over a wide range of applications. In contrast to SMT, the power of both cores is available simultaneously. The quartet of Level 1 caches eliminates a processing bottleneck and reduces demand for access to the system bus. Dual cores are also simple to implement and verify compared the alternatives. This cut over a year off the PA- 8800 development schedule.

Cache sub-system

Modern microprocessors have a voracious appetite for data. They require large primary and secondary caches backed up by high bandwidth system interconnect. The PA-8800 has large 0.75-megabyte (each)“single-cycle” instruction and data caches for each of the two CPU cores. The on-chip, Level 1 caches are backed up with a shared 32-megabyte secondary cache. The Level 2 cache is implemented with four custom 72-megabit DRAM chips that are tightly coupled to the

microprocessor. The DRAMs is clocked at 300MHz and can be accessed with a 13.3-ns latency. Bandwidth to the cache is 10GB/second. The physical address and status bits (TAGs) for the Level 2 cache are stored on the microprocessor chip in a dedicated 1MB cache. This allows the hardware to quickly locate data in the L2 cache and forward it to a requesting processor. This feature also contributes to good multi-processor scaling in midrange and high-end systems.

Cache error protection

Small geometry circuits are subject to transient errors caused by high-energy particles that are present in the environment. These particles cannot be shielded against so microprocessors include extra circuitry to detect and correct the errors that they cause. Memory arrays are relatively vulnerable due to their large circuit areas and small transistor sizes. The PA-8800 implements powerful error detection and correction systems so that in the vast majority of cases computation occurs without interruption and in the extremely unlikely event of an uncorrectable error, the program will be halted without corruption of the data.

Prediction capability of the PA-8800 processor it is necessary to review the standard branch prediction hardware and how it predicts branches.

Standard branch prediction hardware merely attempts to predict whether or not a branch will be taken. It does this by maintaining one or more tables that remember which way the branch went the last time it was executed and predicting accordingly. This tends to work well since software will typically follow repetitive paths through code either in explicit loops or traversing decision-making code. This technique only works for static branches where the destination of the branch is known at compile time and is fully specified in the machine ’s branch instruction.

Dynamic branches require a different approach. These are branches where the destination is not known at compile time. Instead the compiler inserts instructions that calculate the destination at run time. There will be a tendency for a given branch structure to go to the same target location each time it is encountered but the machine can not blindly rely on this behavior. This makes conventional branch prediction hardware useless in these cases. The PA-8800 adds a new branch prediction structure that can predict these branches, shaving precious cycles off of frequently used subroutines. This structure remembers where branches have gone in the past and anticipates that they will go to the same location. Later, when the branch executes in the normal pipeline sequence, the actual destination of the branch is compared to the predicted value and if incorrect, the machine resumes execution at the correct address with the same performance as if no branch prediction had been made.

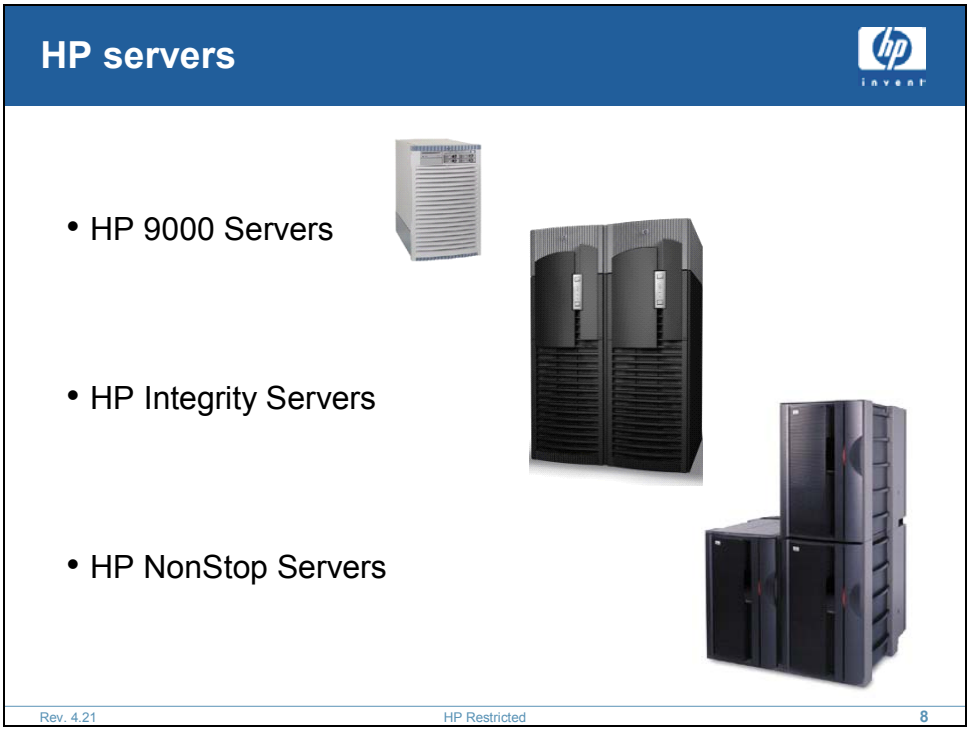
The conventional branch prediction structures have also been enlarged. Together these branch prediction features yield up to 10%extra performance relative to the PA-8700+on a single-CPU basis of comparison.

No software changes or upgrades are required to take advantage of these features. Today's applications compiled under HP-UX will see the full performance benefit.

Power reduction

HP microprocessor designers re-engineered the on-chip cache units and the floating-point unit to eliminate unnecessary power consumption. This was achieved by adding logic that detects when a particular functional unit is idle and shuts down extraneous switching activity such as clocks. In the on chip SRAMs, for example, the memory is divided into banks. Only one bank can be accessed on a given cycle so the others stay powered down. Elsewhere, heavily loaded buses that were previously driven unconditionally are now only driven when they have useful data. Likewise in the floating-point unit—a large consumer of power that is rarely used in commercial computing—activity monitor circuits were added which track how many floating-point instructions are being executed and appropriately allocate power. Additional controls have been added so that HP system designers can fine- tune the trade-off in performance and power consumption to achieve the best point on the performance-power curve for a particular application. Thus, each PA-8800 core will deliver more performance than the PA-8700+processor while consuming less power—about 35 watts per CPU core.

This allows HP servers to reach higher levels of performance while staying in the same thermal envelope. For customers, this means being able to double the number of processors in a system, from 64 to 128 processors in the case of Superdome, without requiring expensive machine room upgrades in the power or cooling systems or extra floor space.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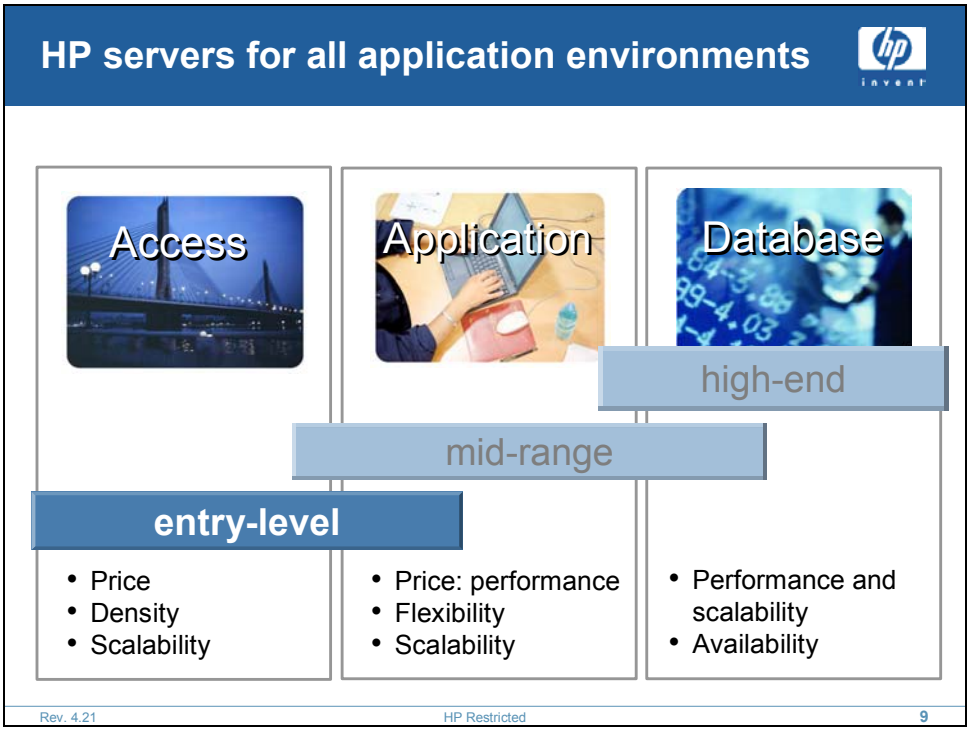
HP servers



HP servers for all application environments

A common model for IT involves three tiers:

Access (sometimes called a web or web/access tier that includes systems functioning at the "edge" of the network.

- Customers who buy entry-level servers tend to be most concerned with price. These servers address your customers' need for load management and security, low price, and high density.

Application consists of the applications and related systems and storage.

- In general, these applications concern themselves with organizing and presenting data for operational and decision-making purposes. These customers purchase the mid-range servers. Price: performance is crucial as well as the flexibility to handle new and unanticipated needs. Customer Relationship Management (CRM), Enterprise Resource Management (ERM) and other enterprise applications tend to run on these systems.

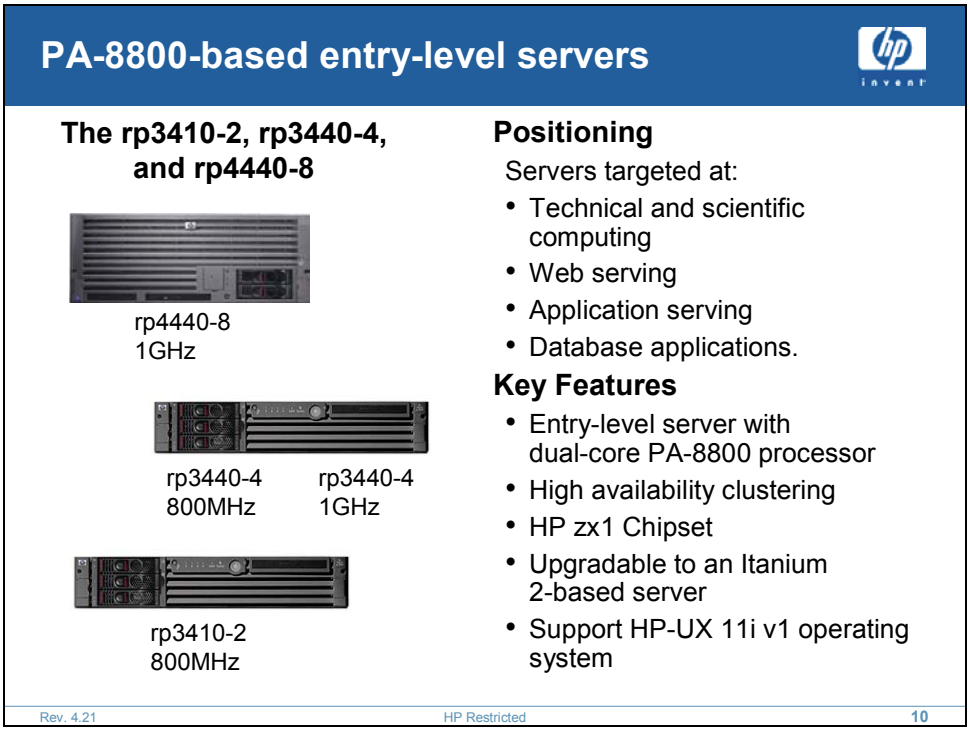
Database is where the bulk of the processing, manipulation and storage of data takes place.

- Customers who choose high-end servers tend to be most concerned with performance, availability and scalability. Data warehouse applications, research and business intelligence solutions need the power to easily manipulate, process and store large amounts of data. Some customers choose the high end of the mid-range to accomplish these tasks as well.

Having strong products and services in each of these tiers is a competitive advantage for HP, and one we're making even more powerful through our "platform of choice" strategy. HP gives you what you need to create innovative solutions for your customers' most pressing IT needs.

High-end servers

The Database Tier is where the bulk of the processing, manipulation and storage of data takes place. This is the realm of our high-end servers, although, in some cases, you will see customers selecting high performing mid-range systems for these applications.



PA-8800-based entry-level servers

Markets

HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers are targeted at performance-hungry markets such as:

- Technical and scientific computing
- Secure Sockets Layer (SSL)

Web serving

- Application serving
- Database applications

These systems are highly affordable, and they support the robust HP-UX 11i v1 operating system environment. The HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers offer the world's only in-box upgrade from an existing entry-level RISC server to an Itanium 2–based server.

Product message

The HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers have been designed to be an integral part of a mission-critical environment. They deliver from 99.95% to close to 99.999% availability, depending on the specific solution configuration, running HP-UX 11i v1—rated as the #1 disaster recovery/disaster-tolerant UNIX by Gartner (September 2003). Delivering these levels of uptime requires a strong base of single-system high availability (SSHA) in the hardware. The HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers have redundancy and resiliency built in from the ground up, starting with the chassis infrastructure and continuing through the I/O and the memory and processor subsystems.

HP 9000 rp34xx-x server overview

- 2 to 4 sockets
- PA-8800 processors
- Up to 24GB memory
- Up to 4 PCI-X I/O slots
- 2U

Positioning:
For customer interested in exceptional performance for a low price

Key Features:

- Industry-leading performance using excellent system, memory, and I/O bandwidth, plus the HP zx1 chipset
- Supports HP-UX 11i version 1 and will support HP-UX 11i version 3
- Investment protection: binary compatibility

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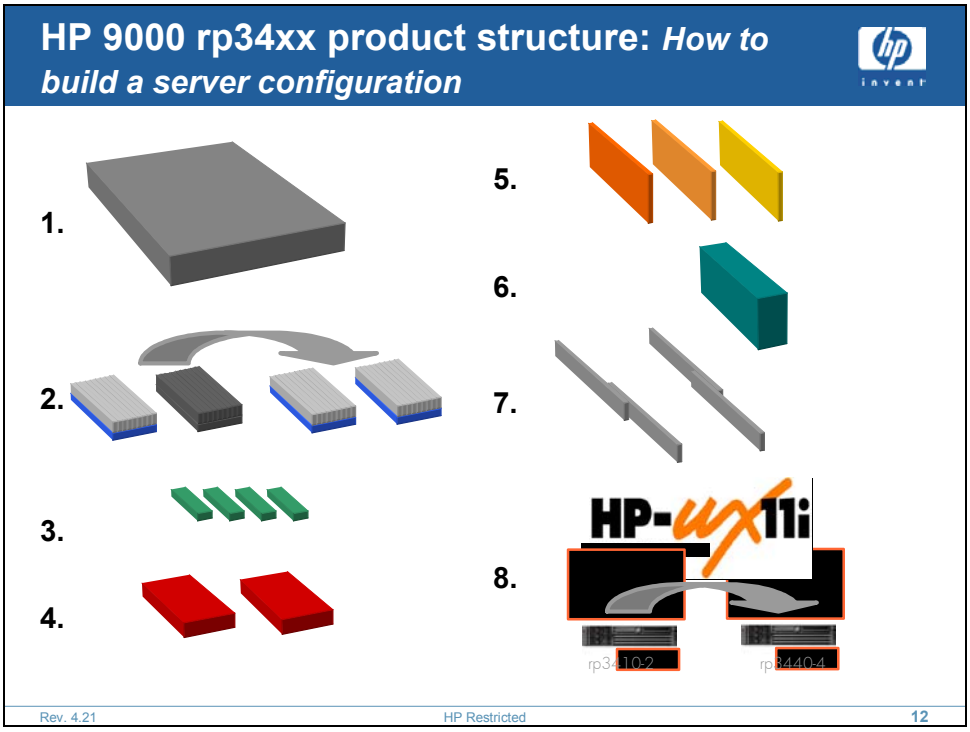
HP 9000 rp34xx-x server overview

The rp3410-2

- The HP 9000 rp3410-2 server, with its sleek 2U footprint, can be equipped with up to two 800 MHz PA-8800 processors loaded with 3 MB of on-chip L1 cache (1.5 MB per processor) and as much as 6 GB of RAM. This means that it has extraordinary compute density, with the ability to install up to 20 servers in a standard 2-meter rack.
- The HP 9000 rp3410-2 server can be installed in a rack or in a standalone, vertical tower configuration. And there's a full range of HP storage peripherals and I/O adapters to complete the package.

The rp3440-4

- The HP 9000 rp3440-4 server, with its sleek 2U footprint, can be equipped with up to four 800 MHz or 1 GHz PA-8800 processors loaded with 3 MB of on-chip L1 cache (1.5 MB per processor) and as much as 24 GB of RAM. This means that it has extraordinary compute density, with the ability to install up to 20 servers in a standard 2-meter rack.
- The HP 9000 rp3440-4 server can be installed in a rack or in a standalone, vertical tower configuration. And there's a full range of HP storage peripherals and I/O adapters to complete the package.



HP 9000 rp34xx product structure: How to build a server configuration

rp3410-2

1. Begin with the Base System
   - Select A7136A which include:
     - One PA-8800 module with one active and one inactive 800 MHz cpu
     - System Board
     - 512MB (2X256MB) memory
     - One power supply
2. Activate the second CPU for a two way system
   - Order A9770A for a firmware upgrade that activates the second CPU (no additional hardware is needed)
3. Add Memory DIMMs
   - In sets of two 256MB, four 512MB, four 1GB and four 2GB DIMMs
4. Do not forget hard disk drives
   - Up to three in 36GB/15k, 73GB/15k and 146GB/10k sizes

5. Then select I/O Cards
   - Choose up to two cards for the open PCI-X hot-plug slots
6. Add the optional 2nd Power Supply (A6874A)
   - The rp3410-2 requires only one power supply
   - The second gives you 1+1 redundancy
7. Choose the Server Form Factor
   - Field rack kit—side mounted rack slides and a cable management arm
   - Factory racking
   - Rack-less form factor—wrap-around, tubular steel frame for stand-alone deployment
8. Consider upgrading the Operating System
   - HP-UX 11i Foundation Operating Environment license for
   - Up to 8 processors is included in the base system price
   - Enterprise and Mission Critical OE are also available

To upgrade to a rp3440-4

Order A9771A for the rp3440 upgrade kit. New CPUs and 800MHz return credits are ordered separately

rp3440-4

1. Begin with the Base System
   - Select A7137A which include:
     - System board
     - One power supply
2. Add 1 or 2 PA-8800 modules (2 cpus each)
   - Order A7138A for PA-8800 800MHz module
   - Order A7139A for PA-8800 1.0GHz module
3. Add Memory DIMMs
   - In sets of two 256MB, four 512MB, four 1GB and four 2GB DIMMs
4. Do not forget hard disk drives
   - Up to three in 36GB/15k, 73GB/15k and 146GB/10k sizes
5. Then select I/O Cards
   - Choose up to four cards for the open PCI-X hot-plug slots

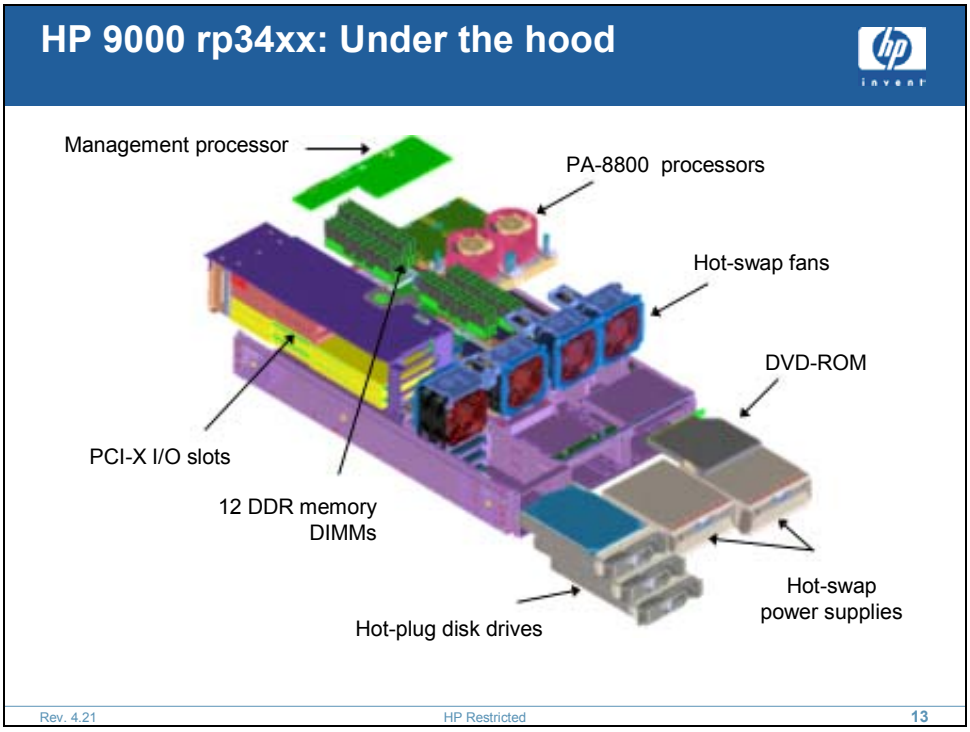
6. Add the optional 2nd Power Supply (A6874A)
   - The rp3440-4 requires only one power supply
   - The second gives you 1+1 redundancy
7. Choose the Server Form Factor
   - Field rack kit—side mounted rack slides and a cable management arm
   - Factory racking
   - Rack-less form factor—wrap-around, tubular steel frame for stand-alone deployment
8. Consider upgrading the Operating System
   - HP-UX 11i Foundation Operating Environment license for up to 8 processors is included in the base system price
   - Enterprise and Mission Critical OE are also available

rp4440-8

1. Begin with a Base System
   - Choose from two models, each of which include:
     - Pair of PA-8800 CPUs — 800 MHz or 1.0 GHz
     - Core I/O — Gigabit LAN and Ultra160 SCSI
     - All boards except memory carrier
     - One power supply
2. Add more processor modules
   - Configurations can have 2, 4, 6 or 8 processors
   - They must all have the same clock frequency
3. Add a Memory Carrier Board
   - Choose either a 16-DIMM or 32-DIMM carrier board

   With Memory DIMMs
   - In sets of four 256MB, 512MB, 1GB and 2GB DIMMs
4. Do not forget hard disk drives
   - Up to two in 36GB/15k, 73GB/15k and 146GB/10k sizes
5. Then select I/O Cards
   - Choose up to six cards for the open PCI-X hot-plug slots
6. Add the optional 2nd Power Supply
   - The rp4440-8 requires only one power supply
   - The second gives you 1+1 redundancy

7. Choose the Server Form Factor
   - Field rack kit—side mounted rack slides and a cable management arm
   - Factory racking
   - Rack-less form factor—wrap-around, tubular steel frame for stand-alone deployment
8. Consider upgrading the Operating System
   - HP-UX 11i Foundation Operating Environment license for up to 8 processors is included in the base system price
   - Enterprise and Mission Critical OE are also available



HP 9000 rp34xx: Under the hood

The server is partitioned into three electrical partitions—the system board, including CPUs, memory, and core I/O; the I/O backplane, including four PCI-X I/O slots (2 slots in the HP 9000 rp3410-2 server and 4 in the HP 9000 rp3440-4 server); and the management processor board.

Two hot-swap power supply bays are located in the lower right corner of the server (when viewed from the front). Just above the power supplies is a slimline optical media drive bay, supporting either a DVD or a DVD/CD-RW combo drive. To the left of the unit's front are three bays for hot-plug hard disk drives. Directly behind the power supplies and peripheral bays are four hot-swap cooling fans.

The left side of the system houses the I/O backplane and I/O card bay. There are four PCI-X slots in the I/O card bay.

The right rear of the server contains the main system board. The system board contains two processor sockets, 12 memory DIMM slots, and the core I/O controllers. The management processor sits on an independent circuit board that attaches to the rear of the main system board.

Racking density

The HP 9000 rp3400 series servers are designed to provide unprecedented performance density. At only two EIA units (one EIA unit = 1.75 inches) per server, up to 20 systems can be installed into a single 2-meter HP cabinet.

The HP 9000 rp3400 series servers are supported in HP Rack System/E and 10000 series racks. They are also supported in a variety of third-party, non-HP racks and cabinets.

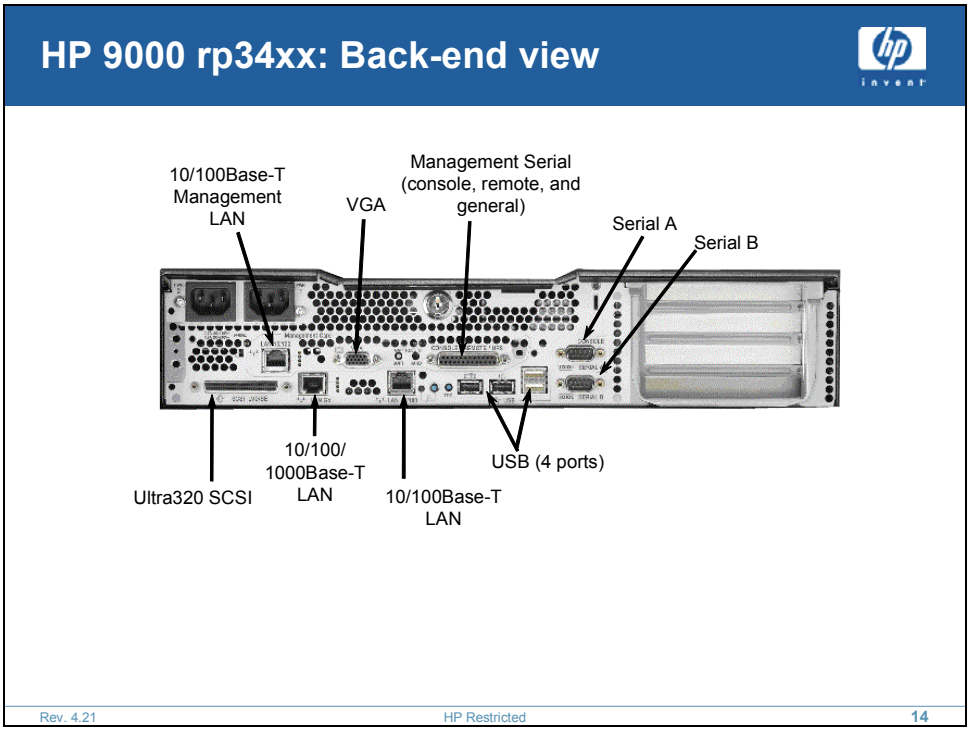
Note: Dimensions for rack configuration are as follows: H = 3.4 inches (8.6 cm), D = 26.8 inches (68.0 cm), W = 19 inches (48.2 cm).

Standalone pedestal configuration

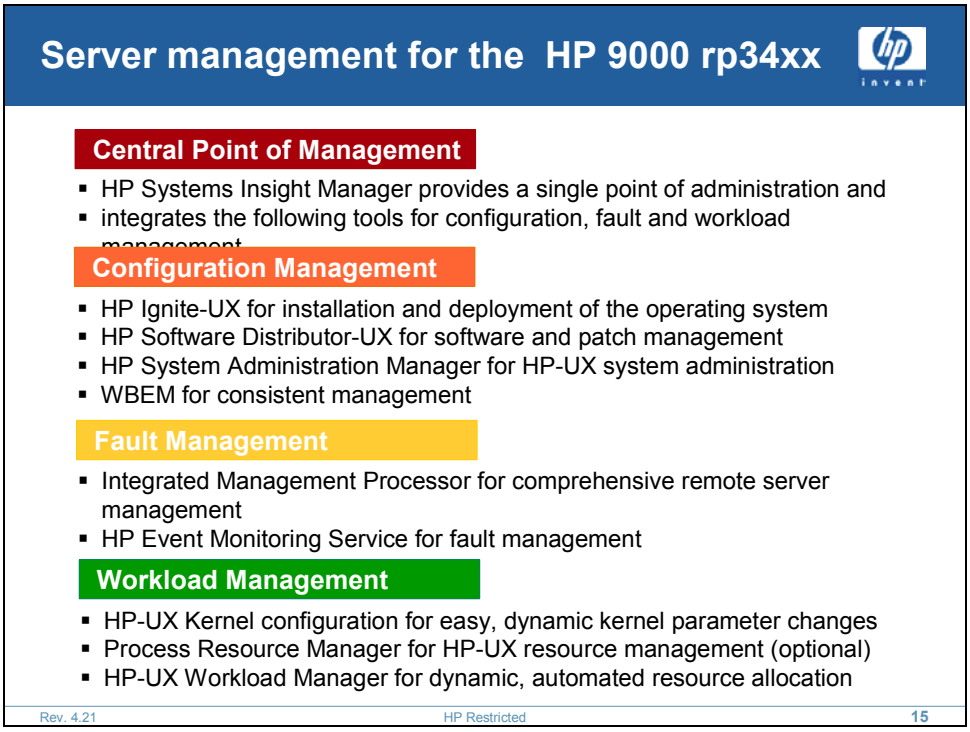
When a cabinet is not desired, the HP 9000 rp3400 series servers are also available in a standalone configuration. The standalone system is ideal for an office environment, under a desk, or on a shelf.

The standalone configuration uses a stylish tower mounting shell, with the system simply placed inside this shell.

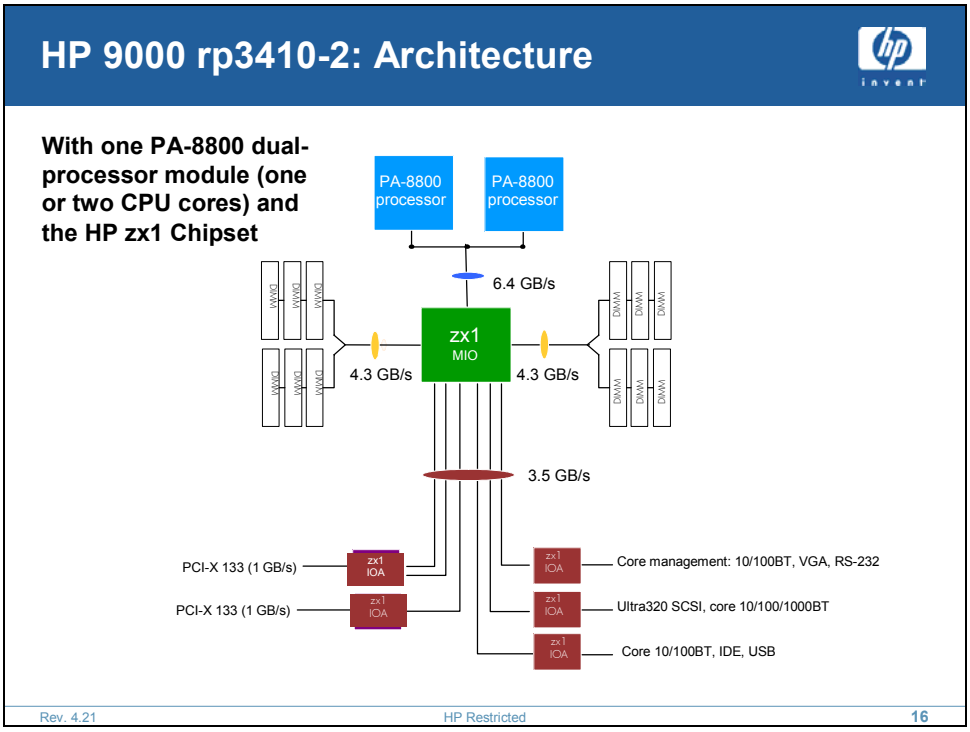
Note: Dimensions for standalone/pedestal configuration: H = 19.5 inches (49.5 cm), D = 26.5 inches (67.3 cm), W = 11.7 inches (29.7 cm).



HP 9000 rp34xx: Back-end view



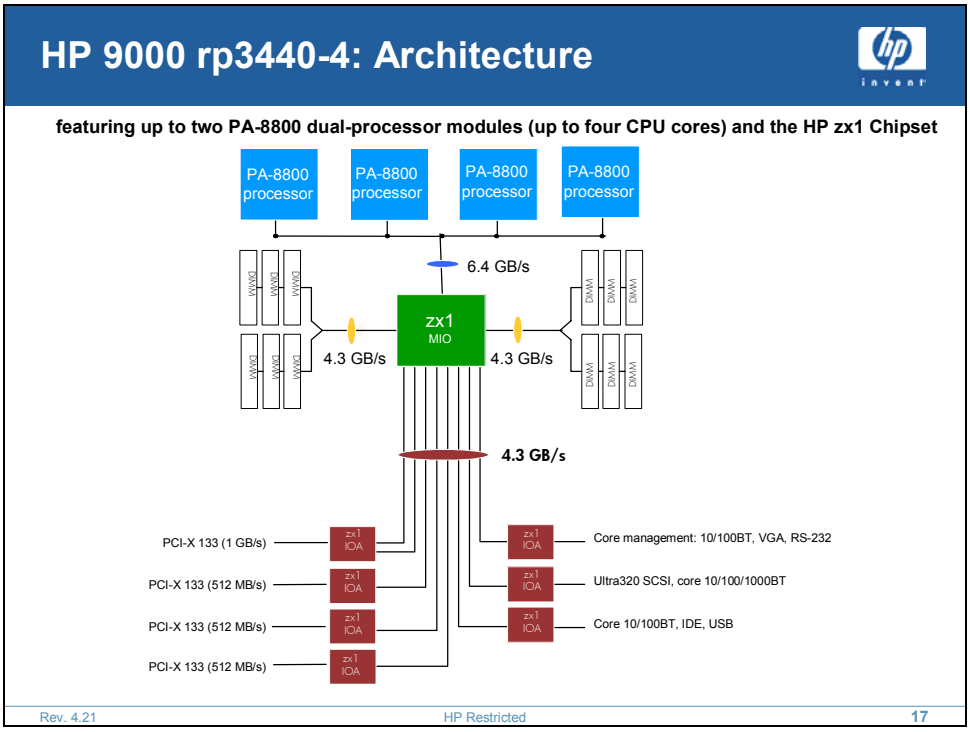
Server management for the HP 9000 rp34xx



HP 9000 rp4310-2: Architecture

Memory DIMMs are attached directly to two 266 MHz, 4.3 GB/s memory buses. Combined memory bandwidth across both buses is 8.5 GB/s. Each bus links up to six double-data-rate (DDR) sync DRAM memory DIMMs. Total system memory capacity is 6 GB, via twelve 2 GB DIMMs.

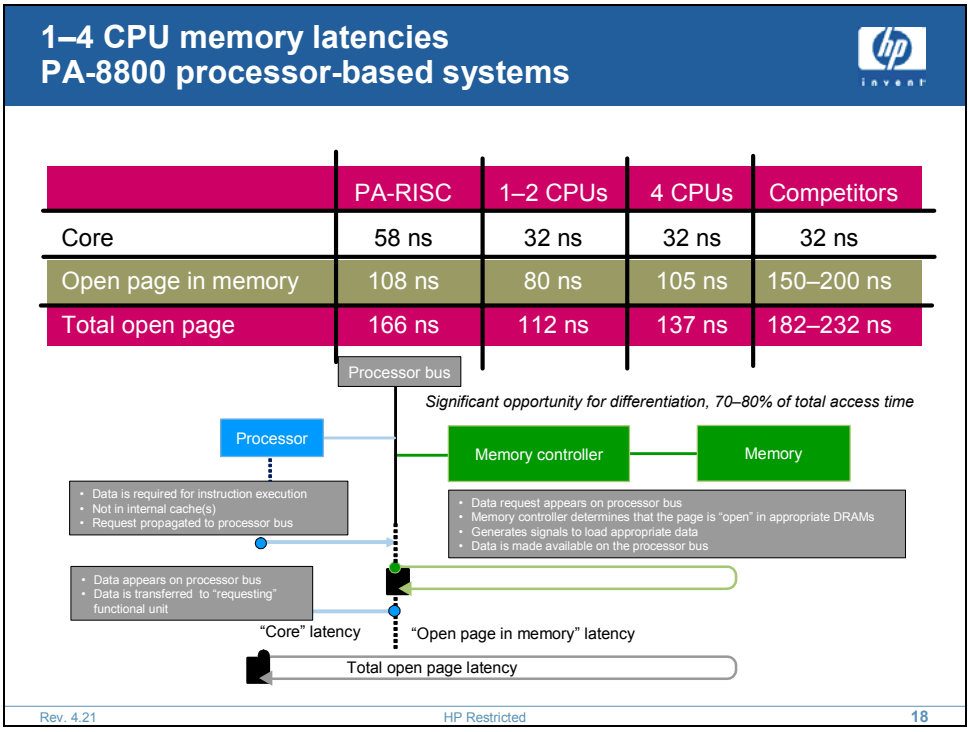
The I/O architecture consists of seven 0.5 GB/s channels allocated among five HP zx1 Chipset I/O adapters. Each of these five adapters provides a PCI-X or PCI bus to the available I/O slots and core I/O devices. The first four channels connect to two 133 MHz PCI-X I/O slots, two channels per slot, providing 1 GB/s of sustained throughput to each slot. The remaining three I/O channels link to three PCI buses, which in turn link to the core LAN, SCSI, IDE, and USB interfaces, and to the management processor.



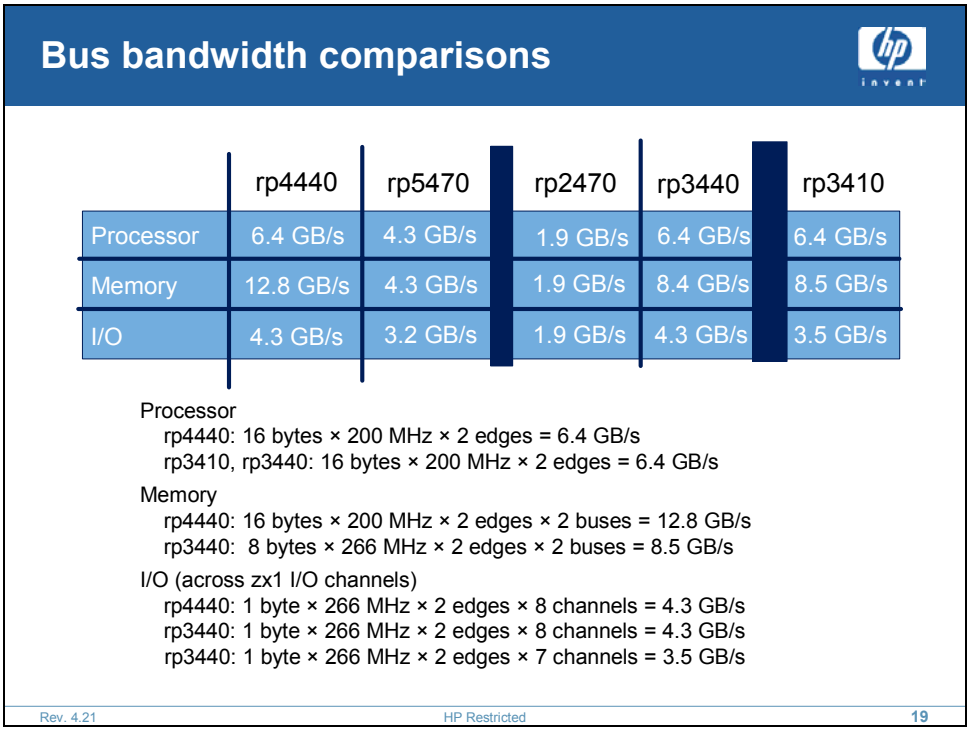
HP 9000 rp3440-4: Architecture

Memory DIMMs are attached directly to two 266 MHz, 4.3 GB/s memory buses. Combined memory bandwidth across both buses is 8.5 GB/s. Each bus links up to six double-data-rate (DDR) sync DRAM memory DIMMs. Total system memory capacity is 24 GB, via twelve 2 GB DIMMs.

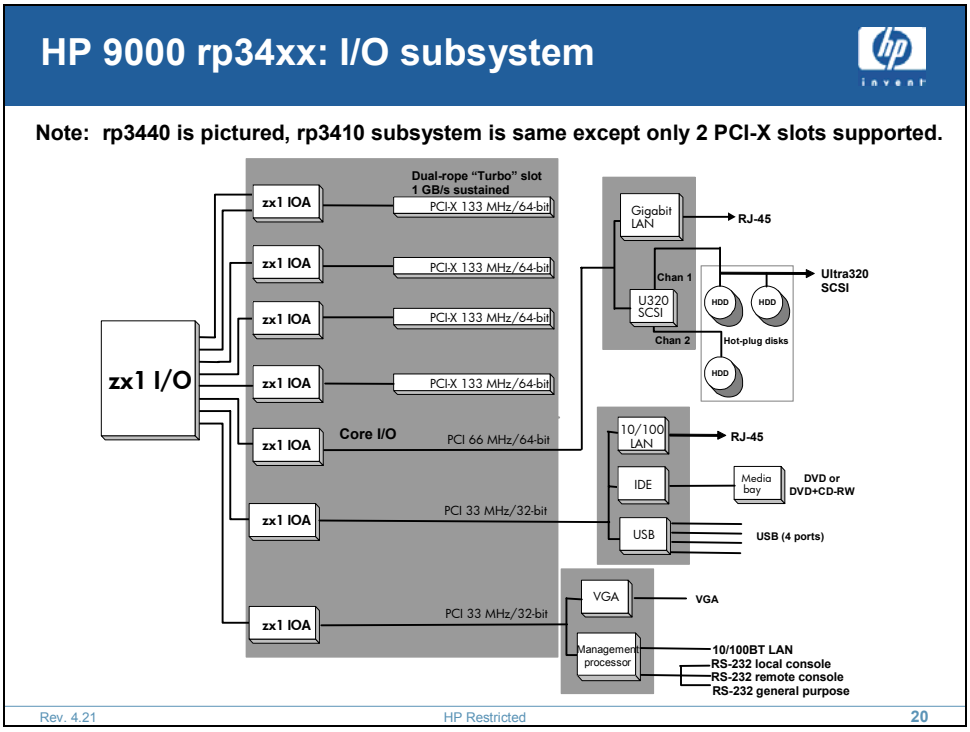
The I/O architecture consists of eight 0.5 GB/s channels allocated among seven HP zx1 Chipset I/O adapters. Each of these seven adapters provides a PCI-X or PCI bus to the available I/O slots and core I/O devices. The first two channels connect to a single 133 MHz PCI-X I/O slot, providing 1 GB/s of sustained throughput. This slot is ideal for high-bandwidth I/O adapters such as high- performance clustering interconnects. The next three I/O channels link to three independent 133 MHz PCI-X I/O slots, each with 0.5 GB/s of sustained throughput. The remaining three I/O channels link to three PCI buses, which in turn link to the core LAN, SCSI, IDE, and USB interfaces, and to the management processor.



1-4 CPU memory latencies PA-8800 processor-based systems



Bus bandwidth comparisons



HP 9000 rp34xx: I/O subsystem

The HP 9000 rp3410-2 architecture uses seven high-speed I/O channels. Each channel provides 0.5 GB/s of sustained I/O throughput. The diagram above shows how these channels allocate bandwidth to the open PCI-X slots and to the integrated core I/O.

The two open PCI-X slots all have their own dedicated 64-bit 133-MHz PCI-X bus and their own independent I/O channel or channels. The independent channels provide improved I/O performance and error containment. Independence protects each I/O card from bus hangs or extended latencies due to the failure or high bandwidth demands of other I/O cards. Independence also ensures that each I/O card can achieve maximum throughput.

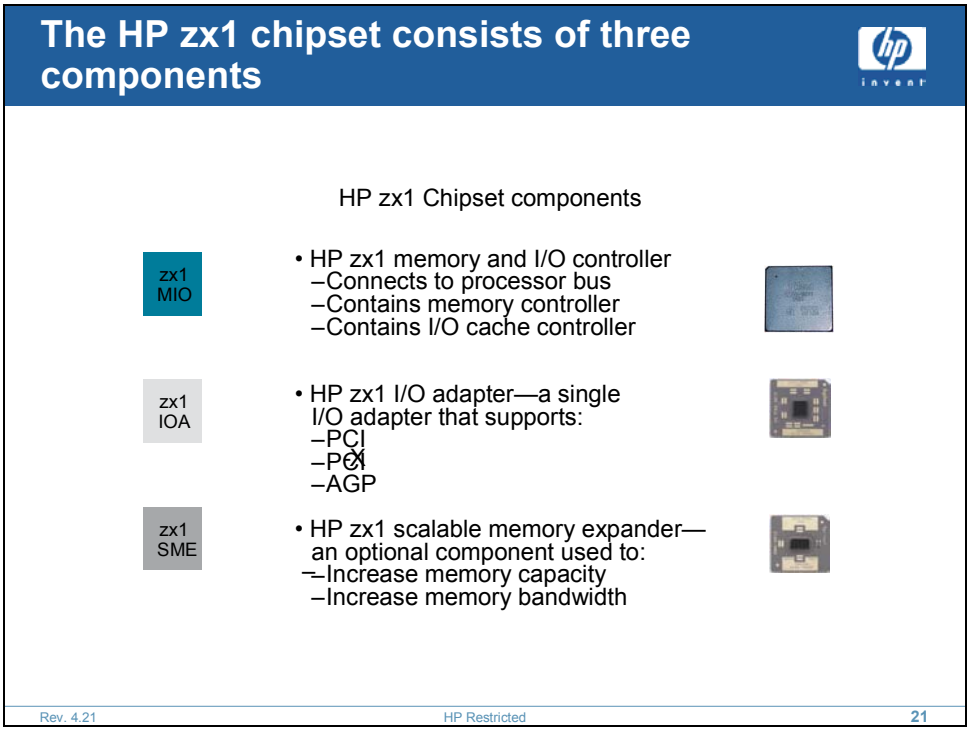
One PCI-X slot has two dedicated I/O channels, resulting in sustained PCI-X bandwidth of 1.0 GB/s. The second slot has one dedicated I/O channel, resulting in sustained PCI-X bandwidth of 512 MB/s.

All I/O slots are keyed for 3.3V I/O cards. 5V cards are not supported in the HP 9000 rp3410-2.

The HP 9000 rp3440-4 architecture uses eight high-speed I/O channels. Each channel provides 0.5 GB/s of sustained I/O throughput. The four open PCI-X slots all have their own dedicated 64-bit 133-MHz PCI-X bus and their own independent I/O channel or channels.

The first PCI-X slot has two dedicated I/O channels, resulting in sustained PCI-X bandwidth of 1.0 GB/s. This slot should be reserved for the highest bandwidth cards, such as clustering interconnects or multi-port storage adapters. The remaining three PCI-X slots each have a single dedicated I/O channel, resulting in 0.5 GB/s of sustained bandwidth on each slot.

All I/O slots are keyed for 3.3V I/O cards. 5V cards are not supported in the HP 9000 rp3440-4.



The HP zx1 chipset consists of three components

HP develops chipsets to meet the needs of enterprise and technical customers. In a world where every company has access to the same 64-bit processors, HP's strength is to develop and tune systems to deliver the kind of performance and reliability that IT, engineering, and research professionals demand.

The HP zx1 Chipset is the central building block of the HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers. Invented entirely by HP, the HP zx1 Chipset is a modular three-chip solution designed for cost-effective, high-bandwidth, low-latency 1- to 8-way symmetrical multiprocessing (SMP) servers.

The HP zx1 Chipset consists of three modular components:

1. The HP zx1 Chipset memory and I/O controller connects to the processor bus and contains dual memory controllers and the I/O cache controller. It interfaces to the processor bus and provides a low-latency connection to DDR memory, either directly or through HP zx1 Chipset scalable memory expanders. The controller can connect up to 12 HP zx1 Chipset memory expanders for quadruple the base memory capacity. It can also connect up to eight HP zx1 Chipset I/O adapters, capable of sustaining 4.3 GB/s of I/O bandwidth.
2. The HP zx1 Chipset I/O adapter chip is a scalable solution designed to support PCI-X, PCI, and AGP bus architectures. It provides a scalable I/O implementation for a wide variety of systems. The HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers do not deploy AGP graphics bus technology

3. The HP zxl Chipset scalable memory expander is an optional component used to increase memory capacity and increase memory bandwidth. Acting as a memory hub, it decreases the number of signal loads on the memory bus, thereby allowing the system to increase its memory transfer rate. Memory expanders are not used in the HP 9000 rp3410-2 and rp3440-4 servers. The HP 9000 rp4440-8 server, however, deploys 6 memory expanders, resulting in large memory capacity (up to 64 GB over 32 DIMM slots) and bandwidth (12.8 GB/s)

The HP zx1 Chipset was designed with several goals in mind:

- Provide the best performance—for demanding applications that don't fit within the processor cache, the memory system design is the key to performance. The HP zx1 Chipset's memory bandwidth has been enhanced with dual memory controllers to provide from 8.5 to 12.6 GB/s of memory bandwidth with 80 to 105 nanoseconds of open page latency.
- Provide the right functionality—including both memory capability and PCI-X support—at 6 GB, 24 GB, and 64 GB, respectively, the HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers provide enough memory capacity for the most demanding tasks. The HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers support 133 MHz PCI-X buses capable of handling the latest generation of high-speed I/O adapters.
- Enable a family of systems via a modular, multi-chip design—designers can choose the chipset components they need and select the number of these components to meet system cost and design requirements. For example, the more expandable HP 9000 rp4440-8 server deploys HP zx1 Chipset scalable memory expanders for greater memory capacity. The HP 9000 rp3410-2 and rp3440-4 servers, on the other hand, do not deploy HP zx1 Chipset scalable memory expanders, resulting in lower system costs.

HP 9000 rp4440-8 overview

- 2 to 4 sockets
- PA-8800 processors
- Up to 64GB memory
- Up to 6 PCI-X I/O slots
- 4U

Positioning:
For customers who require more expandability than the rp34xx

Key Features:

- Superior upgrade and investment protection when compared to 4-way IBM and Sun
- Significant price and price/performance versus most 8-way systems
- Investment protection: binary compatibility

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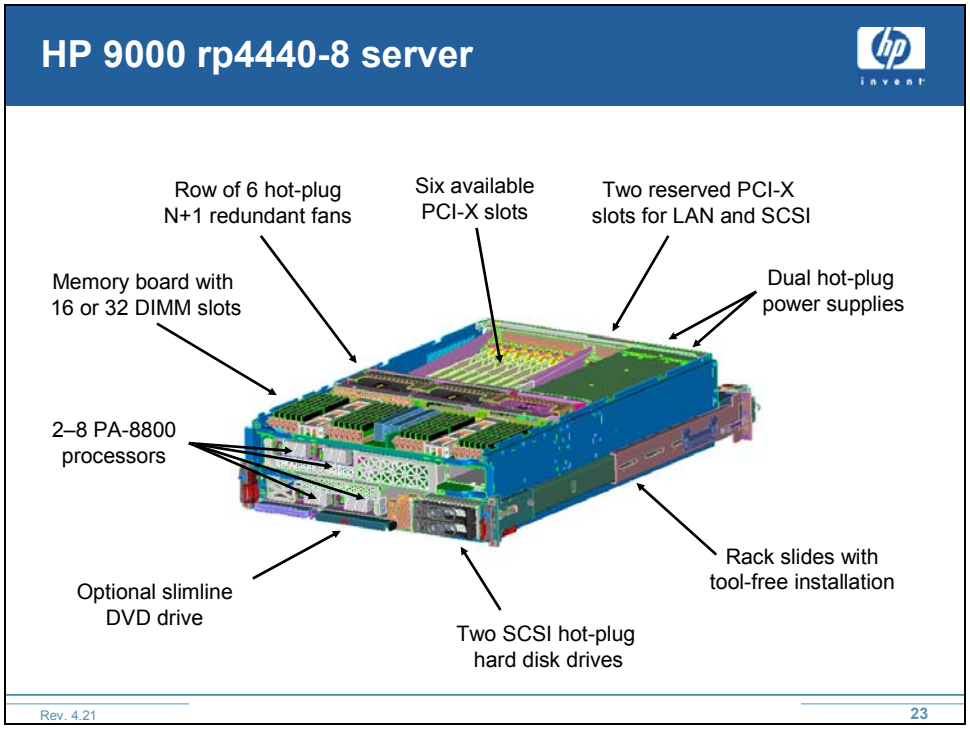
HP9000 rp4440-8 overview

Product message

- This competitively priced server delivers exceptional price: performance, reliability, and availability in a compact, rack-dense design to meet the most demanding enterprise-level computing requirements. The HP 9000 rp4440-8 server can be equipped with up to eight 800 MHz or 1.0 GHz PA-8800 processors with 1.5 MB of on-chip L1 cache per processor and 32 MB of shared L2 cache per processor module, as much as 64 GB of RAM, and six PCI-X I/O expansion slots. With a rack-dense 4U form-factor, the HP 9000 rp4440-8 server maximizes the number of servers per rack, up to 10 per 2-meter rack, for a better return on IT.
- With the HP-UX operating system, the HP 9000 rp4440-8 server gives provides total flexibility. This server also offers a pathway to the future with in-chassis upgrades to HP's PA-8900 processor.
- The HP 9000 rp4440-8 server was designed to be easy to install, service, and maintain. It fits easily into HP 9000 server racks, Compaq ProLiant racks, and many third-party racks using side-mounted slides and a cable management arm that can be installed quickly without tools. The server's blue server identification LED can be activated locally or remotely for easy physical identification of problem hardware, and the quick-find LED panel speeds problem diagnosis by identifying defective or mismatched hardware components. And for reduced maintenance costs, the server is designed for easy repair, with field-replaceable and simple swap-out parts.

- Offering up to 8 processors, the rp4440-8 will provide users with an extensive scale-up performance range, the ability to gradually increase performance capacity in cost-effective increments, and excellent investment protection over time. It will compete effectively against competitive 4-processor and 8-processor servers, e.g. IBM p630 and p650, and Sun V440 and V880, among others. In many situations where you might have sold the rp7410 in the past you will now have a new 8-way server, the HP9000 rp4440-8.



HP9000 rp4440-8 server

The server is partitioned into two main electrical partitions—the system partition, including baseboard, CPU board, and memory carrier board; and the I/O partition, consisting of PCI-X I/O slots, core I/O, and the management processor.

Removing the front bezel and a sheet-metal section that covers the top one-third and front of the server provides access to the memory and processor boards. Memory can be easily added to the server (when powered off) without removing the memory carrier. Depending on your choice of memory carriers, up to 16 or 32 dual in-line memory modules (DIMMs) can be loaded into the server. Both the memory carrier and processor boards can be easily removed without tools by unlatching and sliding them forward.

A media bay located at the lower front of the server accepts an optional, slimline DVD drive. Located to the right of the media bay are the power switch and LED indicators for system status. A pair of hot-plug, low profile disk drives is located in the lower right front corner of the server.

Three pairs of redundant, hot-swap fans span the width of the server behind the processor board, memory board, and other assemblies located in the front half of the server. Behind the bank of fans are two hot-swap power-supply bays at the right rear of the server. Each power supply has a pull-through fan where air exits at the rear. To the left of the power supplies and behind the bank of fans are eight PCI-X slots. Factory-installed SCSI controller and Ethernet LAN cards occupy two of these slots. The remaining six PCI-X slots have hot-plug capability and can be loaded with I/O cards selected by the end user.

Racking density

- The HP 9000 rp4440-8 server offers unparalleled performance density. At four EIA units per server, up to ten servers can be installed into a single 2-meter rack cabinet.
- The HP 9000 rp4440-8 server is supported in HP Rack System/E, 10000 series, 9000 series and 7000 series rack cabinets. Refer to the HP Server Configuration Guide for the latest list of qualified third-party racks.
- Note: Dimensions for rack configuration: H = 6.8 inches (17.3 cm), D = 27.2 inches (69.0 cm), W = 19 inches (48.2 cm).

High-availability slider rails

The HP 9000 rp4440-8 server comes standard with a pair of side-mounted high-availability (HA) slider rails, which use no additional vertical space and can be installed without tools. With the HA slider rails, the unit can be completely serviced without removing it from the rack, thus allowing side-by-side racks of systems to be completely supported without sacrificing floor space for side access to the system.

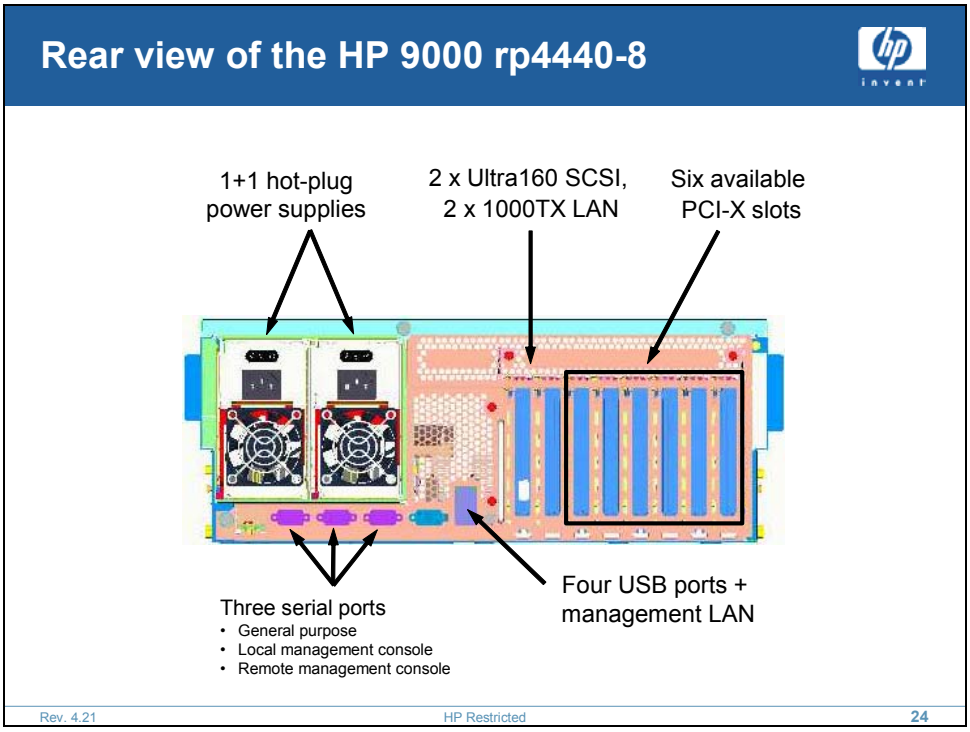
Cabinet spacing requirements

The HP 9000 rp4440-8 server requires a minimum of 24 inches (61 cm) of free space in both the front and rear of the cabinet for proper ventilation. During product installation and servicing, a total of 30 inches (76 cm) of free space is needed at the front of the cabinet.

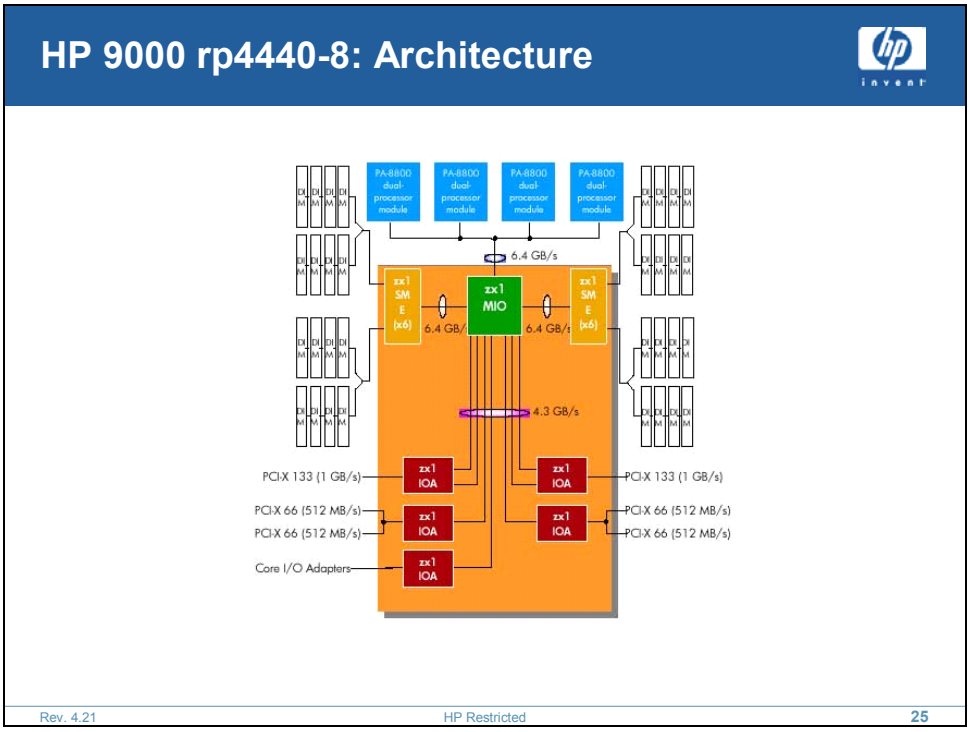
Standalone (rackless) configuration

When a cabinet is not desired, the HP 9000 rp4440-8 server is also available in a standalone (rackless) configuration. The standalone system is ideal for a back room or on a shelf; however, the standalone server should not be placed in an office environment due to acoustic and RFI characteristics. The standalone configuration utilizes the same internal chassis and front plastic bezel as the racked version. A tubular steel frame attaches to the sides and wraps around the bottom of the server. The HP 9000 rp4440-8 server can be positioned either on its bottom or on its side when the tubular frame is attached. The frame also makes it easy for two people to pick up and move the server. Up to three HP 9000 rp4440-8 servers can be stacked in a horizontal position, as in a rack, with plastic brackets that snap onto the steel tubes.

Note: Dimensions for standalone configuration: H = 10.28 inches (26.1 cm), D = 27.36 inches (69.5 cm), W = 20.95 inches (53.2 cm).



Rear view of the HP 9000 rp4440-8



HP 9000 rp4440-8: Architecture

The HP 9000 rp4440-8 server supports two or eight PA-8800 processors (up to four PA-8800 dual- processor modules) linked to the HP zx1 Chipset memory and I/O controller through a 200 MHz, double-pumped, 128-bit system bus. Total bandwidth on the system bus is 6.4 GB/s.

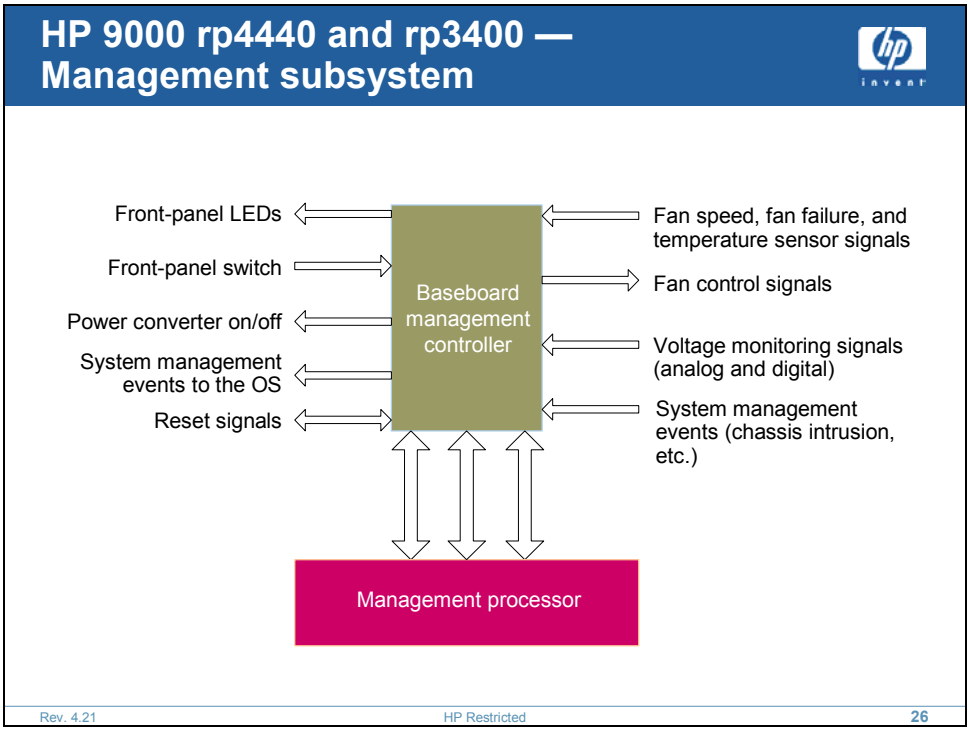
The HP zx1 Chipset memory controller links to two independent 200 MHz, 6.4 GB/s memory buses. Each bus connects to three HP zx1 Chipset scalable memory expanders, which in turn allocate bandwidth to the double data rate (DDR) sync DRAM memory DIMMs. Total DIMM capacity is either 16 or 32 units on a single memory carrier board.

The I/O architecture consists of eight 0.5 GB/s channels allocated among six HP zx1 Chipset I/O adapters. Each of these six adapters provides a PCI-X or PCI bus to the available I/O slots and core I/O devices. The first two I/O channels connect to an independent 133 MHz PCI-X I/O slot with 1.0 GB/s of sustained throughput. The next two I/O channels connect to an identical 133 MHz PCI-X slot. Two more I/O channels connect to a pair of HP zx1 I/O Chipset adapters, each of which in turn connects to a pair of 66 MHz PCI-X I/O slots. Each slot-pair shares 0.5 GB/s of bandwidth.

The final two I/O channels connect to the core I/O. One channel provides 0.5 GB/s of bandwidth to the core 10/100/1000BT LAN as well as to the dual-channel Ultra160 SCSI controller. The other channel provides 0.5 GB/s of bandwidth to the core management LAN, RS-232 serial ports, USB ports, and VGA.

Features

- High memory bandwidth, low memory latency
  - Enables top application performance through consistent response times
  - Supports more users and processes
- High memory capacity supports DDR RAM
  - Enables optimum performance for large models and databases
- High I/O bandwidth and capacity
  - Consolidate applications to reduce the number of servers
  - Very large databases or multiple large databases
  - Eight high-speed channels provide 4.3 GB/s available bandwidth
- Scalability
  - Enables a family of systems tuned to meet a variety of needs



HP 9000 rp4440 and rp3400 — Management subsystem

Extensible firmware interface

The extensible firmware interface (EFI) is an interface between the HP-UX operating systems and the HP 9000–based platform firmware. The file system supported by the extensible firmware interface is based on the file allocation table (FAT) file system. EFI allows the use of FAT-32 for the system partition.

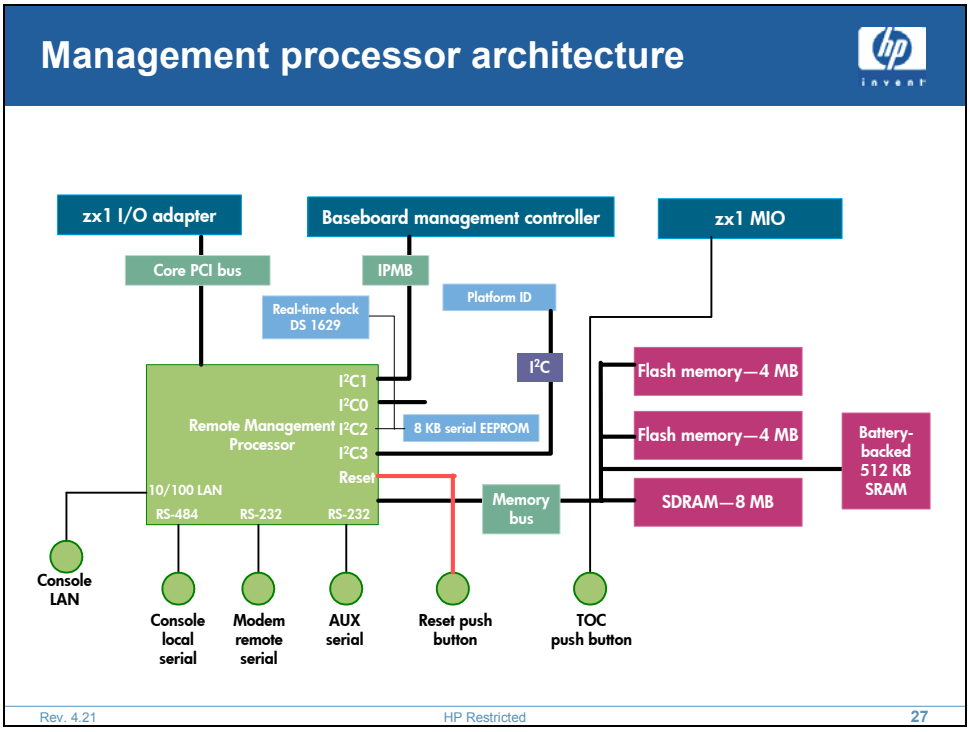
For a hard disk, the system partition is a contiguous grouping of sectors on the disk. The starting sector and size are defined by the EFI partition table residing on the second logical block of the hard disk and/or by the master boot record (MBR), which resides on the first sector of the hard disk. The system partition can contain directories, data files, and EFI images. The EFI system firmware may search the \EFI directory of the EFI system partition, EFI volume, to find possible EFI images that can be loaded. (The HP-UX boot loader is one example of an EFI image.)

Baseboard management controller

The baseboard management controller provides ease of system management. The baseboard management controller supports the industry-standard intelligent platform management Interface (IPMI) specification. This specification describes the management features that have been built into the system, including diagnostics, configuration management, hardware management, and troubleshooting. The baseboard management controller interacts with the management processor to provide the highest level of system manageability and high-availability monitoring.

The baseboard management controller provides the following:

- 40 MHz ARM7TDMI RISC core, 1 MB flash ROM, 512 KB battery-backed RAM
- Power and reset management
- System “health” management: Fans, power supplies, temperatures, voltages
- Event logging and reporting: System event log, forward progress log, diagnostic LEDs on status panel
- Device inventory
- Hardware and data protection: Automatic clean OS shutdown on critical events, secure storage of system configuration parameters, protection of system flash ROM
- Link to dedicated out-of-band management processor (MP) via IPMB: Enables remote management through the MP LAN or MP serial ports
- Compliance with Intelligent Platform Management Interface (IPMI) 1.0



Management processor architecture

The management processor minimizes or eliminates the need for the system administrator to be physically at the system to perform tasks such as diagnostics, system management, or even hard resets. The management processor has its own battery backup, so it can be accessed even in the unlikely event that the main system power is out and the operating system has stopped functioning.

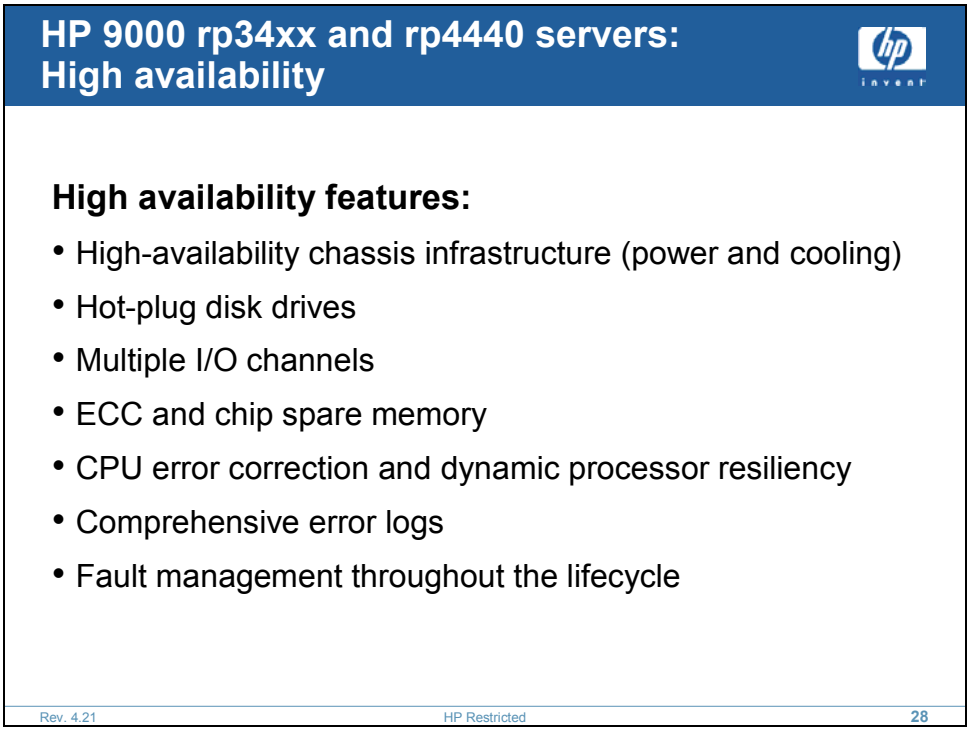
Here are some of the features enabled by the management processor:

- System management over the Internet or intranet (Web console)
- System console redirection
- Console mirroring
- System configuration for automatic restart
- Viewing history log of system events
- Viewing history log of console activity

Setting MP inactivity timeout thresholds

- Remote system control
- Remote power cycle (except for MP housekeeping power)
- Viewing system status
- Event notification to system console, e-mail, pager, and/or HP Response enters; e-mail and pager

- Notification work in conjunction with HP's Event Monitoring System (EMS)
- Automatic hardware protection of critical environmental problems
- Access to management interface and consoles on WAN failure (modem required)
- Automatic system restart
- Forward progress indicator (via a virtual front panel)
- Out-of-band manageability and system firmware update
- Configuration of manageability and console security
- Secure Sockets Layer (SSL) encryption on Web console access



HP 9000 rp34xx and rp4440 servers: High availability

Built for high availability

The HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers have been designed to be an integral part of a mission-critical environment. They deliver from 99.95% to close to 99.999% availability, depending on the specific solution configuration, running HP-UX 11i v1—rated as the #1 disaster recovery/disaster-tolerant UNIX by Gartner (September 2003). Delivering these levels of uptime requires a strong base of single-system high availability (SSHA) in the hardware. The HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers have redundancy and resiliency built in from the ground up, starting with the chassis infrastructure and continuing through the I/O and the memory and processor subsystems.

The servers' strong SSHA is further bolstered by HP's fault event monitoring service (EMS). And for the maximum possible uptime, an HP 9000 rp3410-2, rp3440-4, or rp4440-8 server can be configured as an integral part of a high-availability cluster using clustering software such as HP's Serviceguard.

High-availability chassis infrastructure (power and cooling)

Fans in the HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers provide excellent cooling. They pull cool air from the front of the unit, flow the air back over internal system components, and then discharge the now-heated air out the back of the server. All the fans in the HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers are easily accessible and provide N+1 redundancy.

These servers have high-availability power supplies, too. The HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers' power subsystems provide high availability with N+1 redundant power options.

They each come standard with a single hot-swap power supply; an optional second supply gives these servers 1+1 redundancy of power supplies. To further enhance availability, each power supply has its own dedicated power feed or line cord. Cords can be plugged into separate power grids for the maximum level of power protection.

Hot-plug disk drives

The HP 9000 rp4440-8 server supports up to two SCSI disks, and the HP 9000 rp3410-2 and rp3440-4 servers support up to three. All disks are accessible from the front of the system and can be removed (or hot-plugged) while the server continues to run.

A dual-channel SCSI controller manages the pair of disks in the HP 9000 rp4440-8 server. The disks can be configured either both on a single SCSI channel or one disk on each of the two channels, with disk mirroring for added availability. When only one SCSI channel is used for the disks, the second can be connected to an external device such as a tape drive.

A single dual-channel SCSI controller manages the three disks in the HP 9000 rp3410-2 and rp3440-4 servers. One channel links to two internal disks; the second channel is connected to the third internal disk. This allows disk mirroring across separate SCSI channels, further enhancing availability.

Multiple I/O channels

The multiple HP zx1 Chipset I/O channels in the HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers provide failover, load balancing, and failure isolation. In these servers, failures on one channel do not disrupt activities on other channels. Furthermore, all three servers deploy fully independent PCI-X buses to isolate traffic on I/O adapters. If a problem occurs on one adapter, it will not interfere with traffic on another bus.

ECC and chip spare memory

The memory systems for the HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers utilize error-correcting code to correct single-bit errors as well as HP's chip spare technology to protect against multi-bit errors.

Chip spare enables an entire SDRAM chip on a DIMM to be bypassed in the event that a multi-bit error is detected on that SDRAM. In order to use the chip spare functionality, identical-sized DIMMs must be loaded in quads. Different DIMM sizes are supported, as long as they are in separate quads.

For example, a quad of 512 MB DIMMs can be loaded along with a second quad of 1 GB DIMMs, and chip spare will be enabled on all the DIMMs. Because of the chip spare feature, the HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers are completely resilient to all SDRAM failures, regardless of the number of bits involved in the fault condition. This virtually eliminates memory failures as a source of system errors.

Some other vendors deal with multi-bit SDRAM failures by accepting the fact that they will occur. That is, they use a scheme that supports only failure detection, not failure correction. HP believes that this is unacceptable and a dangerous choice for servers in business-critical environments. In fact, server systems that employ failure detection but not correction are at high risk to fail due to memory problems.

CPU error correction and dynamic processor resiliency

In the HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers, L1 and L2 caches both have full single-bit error checking and correcting as well as double-bit error detection. Additionally, all the instruction and data paths also have single-bit error-checking and -correcting capabilities. What's more, the system processor bus has parity detection, and the data path is covered by error correction.

The HP 9000 rp3410-2, rp3440-4, and rp4440-8 servers employ dynamic processor resiliency (DPR), too. With DPR, any CPU generating correctable cache errors at a rate deemed unacceptable is de-allocated from use by the system. This feature helps protect against a CPU degrading to the point where it may cause system crashes.

DPR works like this: When excessive errors are reported against a CPU, the CPU is deactivated (that is, the operating system will not schedule any new processes on it). The system firmware remembers the CPU's serial number and the time when this action was taken. From then on, at each poll interval the system monitor checks (by comparing the serial numbers) to see if the CPU has been replaced or not. If the processor has been replaced, its history is reset. If the system is rebooted before the offending CPU has been replaced, the monitor generates a warning message and immediately de-allocates the CPU.

Comprehensive error logs

All system events are stored in the system event log (SEL) in nonvolatile memory. In addition, system firmware creates activity and forward progress logs (FPLs) in nonvolatile memory. In all but the most extreme situations—that is, in more than 95 percent of cases—this information will be sufficient to diagnose system failures to a single replaceable part. The SEL and FPL are available both to the management processor (which means they are available remotely) and to system-level tools, leading to quick and accurate diagnosis.

Fault management throughout the lifecycle

Fault management is HP's overall strategy and program to provide a complete value chain for detection, notification, and repair of system problems. Fault management starts during the design phase, when hardware and OS designers include capabilities and instrumentation points that provide the ability to detect and isolate system anomalies. Monitors are created to poll for system health information or to asynchronously respond to instrumentation points that have been designed into the system to report problems or faults.

Fault management also involves implementing several methods for maintaining historical event information, allowing preservation of information for analysis or trending. Faults that generate errors and warnings are automatically logged to syslog; notes and audit information are copied to an event log. Other options are available for preserving historical information as well.

Fault management provides immediate alerts of problems—and even potential problems—as soon as they are detected, so customers can take corrective action. In some cases fault monitors are actually smart enough to repair faults or prevent them from occurring.

Capabilities of fault monitors

Fault management, coupled with the monitoring capabilities, keeps tabs on the health of system components (such as monitoring voltage) and generates close-to-real-time errors and warnings on events (such as fan failure and temperature warnings) when problems develop. These events can trigger corrective action to enable the system to continue functioning, or they can trigger alerts to systems personnel to appropriately handle the situation before it becomes more severe.

Fault monitors are able to:

- Poll the system for health information
- Handle asynchronous events that have been designed into the hardware or software
- Perform corrective action when possible
- De-allocate failing memory before it fails (Dynamic Memory Resiliency)
- De-allocate failing processors before they fail (Dynamic Processor Resiliency)
- De-configure failed processors from the working set before the next reboot
- Shut down the system when power failure causes a switch to UPS
- Manage events so that system performance is not hindered in the face of errors
- Provide information on problem causes and what actions to take

Notification and integrated enterprise management

Fault management currently uses the HP EMS (Event Monitoring Service) infrastructure for its notification methodology. EMS enables a wide variety of notification methods, including pager, e-mail, SNMP traps, system console, system log, text log file TCP/UDP, and OpenView Operations Center (OPC) messaging. Fault management events can be viewed directly on the server, or through HP Insight Manager, which can aggregate information from multiple systems in the data center.

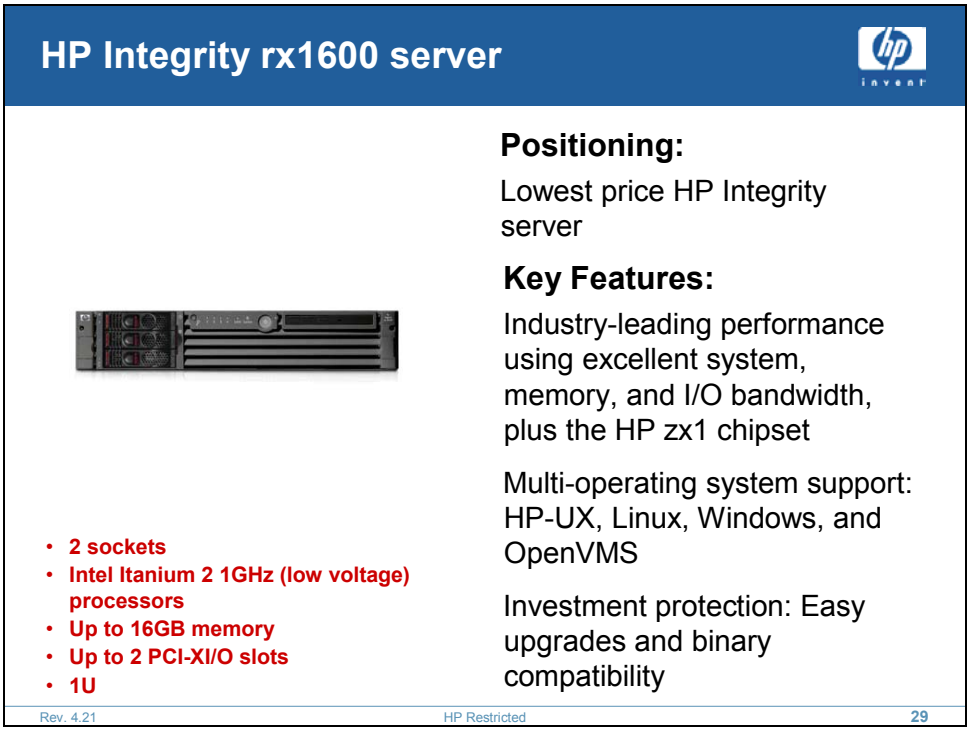
Customers also have the option to integrate fault management events with enterprise management software from HP (OpenView) or from BMC, Tivoli, Computer Associates, or MicroMuse.

Added options with HP support

For customers who purchase HP support, fault management events can be forwarded to the HP Support Organization. In this case, HP can take responsibility for monitoring, filtering, and trending the events and taking action on items that need attention. At the premium end of HP's support offerings, customers can also sign up to receive services from the HP High Availability Observatory (HAO) organization. The HAO provides continuous and proactive monitoring of the customer's environment via a dedicated and private ISDN network. The ISDN link allows secure information flow between the customer site and the HP Support Organization and provides HP support engineers with direct access to the customer's system. As part of the HAO implementation, HP installs a support node at the customer site, and this node is connected securely to the HP Support Organization.

Proactive, not reactive

Fault management uses the philosophy of proactive (as opposed to reactive) management of problems. Fault management provides highly accurate fault diagnosis the first time, even as the problem occurs, and initiates or allows fast corrective action. Fault management results in a substantial decrease in unplanned downtime.



HP Integrity rx1600 server

HP Integrity rx1600 server at a glance

The HP Integrity rx1600 server uses the Low Voltage Intel Itanium 2 processor in a slim, 1U (3.5-inch height) system package. It provides industry-leading performance in a dense form factor. The Low Voltage (LV) Intel Itanium 2 processor delivers industry-leading $/FLOPS for compute-intensive workloads, at lower power levels, where space is at a premium. The HP Integrity rx1600 server supports up to two 1.0 GHz LV Intel Itanium 2 processors with 1.5 MB of on-chip L3 cache and as much as 16 GB of RAM. This means that it has extraordinary compute density. Fitting 41 servers into a 2-meter rack delivers an astounding 320 gigaFLOPS of potential power.

The Integrity rx1600 server also leverages the same management features as the Integrity rx2600 server. It is ideal for compute-intensive server farms in the high-performance technical and scientific computing markets, and it is a perfect fit for the network edge, security, and software engineering fields. Features such as memory chip spare, an optional management processor, and high-availability clustering support make the Integrity rx1600 server a leader among high compute density servers.

The Integrity rx1600 server offers incredible investment protection with in-chassis upgrades to future Intel Itanium 2 processors. The Integrity rx1600 server is also flexible, with a choice of 64-bit operating systems—HP-UX, Linux®, or OpenVMS Evaluation Release (until 2Q 2004, when a production-quality release is expected)—to suit any need. And there's a full range of HP storage peripherals and I/O adapters to complete the package.

Powerful entry-level HP Integrity servers introduce a new era of computing. They reduce platform costs, enable higher performance and scalability, and enhance customer flexibility. Integrity servers provide the agility, accountability, and return on IT investment (RoIT) customers need to build an adaptive enterprise.

The entry-level HP Integrity servers bring unparalleled performance in their class to commercial computing applications in key areas of the enterprise, from databases and business intelligence to enterprise resource planning and customer resource management. Technical computing users will also benefit by running simulations faster and performing more in-depth analysis than they could before. And, the industry-leading power and scalability of these Integrity servers are further enhanced when used in a high-availability clustering solution, ensuring data integrity, maximizing application availability, and minimizing planned maintenance time.

Entry-level HP Integrity servers maximize users RoIT. Investment protection is guaranteed because HP offers the flexibility to choose between HP-UX, Linux, Windows, and OpenVMS operating systems. HP Integrity servers allow customers to select the operating system that best meets their needs now and keep the flexibility to change operating systems as their business needs change. Flexibility of design along with a minimized physical footprint makes space saving and high-density computing a reality for businesses and lets them derive the highest possible value from their IT assets.

rx1600 overview

Performance

- Industry leading performance
- Excellent system, memory, and I/O bandwidth, HP's zx1 chipset

Operating systems

- Multi-OS support: HP-UX and Linux with Windows and OpenVMS to follow
- World's most advanced O/S interoperability

Management

- Event monitoring capabilities
- Dedicated management processor (optional with purchase of management card)
- Baseboard management controller with basic control and fault management built in
- Optional extended manageability adds Web/LAN interface with enhanced management capabilities
- Optional 10/100Base-T management LAN

Availability

- Hot-plug disks
- Chip spare technology
- Memory scrubbing and page de-allocation
- CPU failure de-allocation
- HA clustering capabilities

Investment protection

- Future low-voltage IPF upgrades available in 1U form factor
- Binary compatibility

Security

- Integrated secure web console (optional with purchase of management card)

Processors and chipsets

- 1 or 2 1-GHz Intel® Itanium2®-based “Deerfield” processors, each with L3 1.5 MB cache
- HP zx1 Chipset
- 128-bit, 200 MHz bus
- 6.4 GB/s system bandwidth

Memory

- 512MB to 16 GB (8 slots)
- PC2100 DDR DIMMs w/ ECC
- 128-bit, 266 MHz memory interface (8.5 GB/s peak)
- Chip sparing support

Internal peripherals

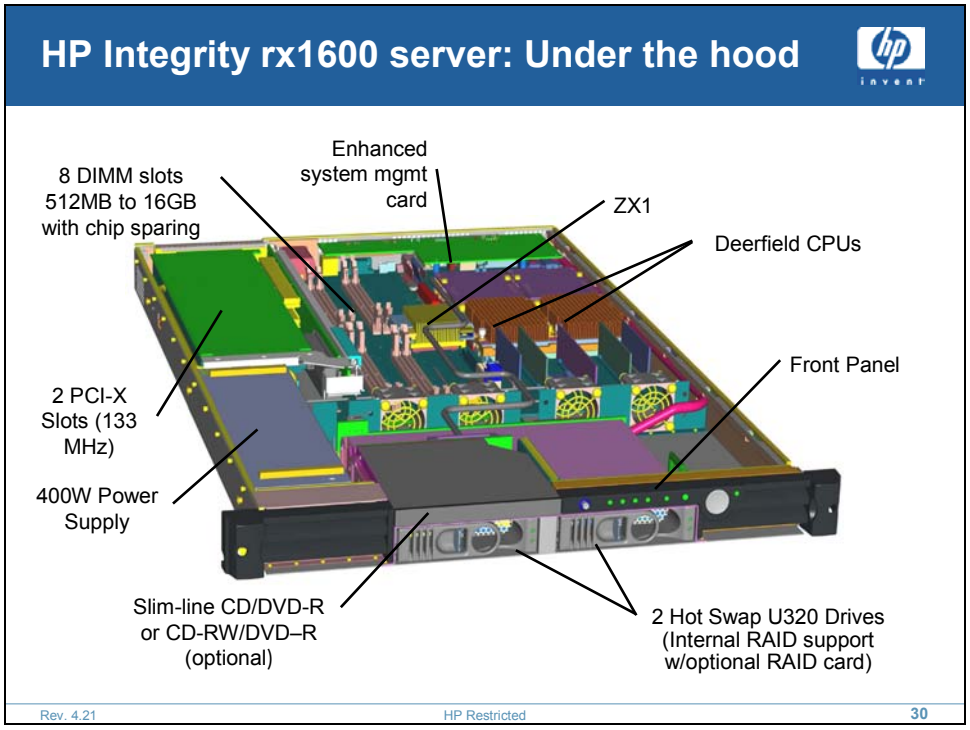
- 2 hot-plug SCSI HDDs
  - 36 GB (10K rpm)
  - 73 GB (15K rpm)
  - 144GB (10K rpm)
- DVD or DVD/CD-RW

Form factor

- 1 EIA units (U) or 1.75² height
- 40 servers per 2m rack
- Designed for data center and utility closet operation (5–35°C)

I/O subsystem

- 2 PCI-X 64 bit 133 MHz slots
  - One full length, one half length
- Ultra320 SCSI, Gigabit, 100Base-T, USB, serial built in
- Optional extended built-in I/O: VGA, management LAN, additional serial ports
- 3.5 GB/s peak I/O bandwidth

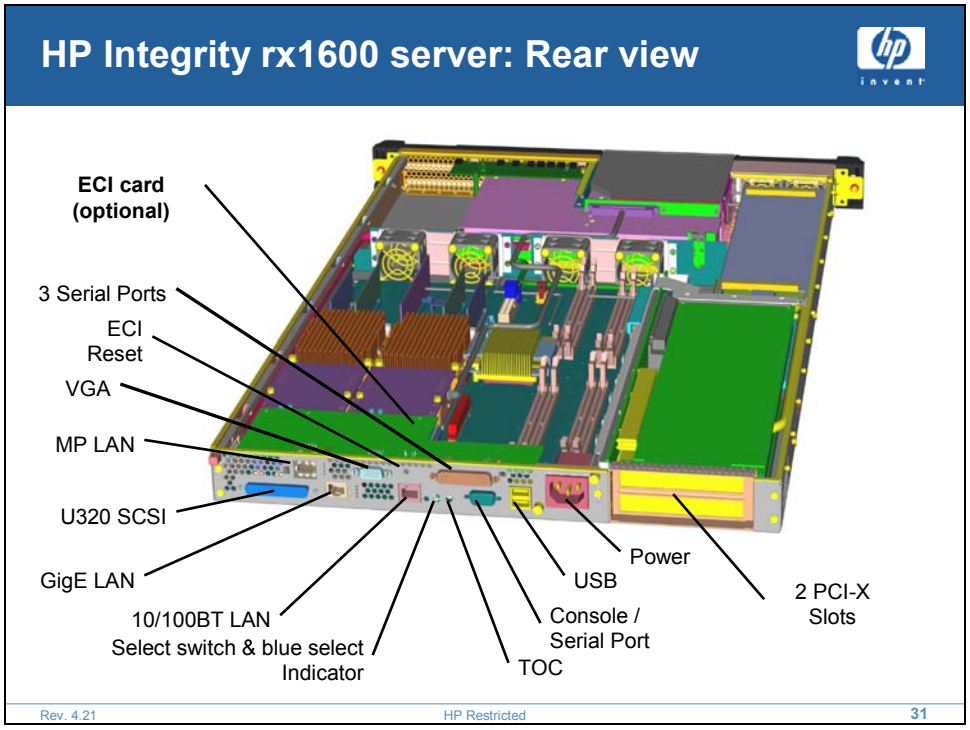


HP Integrity rx1600 server: Under the hood

Two hot-swap disk drive bays are located in the lower right corner of the server (when viewed from the front). Just above the power supplies is a slimline optical media drive bay, supporting either a DVD or a DVD/CD-RW combo drive. Directly behind the power supplies and peripheral bays are four cooling fans.

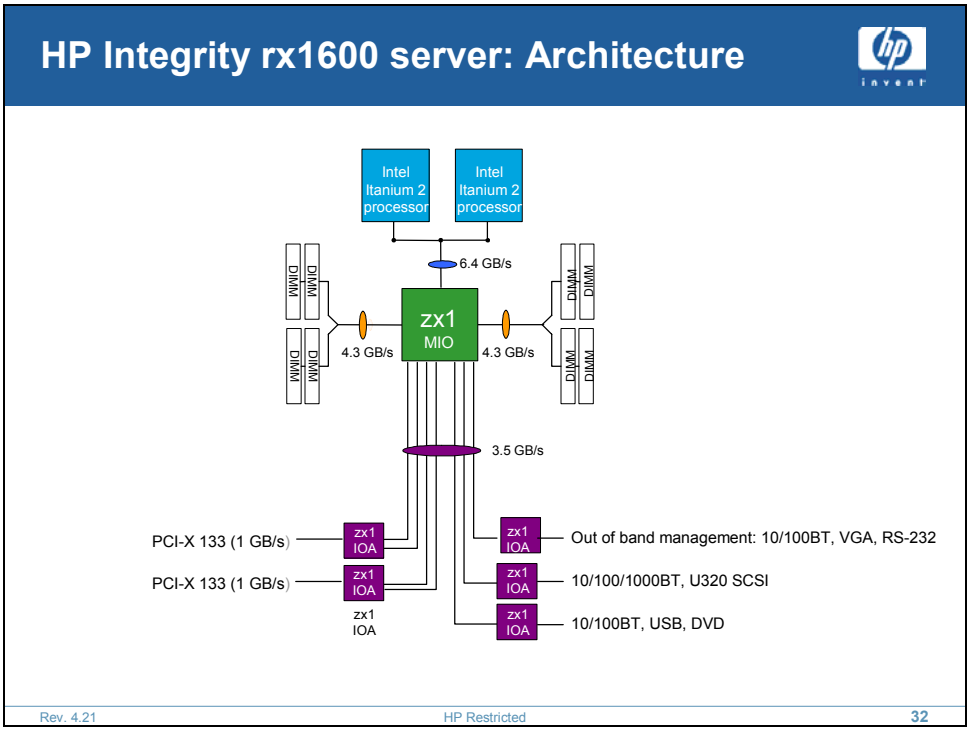
The left side of the system houses the I/O backplane and I/O card bay. There are two PCI-X slots in the I/O card bay; one full-length slot and one half-length slot.

The right rear of the server contains the main system board. The system board contains two Intel Low Voltage Itanium 2 processor sockets, 8 memory DIMM slots, and the core I/O controllers. The management processor sits on an independent circuit board that attaches to the rear of the main system board.



HP Integrity rx1600 server: Rear view

The exploded picture is the rear view of the location of major components as well as the mechanical and architectural features of the Integrity rx1600 server.

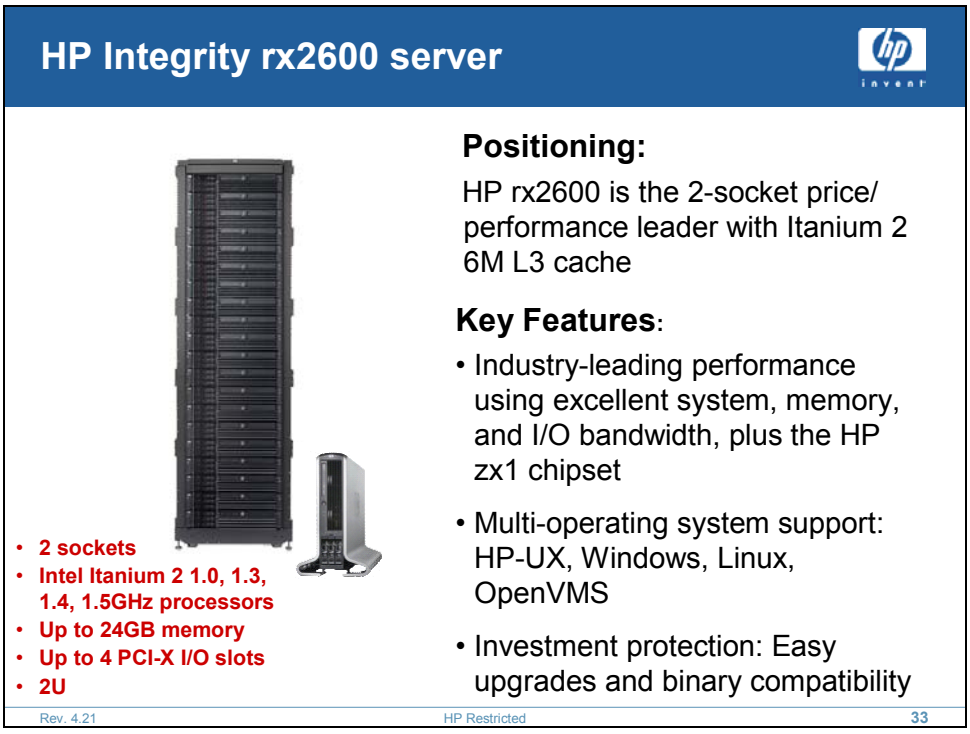


HP Integrity rx1600 server: Architecture

The HP Integrity rx1600 server supports either one or two Low Voltage Intel Itanium 2 processors linked to the HP zx1 Chipset memory and I/O controller through a 200 MHz, double-pumped 128-bit front-side system bus. Total bandwidth on the system bus is 6.4 GB/s.

Memory DIMMs are attached directly to two 266 MHz, 4.3 GB/s memory buses. Combined memory bandwidth across both buses is 8.5 GB/s. Each bus links up to six double data rate (DDR) DRAM memory DIMMs. Total system memory capacity is 16 GB, via twelve 8 GB DIMMs.

The I/O architecture consists of seven 0.5 GB/s channels allocated among five zx1 Chipset I/O adapters. Each of these seven adapters provides a PCI-X or PCI bus to the available I/O slots and core I/O devices. The first four channels connect to two 133 MHz PCI-X I/O slots, providing 1 GB/s of sustained throughput per slot. These slots are ideal for high-bandwidth I/O adapters such as high-performance clustering interconnect. The remaining three I/O channels link to three PCI buses, which in turn link to the core LAN, SCSI, IDE, and USB interfaces and to the management processor.



HP Integrity rx2600 server

Positioning

The HP Integrity rx2600 server is the industry's best-performing 2-way Itanium 2–based server. It has a sleek 2U footprint and can be equipped with up to two 1.5 GHz Intel Itanium 2 processors loaded with 6 MB of on-chip L3 cache and as much as 24 GB of RAM. This means that it has extraordinary compute density. Fitting 20 servers into a 2-meter rack delivers an astounding 240 gigaFLOPS of potential power.

The Integrity rx2600 server also has extensive availability and management features, which make it ideal for deployments in mission-critical data centers or compute-intensive server farms. Features such as hot-swap redundant components, memory chip spare, an integrated management processor, and high-availability clustering support make the Integrity rx2600 server the clear leader among 2-way Itanium 2–based servers.

The Integrity rx2600 server offers incredible investment protection with in-chassis upgrades to future Intel Itanium 2 servers. The Integrity rx2600 server is also flexible, with a choice of 64-bit operating systems—HP-UX, Linux, Microsoft® Windows®, or OpenVMS Evaluation Release v8.1 (until 2H 2004, when a v8.2 production-quality release is expected)—to suit any need. It can be installed in a rack or in a standalone, vertical tower configuration. And there's a full range of HP storage peripherals and I/O adapters to complete the package.

With the release of Intel Itanium 2 6M processors, the HP Integrity rx2600, powered by 1–2 Intel Itanium processors, improves price: performance in enterprise HP-UX, Linux and Windows environments and gives customers a cost-effective, yet powerful, entry into a technology with tremendous growth potential.

HP is unique in the market of Itanium 2 servers by offering the only enterprise-class UNIX.

Performance will only get better with the Intel Itanium 2 6M (Madison) processors. For instance new performance results show the following:

- #1 Java Business Benchmark performance — SPECjbb2000
- #1 Secure Web Transaction Processing — SPECweb99_SSL

According to the IDC Worldwide Server Market Forecast And Analysis, 2001-2006 (May 2002), Itanium will be the dominant 64-bit architecture.

Ideal environments

The HP Integrity rx2600 server enable technical computing users to process more transactions, do more in-depth analysis, run complex models faster and render high quality images with optimized performance. Commercial users will run their applications with superior performance, decreased costs, and reduced complexity.

Differentiators

The rx2600 is equipped with four 64-bit 133MHz PCI-X slots, each dedicated to its own PCI-X channel. This one-to-one pairing of slots to channels ensures the system is capable of handling the most arduous I/O demands. The servers have plenty of high availability features.

The rx2600 is equipped with N+1 redundant/hot-swap power supplies and fans, dual power cords, and a service processor. To maximize uptime, the system is able to automatically de-configure either memory or CPU in the event of a failure.

Because of the rx2600's small form factor, clustering two or more rx2600s provides unprecedented performance. Clustering allows the consolidation of system resources, including I/O, bandwidth, memory, storage and compute capacity.

Benefits to the customer

With the Intel Itanium 2 6M processors the HP Integrity rx2600 server offers:

- 50% performance increase over current rx2600 server
- Lowered memory latencies and increased memory and I/O subsystem scalability achieve industry leading performance
- Unprecedented performance in a densely-racked, low-priced solution

Key differentiators

HP Integrity rx2600 server	HP Integrity rx5670 server	HP Integrity rx4640 server
■ Up to 2 sockets ■ Itanium 2 1.0, 1.3, 1.4, 1.5GHz processors ■ 8.6GB/sec memory throughput ■ Spare memory chip ■ Four-way memory interleave ■ HP-UX, Windows, Linux ■ Four PCI-X slots ■ HA features	■ Up to 4 sockets ■ Itanium 2 1.3 or 1.5GHz processors ■ 12.8GB/sec memory throughput ■ Spare memory chip ■ Four-way memory interleave ■ HP-UX, Windows, Linux ■ Ten PCI-X slots (Nine available when using Windows) ■ HA features	■ Up to 4 sockets ■ Itanium 2 1.3 or 1.5GHz processors ■ 12.8GB/sec memory throughput ■ Spare memory chip ■ Four-way memory interleave ■ HP-UX, Windows, Linux, OpenVMS ■ Six PCI-X slots ■ HA features

A few features that make HP Integrity systems the leading choice for technical computing include:

- Exceptional floating-point performance
- Full 64-bit addressability
- Great price: performance
- Excellent memory bandwidth and low-latency system architecture
- The most powerful price: performance clusters
- Software libraries optimized for the architecture
- A full range of systems
- Backwards compatibility

With the added performance of Intel Itanium 2 6M processors, the enterprise features of HP-UX 11i v. 2 and the growing number of commercial applications, HP Integrity servers are now ready to take on the commercial markets.

HP Integrity rx2600 server: DP Itanium 2 performance

- 1GHz/1.5M L3 cache benchmark estimates:

  SPECint_base2K = 715

  SPECfp_base2K = 1200

  SPECweb99_SSL = 1100

  SPECweb99 = 3300

  TPC-C = 42K

  1Ghz/1.5M performance will be VERY close to McKinley (1GHz/3M) performance.

- 1.4GHz/1.5M L3 cache benchmark estimates:

  To be provided at a later date

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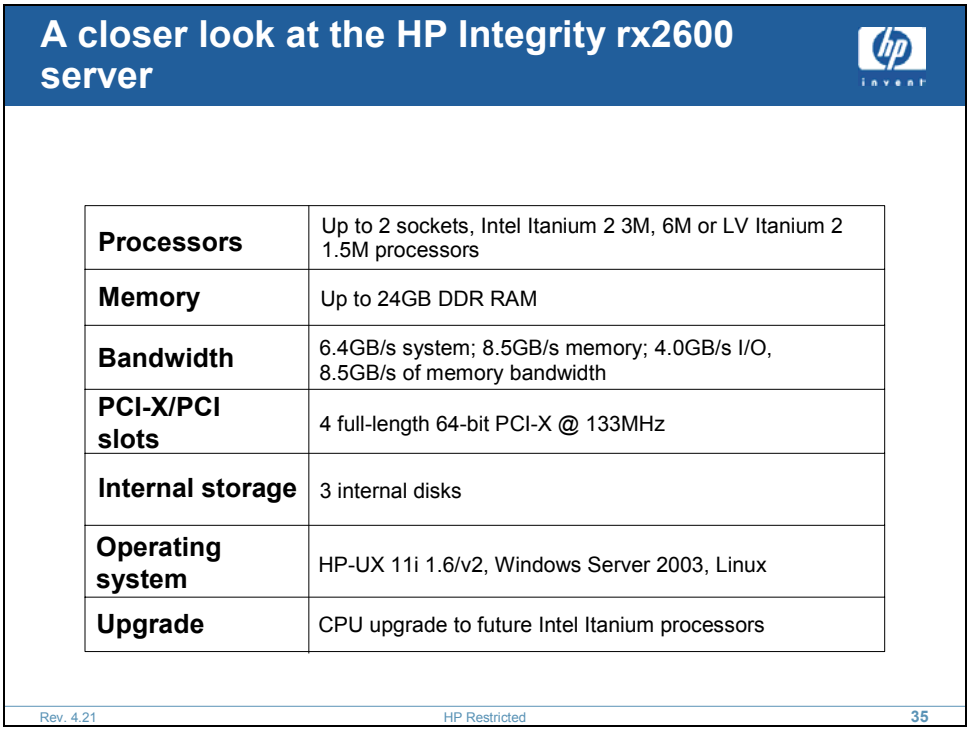
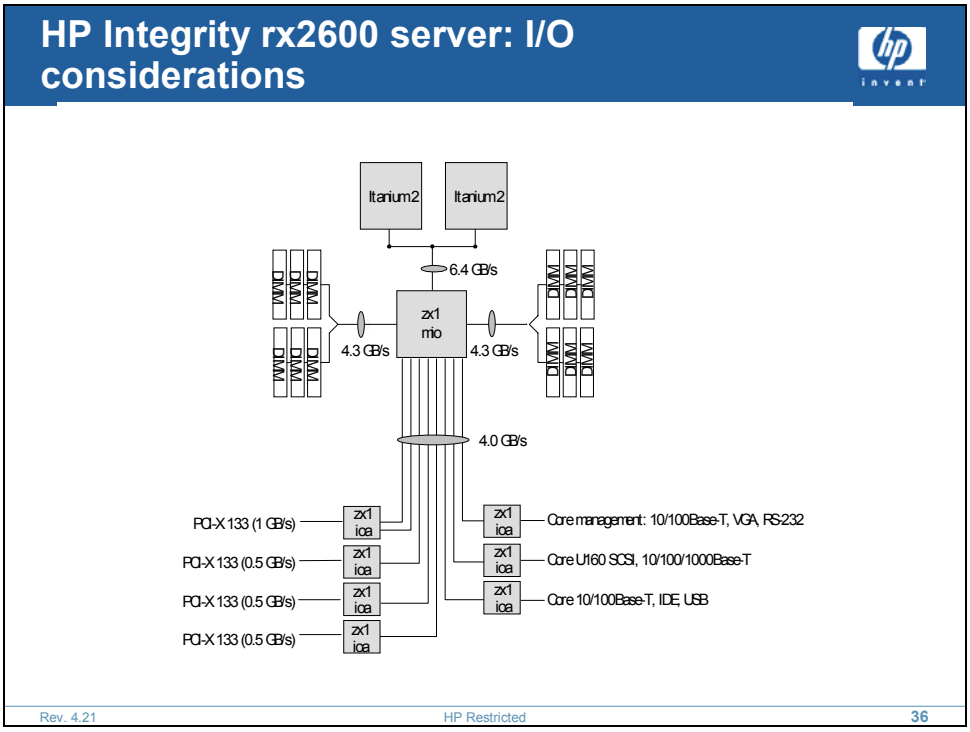
HP Integrity rx2600 server: DP Itanium 2 performance



A closer look at the HP Integrity rx2600 server

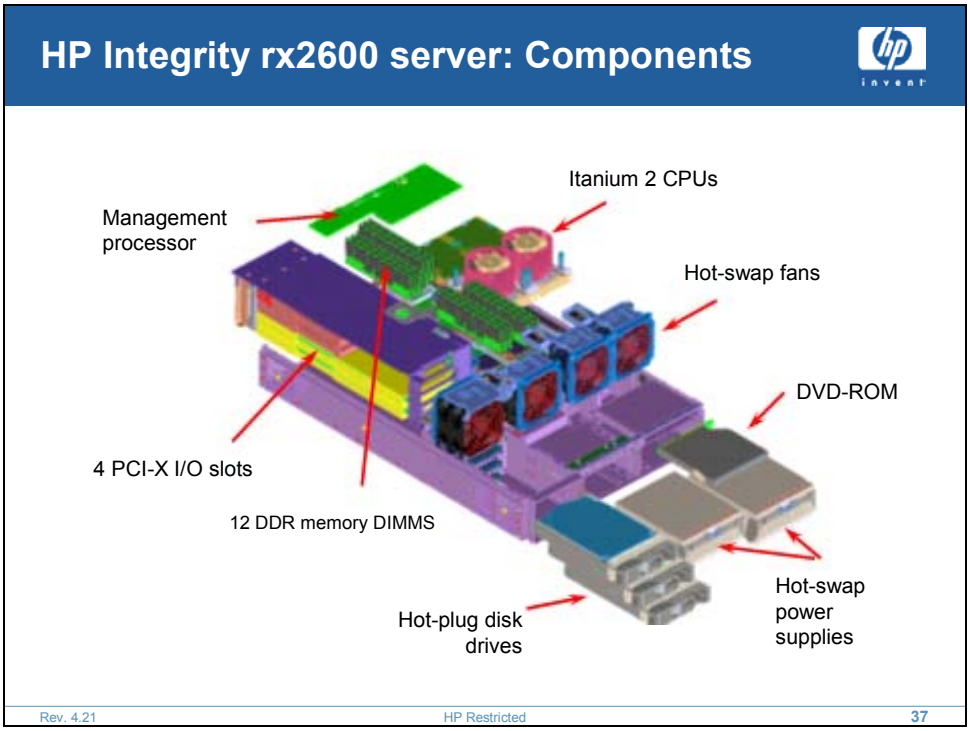
The rx2600 server empowers technical computing users to process more transactions, do more in-depth analysis, run complex models faster and render high quality images with optimized performance. Commercial computing users will run their applications with superior performance, decreased costs, and reduced complexity.



HP Integrity rx2600 server: I/O considerations

The four, open PCI-X slots all have their own dedicated 64-bit 133MHz PCI-X bus and their own independent I/O channel or channels. The independent channels provide improved I/O performance and error containment. Independence protects each I/O card from bus hangs or extended latencies due to the failure or high bandwidth demands of other I/O cards. Independence also ensures that each I/O card can achieve maximum throughput.

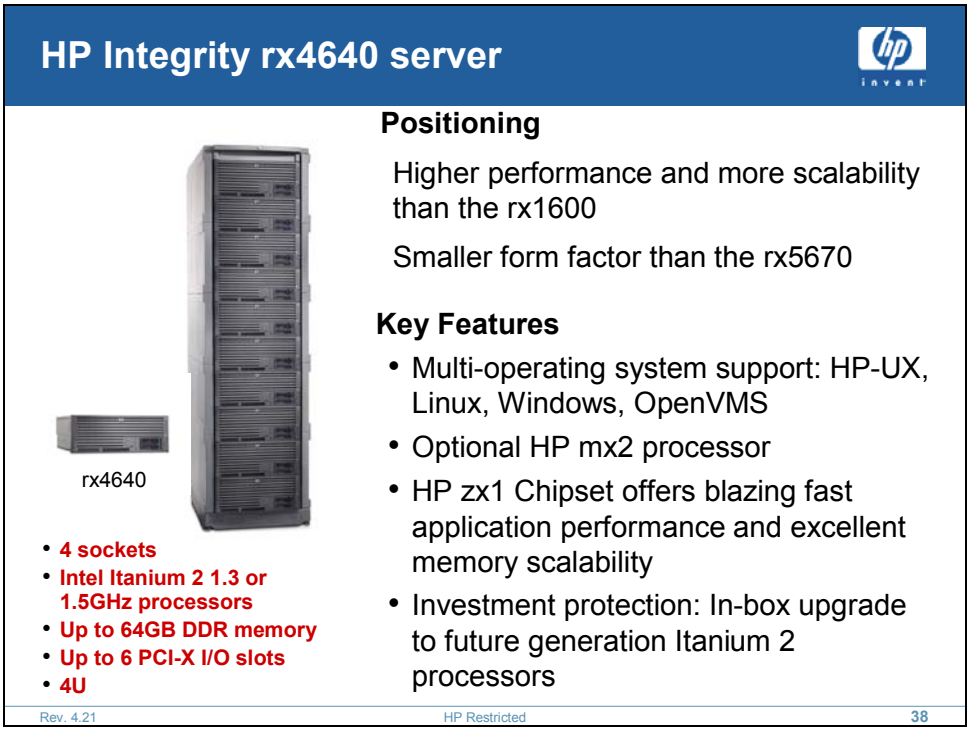
- The first PCI-X slot has two dedicated I/O channels, resulting in sustained PCI-X bandwidth of 1.0GB/s. This slot should be reserved for the highest bandwidth cards, such as clustering interconnects or multi-port storage adapters. The remaining three PCI-X slots each have a single dedicated I/O channel, resulting in 0.5GB/s of sustained bandwidth on each slot. All I/O slots are keyed for 3.3V I/O cards. 5V cards are not supported in the HP Integrity rx2600.
- The remaining three I/O channels link to three PCI busses, which in turn link to the core LAN, SCSI, IDE, and USB interfaces, and to the management processor.



HP Integrity rx2600 server: Components

The left side of the system houses the I/O backplane and I/O card bay. There are four PCI-X slots in the I/O card bay.

The right rear of the server contains the main system board. The system board contains two Intel Itanium 2 CPU sockets, 12 memory DIMM slots, and the core I/O controllers. The management processor sits on an independent circuit board that attaches to the rear of the main system board.



HP Integrity rx4640 server

HP Integrity rx4640 server at a glance

This competitively priced server brings you exceptional price: performance, reliability, and availability in a compact, rack-dense design to meet the most demanding enterprise-level computing requirements. The rx4640 can be equipped with up to four 1.5GHz Intel Itanium 2 processors loaded with 6MB of on-chip L3 cache, as much as 64GB of RAM, and six PCI-X I/O expansion slots. With a rack-dense 4U form factor, the rx4640 maximizes the number of servers per rack for a better return on IT.

With a choice of operating systems, including HP-UX, Linux, Windows (in 1H 2004), and OpenVMS (evaluation release v8.1), the rx4640 gives you total flexibility. This server also offers a pathway to the future with in-chassis upgrades to Intel's next-generation Itanium 2 processors (available in 2004) as well as the HP mx2 dual-processor module (available in 1H 2004), which doubles the Intel Itanium 2 processor density without requiring more power or space.

The rx4640 was designed to be easy to install, service, and maintain. It fits easily into HP 9000 server racks, Compaq ProLiant racks and many third-party racks using side-mounted slides and a cable management arm that install quickly without tools. The blue server identification LED can be activated locally or remotely for easy physical location of problem hardware, and the quick find LED panel speeds problem diagnosis by identifying defective or mismatched hardware components. And you have the option of reducing maintenance costs by repairing the server yourself with field-replaceable parts and simple swap-out repairs.

Customer base

- Extended manufacturing: robust parallel 64-bit platform and high degree of scalability address key issues for manufacturing applications.
- Financial services: Power and flexibility play important roles in application server platforms for enterprise deployments of Windows, and in enabling new levels of network security.

The Itanium ecosystem has reached critical mass, enabling sales growth into commercial computing and continued success in technical computing.

- Commercial
  - Application deployment
  - IT consolidation
  - Commercial software development
- Business applications
- Data warehousing
- Transaction processing
- Middleware
- Security
- Messaging

Product message

- HP offers the broadest range of Itanium-based systems delivering industry-leading integer and floating-point performance. These systems are powered by HP zx1 Chipset creating the fastest Itanium 2-based platforms available.

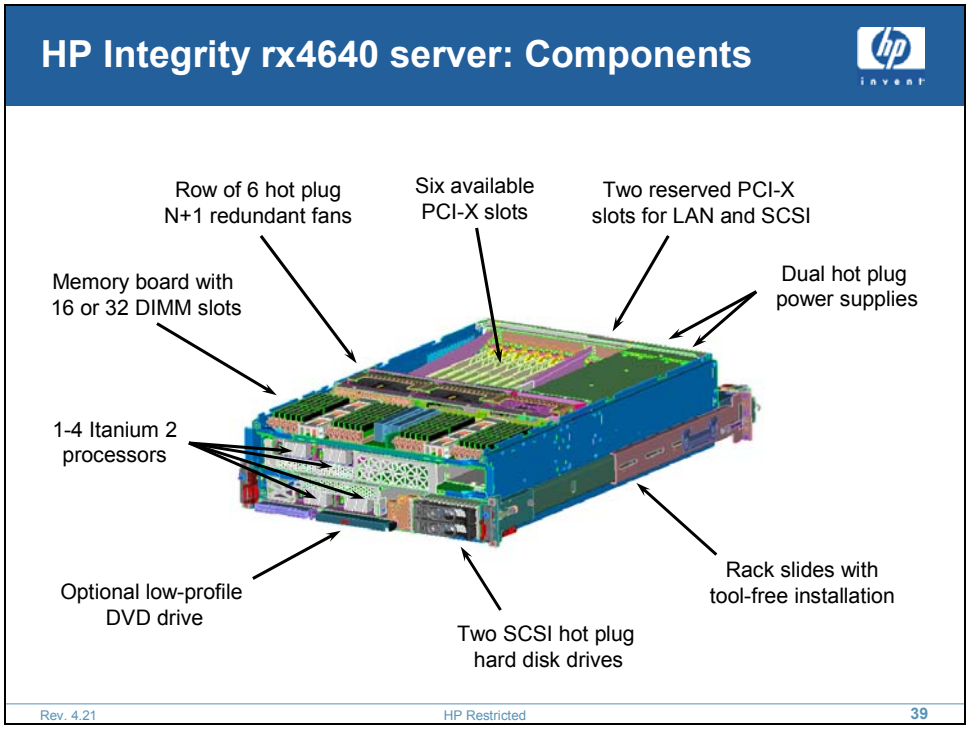
Standard features

- 4U (10 per 2-meter rack)
- Rack-optimized
- One to four Intel Itanium 2 processors
- HP zx1 Chipset
- 6.4GB/s system bandwidth
- 12.8GB/s memory bandwidth
- Six PCI-X I/O slots
- Independent I/O channels
- 4.0GB/s I/O bandwidth
- Gigabit LAN and Ultra160 SCSI
- Management processor

- HP-UX, Linux, Windows (1H 2004) and OpenVMS operating systems support
- Choice of 32 DIMM or 16 DIMM memory boards
- 64GB or 32GB total capacity
- zx1 scalable memory expanders for enhanced capacity and bandwidth
- Memory boards on separate buses—use both for optimal performance
- PC2100 ECC registered DDR266A/B SDRAM
- Memory loading in quads of equal density—specific loading order
- 1GB, 2GB, 4GB, and 8GB DIMM quad products

High availability

- Hot-plug disks
- Redundant, hot-swap fans and power
- Memory scrubbing and page de-allocation
- CPU failure de-allocation
- Memory chip spare
- HP Serviceguard support



HP Integrity rx4640 server: Components

Removing the front bezel and a sheet metal section that covers the top one-third and front of the server provides access to the memory and processor boards. Memory can be easily added to the server (when powered off) without removing the memory carrier. Depending on your choice of memory carriers, up to 16 or 32 dual in-line memory modules (DIMMs) can be loaded into the server. Both the memory carrier and processor boards can be easily removed without tools by unlatching and sliding them forward.

A media bay located at the lower front of the server accepts an optional, slimline DVD drive. Located to the right of the media bay are the power switch and LED indicators for system status. A pair of hot-plug, low profile disk drives are located in the lower right-front corner of the server.

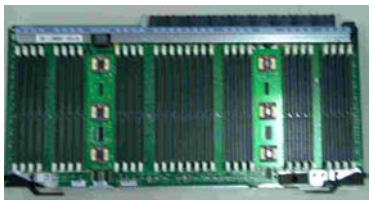
Three pairs of redundant, hot-swap fans span the width of the server behind the processor board, memory board, and other assemblies located in the front half of the server.

Behind the bank of fans are two hot-swap power-supply bays at the right rear of the server. Each power supply has a pull-through fan where air exits at the rear. To the left of the power supplies and behind the bank of fans are eight PCI-X slots. Factory-installed SCSI controller and Ethernet LAN cards occupy two of these slots. The remaining six PCI-X slots have hot-plug capability and can be loaded with I/O cards selected by the end user.

Components

- Row of 6 hot-plug N+1 redundant fans
- Six available PCI-X slots
- Two reserved PCI-X slots for LAN and SCSI
- Dual hot-plug power supplies
- Rack slides with tool-free installation
- Two SCSI hot-plug hard disk drives
- Optional low-profile DVD drive
- 1-4 Itanium 2 processors
- Memory board with 16 DIMM or 32 DIMM slots

HP Integrity rx4640 server: Memory subsystem



12.8 GB/s memory bandwidth
105 ns open page latency

- Choice of 32-DIMM or16-DIMM memory boards
- 64 or 32GB total capacity
- zx1 scalable memory expanders for enhanced capacity and bandwidth
- Memory boards on separate buses—use both for optimal performance
- PC2100 ECC registered DDR266A/B SDRAM
- Memory loading in quads of equal density—specific loading order
- 1GB, 2GB, 4GB, and 8GB DIMM quad products

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HP Integrity rx4640 server: Memory subsystem

- Choice of 32 DIMM or 16 DIMM memory boards
- 64GB or 32GB total capacity
- zx1 scalable memory expanders for enhanced capacity and bandwidth
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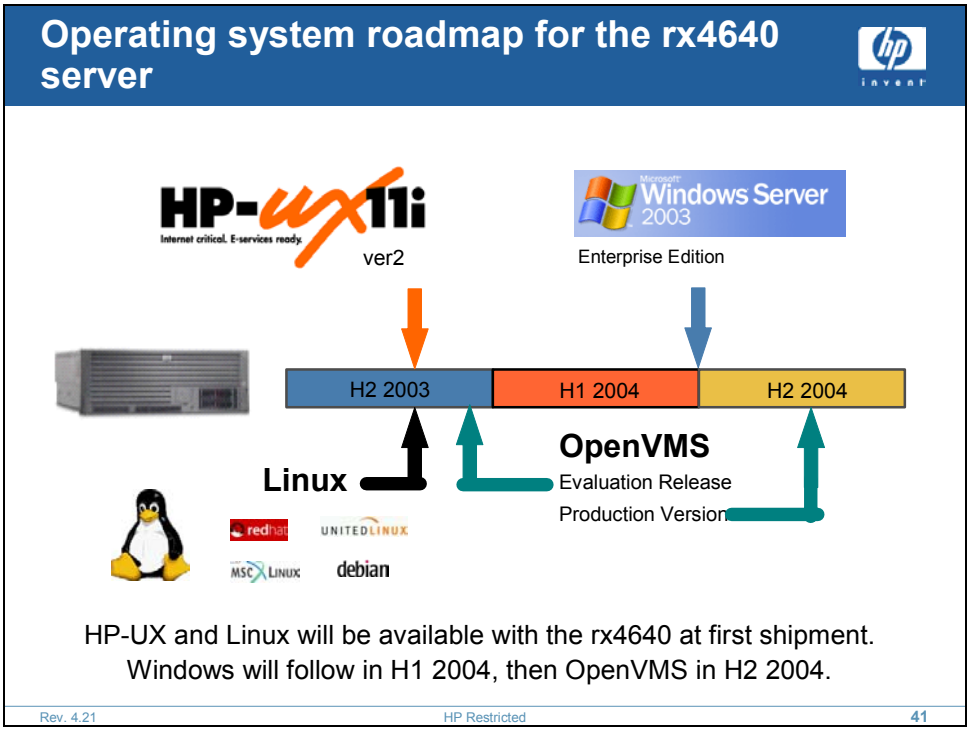
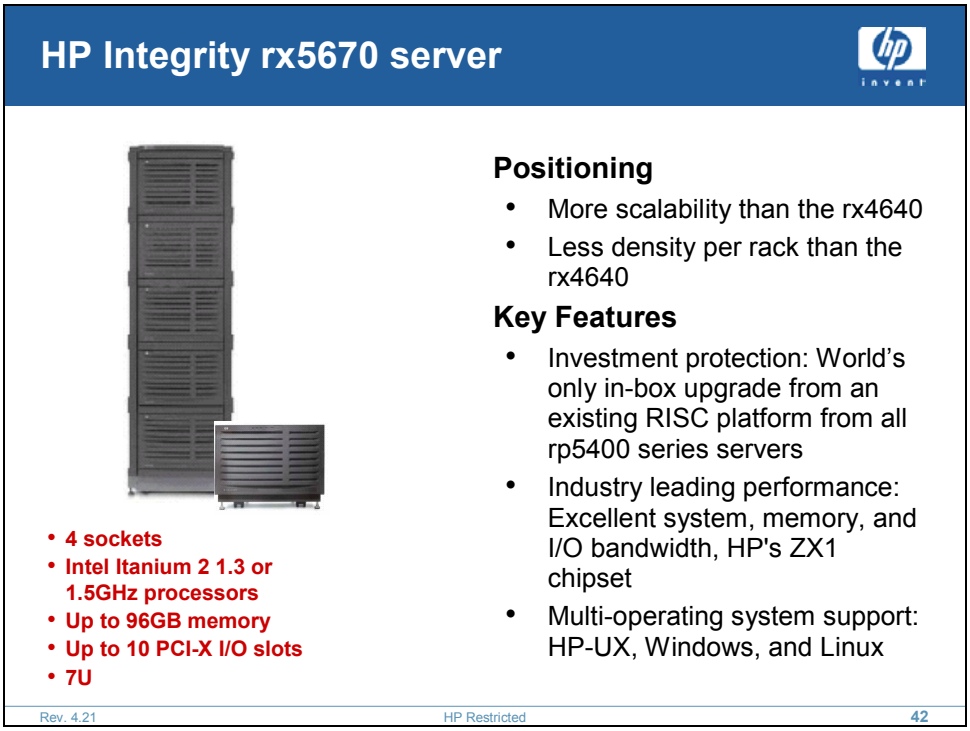


Operating system roadmap for the rx4640 server



HP Integrity rx5670 server

Positioning

The HP Integrity rx5670, powered by 2 to 4 Intel Itanium 2 processors, improves price: performance in enterprise HP-UX, Linux, or Windows environments. With 1.3GHz or 1.5 GHz Intel Itanium CPUs and up to 96GB memory, your customer can achieve more performance, improve business processes, and manage their IT more efficiently.

Even with the Intel Itanium 2 3M processors the rx5670 delivers breakthrough performance across commercial computing workloads:

- #1 OLTP performance in 4-way space, beating all the competition. The rx5670 is 25% faster than the closest 4-way competitor as measured by OLTP estimates and is cheaper than any other alternative at $4.97/tpm.
- #1 floating-point performance — SPECfp2000.

According to the IDC Worldwide Server Market Forecast and Analysis, 2001-2006 (May 2002), Itanium will be the dominant 64-bit architecture.

Ideal environments

The ideal environment for rx5670 is existing customers requesting more performance for their existing applications. Customers can expect a 30-50% performance boost on the new HP Integrity servers running Intel Itanium 2 6M processors. The rx5670 is aggressively priced, and is, therefore, ideal for customers with tight budgets. Suggest rx5670 for customers requiring OS flexibility.

Like the rx2600, the rx5670 enables technical computing users to process more transactions, do more in-depth analysis, run complex models faster, and render high quality images with optimized performance. Commercial users will run their applications with superior performance, decreased costs, and reduced complexity.

Differentiators

HP developed its own chipset for its Itanium 2 line of servers called the HP zx1 Chipset. This chipset was designed with 12.8GB/sec memory bandwidth for the rx5670, and 8.6GB/sec memory bandwidth for the rx2600, which is 25% faster than the front-end bandwidth of an Itanium 2 processor. In addition, the system uses DDR (Double Data Rate) memory and a four-way memory interleave to increase the system's memory subsystem performance. This translates into an extremely low probability of a memory bottleneck in a properly configured system. Further, the system's memory subsystem was designed with "Memory Chip Spare" technology, which reduces the possibility of a system failure due to a memory chip malfunction.

HP is unique in the market of new Itanium 2 servers by offering the only enterprise-class UNIX. HP-UX 11i version 2 runs natively on the Itanium 2 processors, giving HP a distinct advantage over its competitors who must rely on either Linux or Microsoft for a solution.

The rx5670 has ten PCI/PCI-X slots.

- Equipped with N+1 redundant/hot-swap power supplies and fans, triple power cords for the rx5670 and a service processor. To maximize uptime, the system is able to automatically de-configure either memory or CPU in the event of a failure.

Key differentiators	
HP Integrity rx2600 server	**HP Integrity rx5670 server**
■ 2 socket	■ 4 sockets
■ Itanium 2 1.0, 1.3, 1.4, 1.5GHz processors	■ Itanium 2 1.3 or 1.5GHz processors
■ 8.6GB/sec memory throughput	■ 12.8GB/sec memory throughput
■ Spare memory chip	■ Spare memory chip
■ Four-way memory interleave	■ Four-way memory interleave
■ HP-UX, Windows or Linux	■ HP-UX, Windows or Linux
■ Four PCI-X slots	■ Nine PCI-X slots, 1 PCI slot
■ HA features	■ HA features

A few features that make the HP Itanium 2-based systems the leading choice for technical computing include:

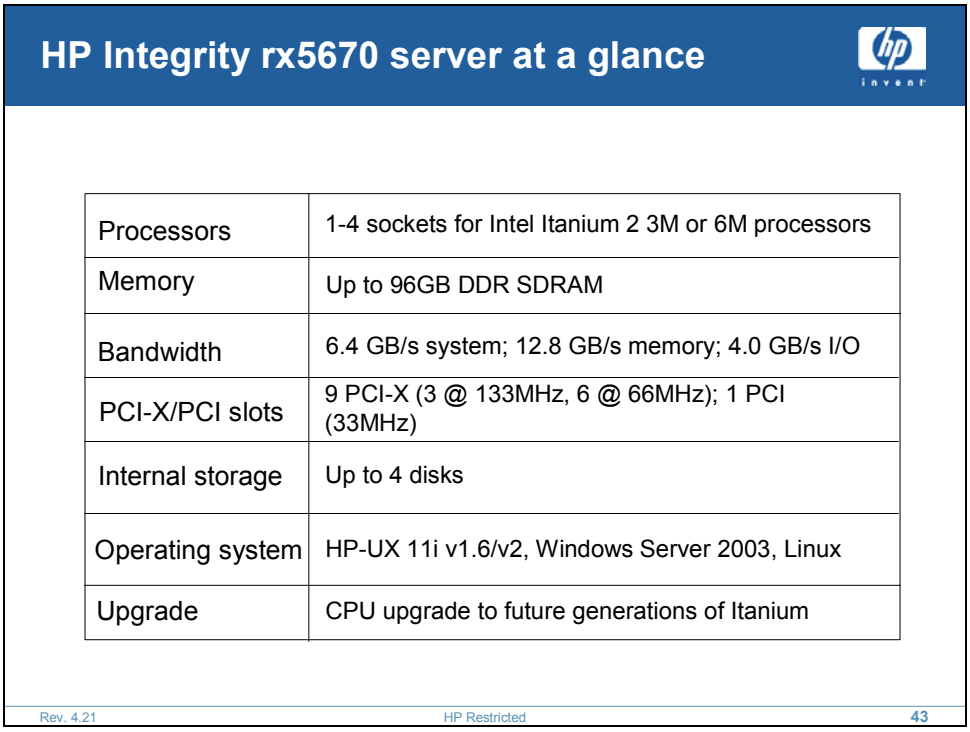
- Exceptional floating-point performance
- Full 64-bit addressability
- Great price: performance
- Excellent memory bandwidth and low-latency system architecture
- The most powerful price: performance clusters
- Software libraries optimized for the architecture
- A full range of systems
- Backwards compatibility

Now with the even higher performance of Intel Itanium 2 6M processors, HP-UX 11i v.2 enterprise functionality, and an increasing number of commercial applications these servers are poised to take over the commercial market entry level.

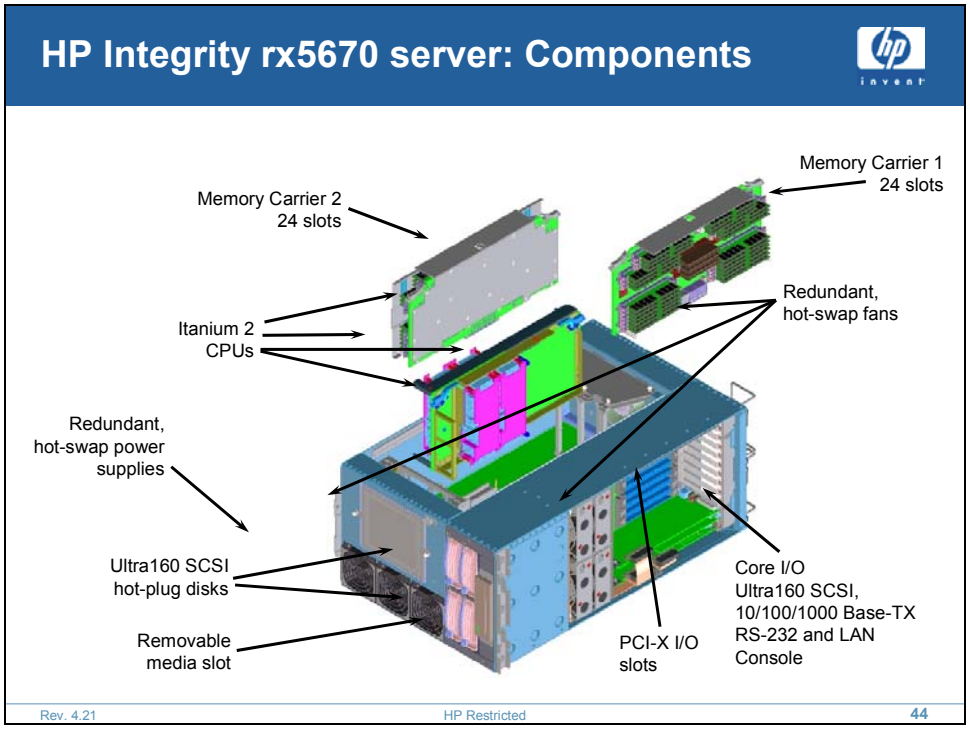
Benefits to the customer

The HP Integrity rx5670 server offers:

- Higher performance than today's RISC and X86 platforms. It is two times faster than first generation Itanium processors and up to 50% faster than the second generation Itanium processors.
- Blazing fast application performance, particularly J2EE-based applications.
- Unmatched memory scalability.
- Customer and ISV applications currently running on HP-UX can run unmodified on HP Integrity servers using the Aires translator.
- Smooth transition from HP 9000 to HP Integrity servers.
- Easy integration of Itanium processors into the existing environment.



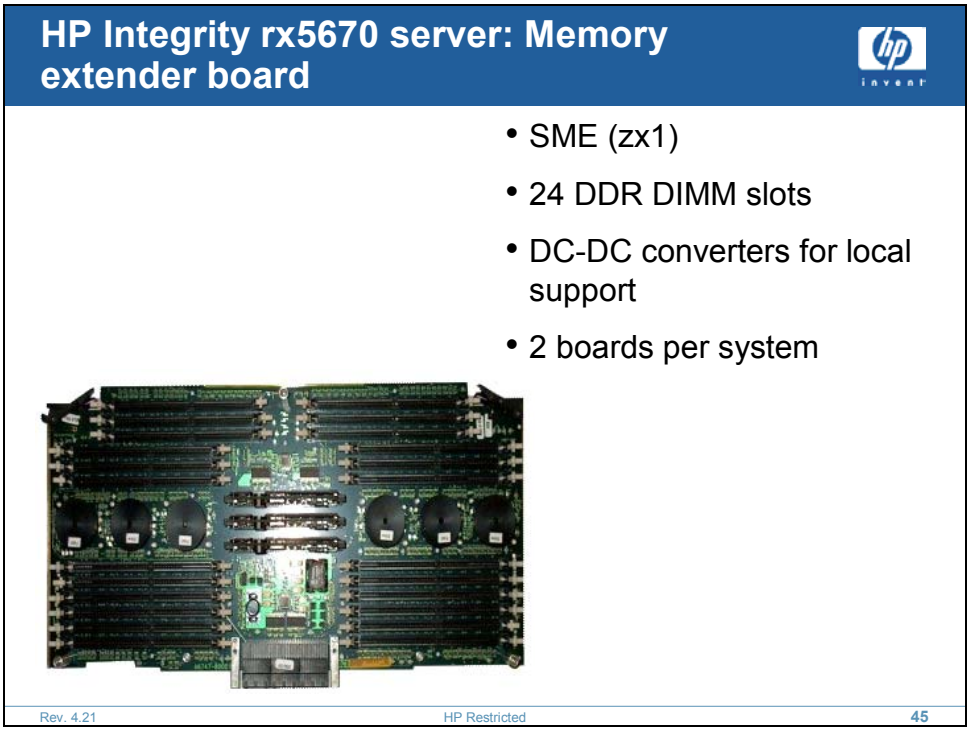
HP Integrity rx5670 server at a glance



HP Integrity rx5670 server: Components

Four hot-swap power supply bays are located in the lower left corner of the server (when viewed from the front). To the right of the front panel, a peripheral bay provides space for four hot-plug disks and one removable media device (either DVD-ROM or DDS-3). Directly above the power supply bays is the first of eight hot-swap cooling fans.

- The right side of the system houses the I/O backplane and I/O card bay. There are twelve PCI-X/PCI slots in the I/O card bay. Two or three of these slots are factory-loaded with core I/O cards, depending on the choice of operating system. The remaining nine or 10 slots are available for a wide variety of optional I/O adapter cards. Two pairs of fans provide cooling for the I/O bay as well as the peripheral bay.
- An opening at the top of the server provides access to the CPU board, memory carriers, and system baseboard. In aggregate, these boards provide support for up to four CPUs and 48 dual inline memory modules (DIMMs).



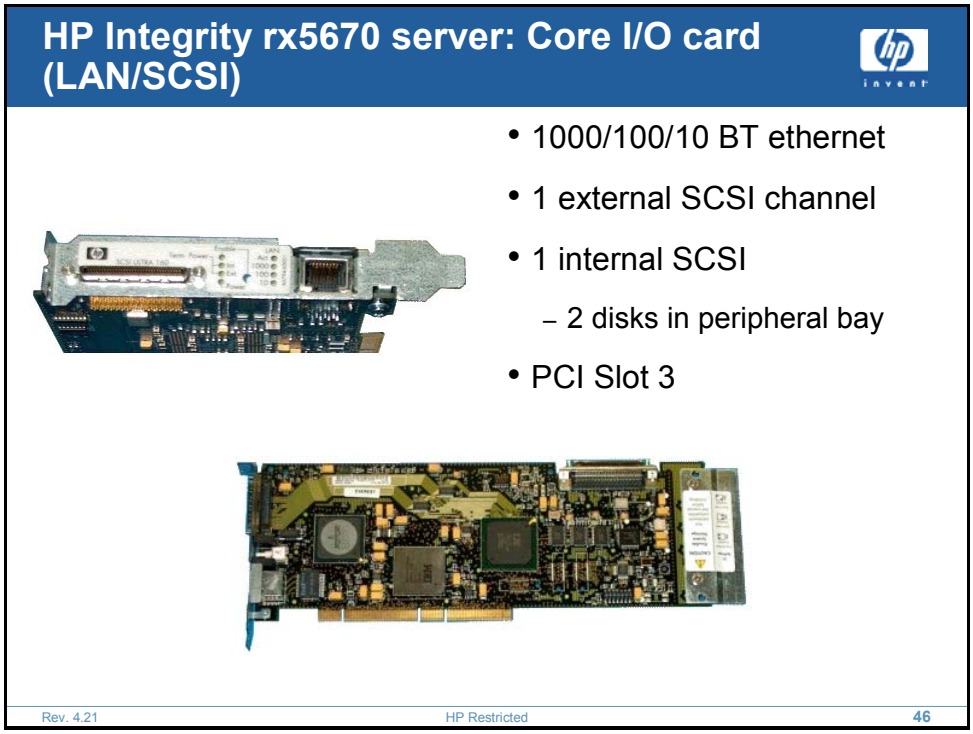
HP Integrity rx5670 server: Memory extender board

The HP zx1 Chipset consist of three modular components:

1. ˜The HP zx1 Chipset memory and I/O controller connects to the processor bus and contains dual memory controllers and the I/O cache controller. It interfaces to the Itanium 2 processor bus and provides a low-latency connection to DDR memory, either directly or through zx1 scalable memory expanders. The controller can connect up to 12 zx1 memory expanders for quadruple the base memory capacity. It can also connect up to 8 zx1 I/O adapters, capable of sustaining 4.0GB/s of I/O bandwidth.
2. The HP zx1 Chipset I/O adapter chip is a scalable solution designed to support PCI-X, PCI, and AGP bus architectures. It provides a scalable I/O implementation for a wide variety of systems. The rx2600 and rx5670 do not deploy AGP graphics bus technology. AGP is available in the HP Workstations zx2000 and zx6000, which also employ the HP zx1 Chipset.
3. The HP zx1 Chipset scalable memory expander is an optional component used to increase memory capacity (up to 4 times) and increase bandwidth to the main memory to 12.8GB/s. Acting as a memory hub, it decreases the number of signal loads on the memory bus, thereby allowing the system to increase its memory transfer rate.

The HP Integrity rx5670 supports DDR (double data rate) SyncDRAM (synchronous dynamic random access memory) DIMMs with ECC and chip spare protection. The HP Integrity rx5670 supports up to two 24 DIMM memory carrier boards, for a maximum of 48 DIMMs. Each memory carrier board connects to the memory controller via a 6.4-GB/s memory bus.

Memory expanders are not used in the rx2600. The rx5670, however, deploys 12 memory expanders, resulting in exceptional memory capacity (48 DIMM slots) and bandwidth (12.8GB/s).



HP Integrity rx5670 server: Core I/O card (LAN/SCS)

Note

See the latest Ordering and Configuration Guide for component descriptions and details.

HP 9000, Integrity (Itanium-based), and carrier-grade servers Configuration Guide March 2004, page 2-230, bookmark: rx5670/Core I/O.

The LAN/SCSI core I/O board provides:

- Internal SCSI bus for 2 hard drives
- External SCSI bus
- System LAN port (10/100/1000)

HP Integrity rx5670 server: Core I/O card (GSP/LAN)

- GSP console/lan
- 2 internal SCSI paths
  - Removable media
  - 2 disks
- Hardware TOC button
- PCI Slot 1

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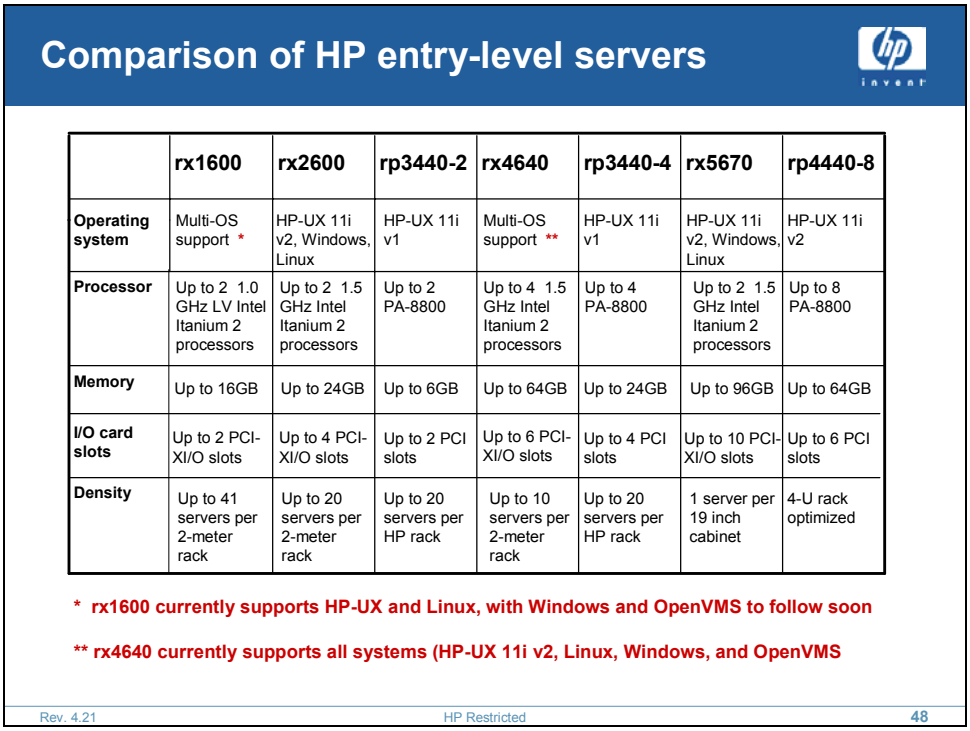
HP Integrity rx5670 server: Core I/O card (GSP/LAN)

The MP (Management Processor) Console/SCSI core I/O board provides:

- MP console/LAN
- 2 internal SCSI buses (1 removable media, 2 disks)
- Hardware TOC (Transfer of Control or Reset) button



Comparison of HP entry-level servers

	rx1600	rx2600	rp3440-2	rx4640	rp3440-4	rx5670	rp4440-8
Operating system	Multi-OS support *	HP-UX 11i v2, Windows, Linux	HP-UX 11i v1	Multi-OS support **	HP-UX 11i v1	HP-UX 11i v2, Windows, Linux	HP-UX 11i v2
Processor	Up to 2 1.0 GHz LV Intel Itanium 2 processors	Up to 2 1.5 GHz Intel Itanium 2 processors	Up to 2 PA-8800	Up to 4 1.5 GHz Intel Itanium 2 processors	Up to 4 PA-8800	Up to 2 1.5 GHz Intel Itanium 2 processors	Up to 8 PA-8800
Memory	Up to 16GB	Up to 24GB	Up to 6GB	Up to 64GB	Up to 24GB	Up to 96GB	Up to 64GB
I/O card slots	Up to 2 PCI-XI/O slots	Up to 4 PCI-XI/O slots	Up to 2 PCI slots	Up to 6 PCI-XI/O slots	Up to 4 PCI slots	Up to 10 PCI-XI/O slots	Up to 6 PCI slots
Density	Up to 41 servers per 2-meter rack	Up to 20 servers per 2-meter rack	Up to 20 servers per HP rack	Up to 10 servers per 2-meter rack	Up to 20 servers per HP rack	1 server per 19 inch cabinet	4-U rack optimized

*** rx1600 currently supports HP-UX and Linux, with Windows and OpenVMS to follow soon**

**** rx4640 currently supports all systems (HP-UX 11i v2, Linux, Windows, and OpenVMS**

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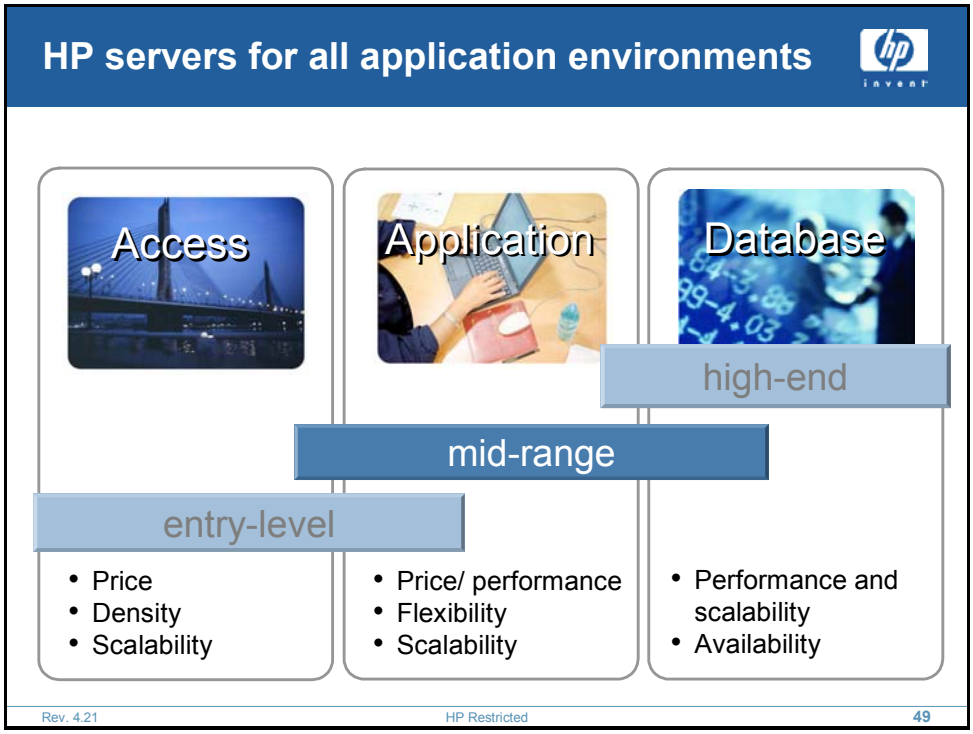
Comparison of HP entry-level servers



HP servers for all application environments

Note

This slide introduces the section on mid-range servers.

Emphasize this section because mid-range servers are the platform of choice for business-critical solutions.

The application tier consists of the applications, related systems, and storage that organize and present data for operational and decision-making purposes. Price/performance and the flexibility to handle new and unanticipated needs are very important.

Although you have seen impressive price/performance with our entry-level servers, we typically address this tier with mid-range servers. These servers are the primary business for HP and are a key revenue contributor to the company's bottom line.

HP midrange servers now offer even more to reduce total cost of ownership:

- Free factory hard-partitioning
- Free custom placement of CPU, memory, and I/O resources into servers and rp8400 Server Expansion Unit
- Free custom operating system load
- Free site prep and installation

HP 9000 rp7420-16 server

- 8 sockets
- PA-8800 processors
- Up to 64GB memory
- Up to 14 PCI-X I/O slots
- 2 nPartitions
- 10U

Positioning

- Increase business agility with leading mid-range performance
- Handle workloads ranging from application-serving to supporting mission-critical databases

Key features

- HP sx1000 Chipset
- nPars and vPar capabilities
- Investment protection: Upgradeable to future PA-RISC or Intel Itanium processors

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HP9000 rp7420-16 server

“Increase business agility with leading midrange performance.”

The HP 9000 rp7420-16 server provides a new level of midrange scalability and performance, with available configurations of up to 16 PA-8800 processors (as compared to the previous generation’s maximum of eight PA-8700+ processors). Made possible by HP’s dual-core technology, the HP 9000 rp7420-16 server offers leading density of up to four 16-way servers per rack—and more than double the compute power per chassis. For existing HP 9000 rp7410 server customers, this new level of performance can be achieved through in-box upgrades to the new PA-8800 processor, bringing significant improvements to IT capabilities at a comparatively small cost.

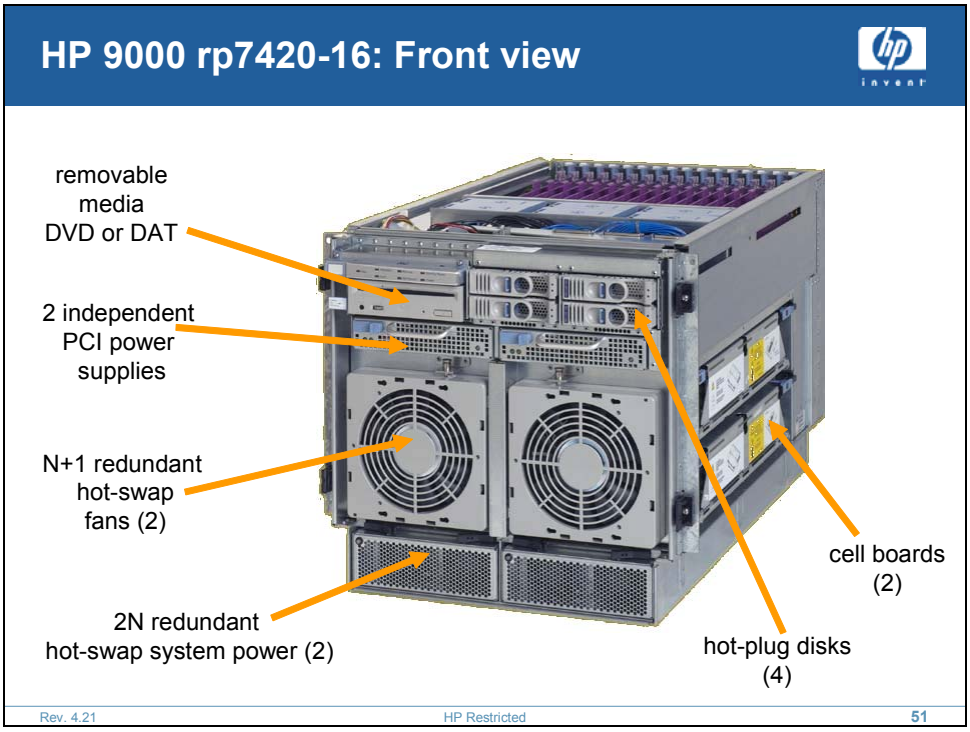
The HP 9000 rp7420-16 server’s HP sx1000 Chipset and improved PCI-X I/O capabilities bring you the raw power you need to handle workloads ranging from application-serving to supporting mission-critical databases. Both hard and virtual partitioning capabilities enhance the HP 9000 rp7420-16 server’s flexibility for application and server consolidation. Moreover, as an ideal platform on which to consolidate multiple smaller servers, the HP 9000 rp7420-16 server can be the key to both lowering TCO and decreasing IT complexity.

Features

- Leading midrange performance based on PA-8800 processors and the HP sx1000 Chipset.
- HP-UX 11i Virtual Server Environment with HP Workload Manager, the industry's only automatic goal-based workload management for UNIX, and on HP-UX 11i partitioning continuum (vPars, nPars, HP Process Resource Manager).
- Solid UNIX leadership in high availability, security, and quality: HP Serviceguard, rated as the #1 disaster recovery/disaster-tolerant solution among UNIX vendors; the most secure commercial UNIX; #1 UNIX best quality.
- Industry-leading high-availability features and solutions.
- Broad portfolio of ISV applications available.
- Industry-leading services and support to build your highly available infrastructure.
- In-chassis upgradable to future generations of PA-RISC and Intel Itanium processors.
- Superb rack density—up to four 16-way servers per rack!
- Consistent management tools.
- Built-in HP-UX 11i v1 binary, source, and data compatibilities and Linux and Windows interoperability.

Benefits

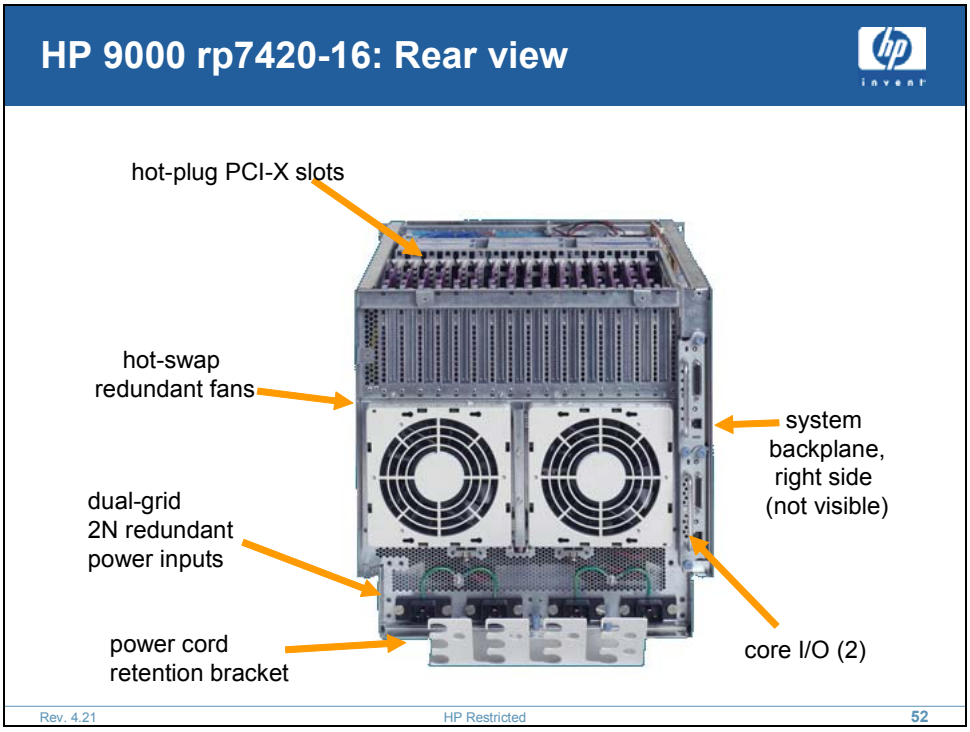
- Blazing fast application performance to meet your demanding business needs
- Allocates resources automatically and improves system usage while maintaining service levels
- Unprecedented reliability to protect your business from unforgiving interruptions
- Wide range of application choices to meet critical business and IT requirements
- Reduced time to solution deployment; proactive and reactive support services help maintain availability and reliability of IT environments
- Assured future performance without costly box swaps
- Reduced costs and increased operating efficiency
- Common and simplified management to reduce costs
- Investment protection and lasting value for future growth



HP9000 rp7420-16: Front view

A peripheral bay located at the top front of the HP 9000 rp7420-16 server provides space for four hot-plug disk drives and one removable-media device (DVD or DAT). Directly below the peripheral bay are two PCI-X power bricks, which supply DC power for the PCI-X backplane. Below the power supplies are two redundant, hot-swappable cooling fans. These fans pull cool air in from the front and force air to the rear, cooling the system's internal components. At the bottom is the bulk power supply (BPS) bay, which houses two redundant (2N) hot-swap power supplies with dual grid support.

The illustration also shows the right side of the HP 9000 rp7420-16 server with a view of the cell board bay, which supports up to two cell boards. The cell boards contain processors, memory, and cell controller chips.



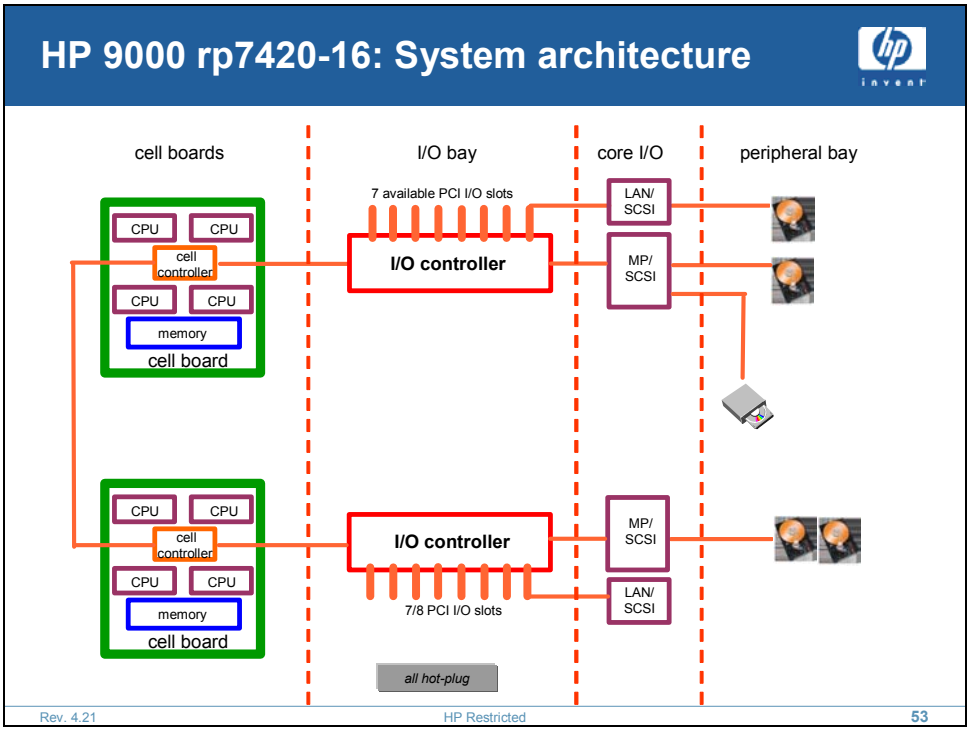
HP9000 rp7420-16: Rear view

This slide shows a rear view of the HP 9000 rp7420-16 server, showing the location of the two hot-swappable 150 mm exhaust fans and the I/O bay bulkhead directly above them. The core I/O cards are located at the right edge of the unit.

The system backplane board houses the linkages used for communications between cell boards, I/O, and internal peripherals. The HP 9000 rp7420-16 server's I/O card bay is located at the top rear of the system. It contains 15 PCI-X card slots, all currently supporting hot-plug functionality.

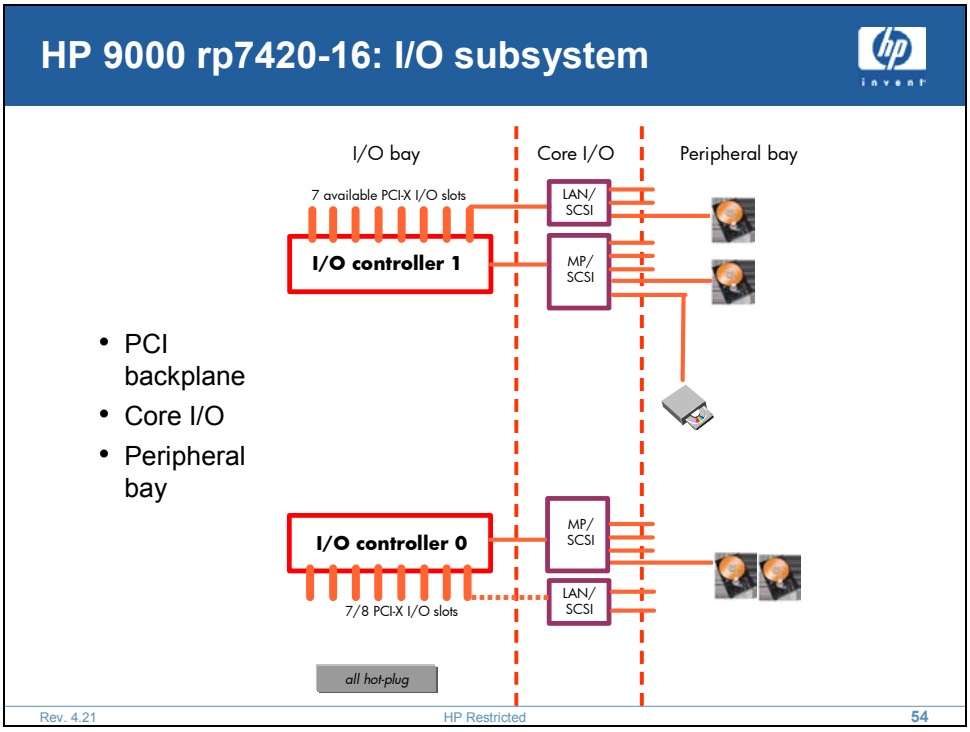
The bottom rear of the HP 9000 rp7420-16 server has inputs for the 2+2 redundant line cords. Because of the high degree of connectivity offered in the HP 9000 rp7420-16 server, a cable management arm (not shown) is provided in racked systems for dressing cables and simplifying cable routing (available only on racked systems).

The HP 9000 rp7420-16 and rp8420-32 servers share many system components and design features. The similarities are evident in figures 4 and 5, which show the major components and architectural features of the HP 9000 rp8420-32 server.



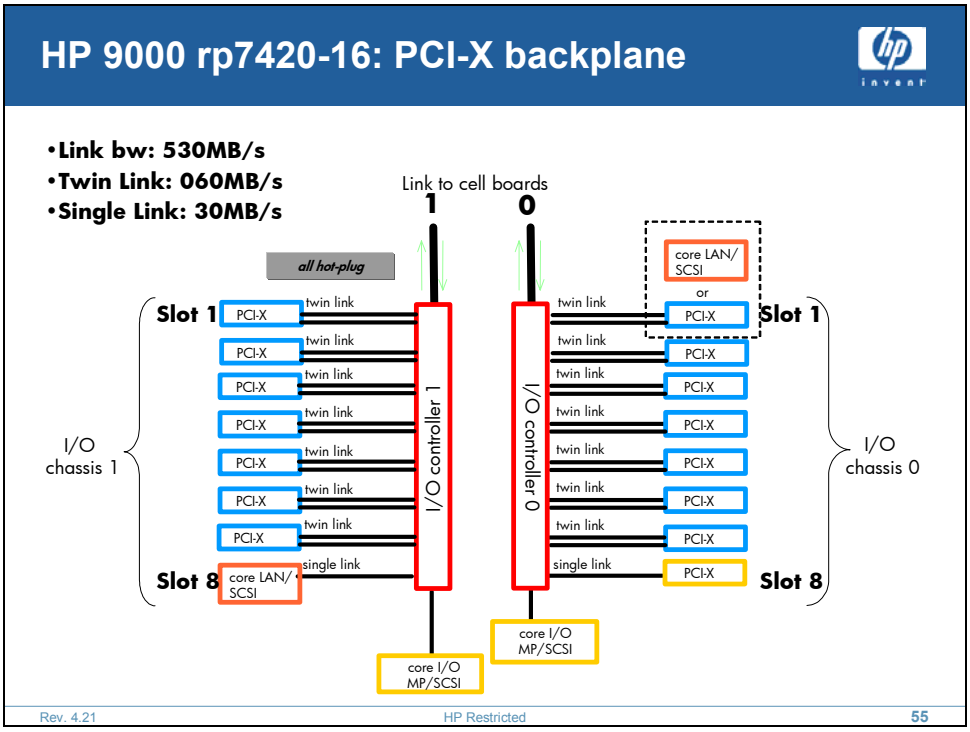
HP9000 rp7420-16: System architecture

The HP 9000 rp7420-16 server architecture is designed around the ability to operate the server as a single 2- to 16-way SMP system or to divide it into two independent hard partitions (nPars). This slide shows the primary components of the HP 9000 rp7420-16 server architecture. When the system is configured as a non-partitioned server, all resources in the architecture are available to perform together as one logical server. When it is configured as two nPars, system resources are divided into two logical servers, or independent partitions, each containing a cell board with a dedicated set of I/O resources. In this architecture, imagine that the solid line connecting the upper and lower cell boards is no longer there. The drawing would then reflect a system divided into two independent partitions. The cell board, I/O bay, core I/O, and peripheral bay in the upper half of the drawing would be an independent hard partition, which is isolated from the second partition shown in the lower half of the drawing.



HP 9000 rp7420-16: I/O subsystem

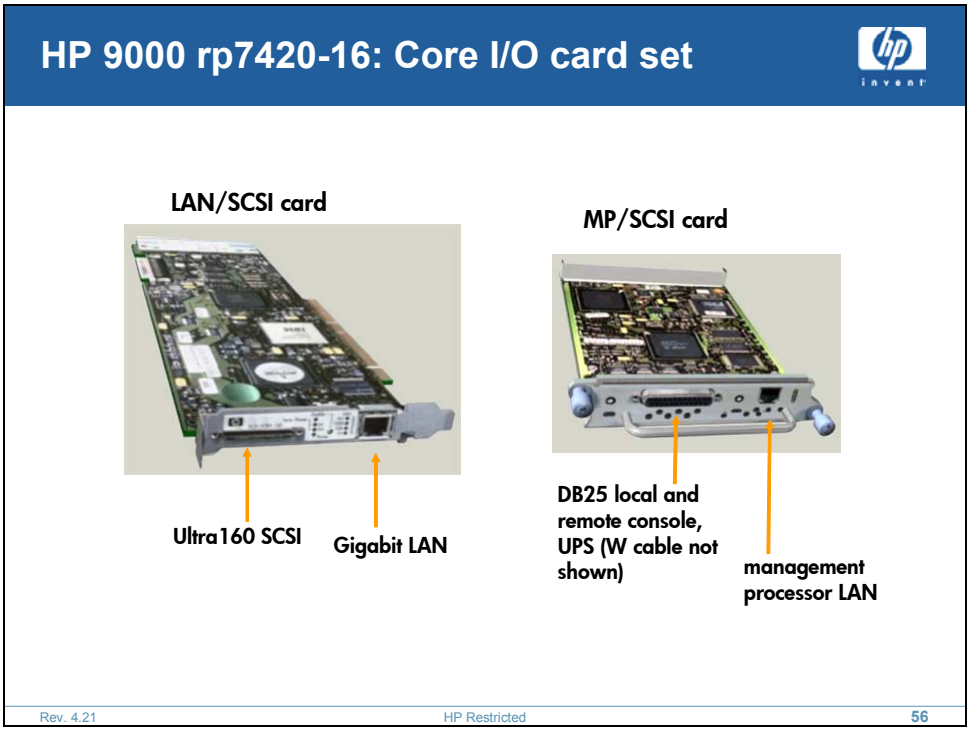
Each HP 9000 rp7420-16 and rp8420-32 server contains an embedded high-performance I/O subsystem. In addition, the HP 9000 rp8420-32 server can optionally connect to external I/O resources located in the HP Server Expansion Unit (SEU) through a high-performance I/O cable link. The components within the I/O subsystem are the I/O controllers, internal peripheral bay, and multifunction core I/O.



HP 9000 rp7420-16: PCI-X backplane

The I/O slot implementations between the rp7420 and the rp8420 servers are almost identical—the difference is the use of one or two slots by the rp7420-16 core I/O. In both figures, note that 14 of the 16 I/O card slots are supported by dual high-performance links. These dual-link I/O slots provide a maximum of 1.06 GB/s of peak bandwidth for the slot. The remaining two I/O slots are single links and provide a maximum of 530 MB/s of peak bandwidth. Aggregate I/O slot bandwidth is 15.9 GB/s.

Every PCI-X slot in the HP 9000 rp7420-16 and rp8420-32 servers is capable of running at 133 MHz x 64 bits. This means that every I/O slot will allow the industry's highest-performing PCI-X cards to run at their maximum design speed.



HP 9000 rp7420-16: Core I/O card set

HP 9000 rp7420-16 server core I/O

The HP 9000 rp7420-16 server chassis supports up to two core I/O card sets. Each set contains two cards (MP/SCSI and LAN/SCSI), which are installed in different locations: MP/SCSI cards are installed along the right rear vertical edge of the chassis; LAN/SCSI cards are installed in the PCI-X card bay. A minimum of one core I/O card set must be ordered with each system; the optional second core I/O card set can be used to enable hardware partitioning or to utilize the full capacity of the built-in mass storage bays.

Both core I/O card sets are identical. However, the electrical connections to internal peripherals and the I/O controller are slightly different. In the primary core I/O set, the LAN/SCSI board is supported by a single 530 MB/s link; in the secondary core I/O set, the LAN/SCSI board is supported by two 530 MB/s links. In addition, in the primary core I/O set, the two SCSI controllers—one in the LAN/SCSI card and one in the MP/SCSI card—each support a single internal disk drive. In the secondary core I/O, only the MP/SCSI board is used to support disk drives; however, both disk drives are supported off this single SCSI controller and bus.

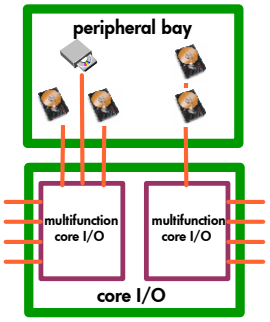
The management processor

The management processor (MP) is a dedicated processor located on each MP/SCSI card that simplifies and extends system management and enhances serviceability. The MP minimizes or eliminates the need for the system administrator to be physically at the system to perform tasks such as diagnostics, system management, or even hard resets. Following are some of the features enabled by the HP 9000 rp7420-16 and rp8420-32 servers' management processor:

- System management over the Internet or intranet
- System console redirection
- Console mirroring
- System configuration for automatic restart
- Viewing history log of system events
- Viewing history log of console activity
- Setting MP inactivity timeout thresholds
- Remote system control
- Remote power cycle (except for MP housekeeping power)
- Viewing system status
- Event notification to system console, e-mail, pager, and/or HP Response Centers (e-mail and pager notification work in conjunction with HP Event Monitoring Service [EMS])
- Automatic hardware protection of critical environmental problems
- Access to management interface and consoles on WAN failure (modem required)
- Automatic system restart
- Remote resetting of hardware partitions
- Forward progress indicator (via a virtual front panel)
- Out-of-band manageability and processor-dependent code (PDC) firmware update
- Configuration of manageability and console security
- MP failover (systems with both core I/O boards)
- Secure Sockets Layer (SSL)

HP 9000 rp7420-16: Internal peripheral bay

- Up to 4 internal hot-plug disk drives
- 1 removable media drive: DVD or DAT
- 15K rpm high-performance disks
- Full disk mirroring supported across independent buses, controllers, and core I/O cards
- SCSI controllers integrated into the multifunction core I/O
- Disks in 36GB, 73GB, and 146GB capacities



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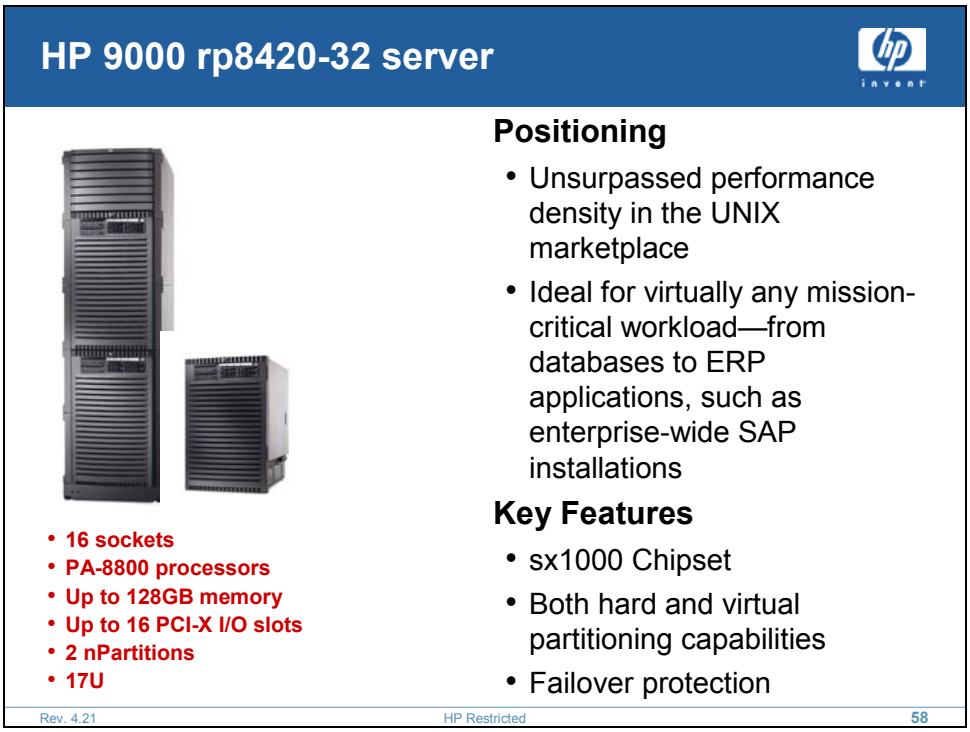
HP 9000 rp7420-16: Internal peripheral bay

Each HP 9000 rp7420-16 server core I/O card set contains dual-channel Ultra160 SCSI controller chips that support the SCSI devices in the internal peripheral bay. Each core I/O card set supports two internal disks. It is important to note that separate controllers and SCSI buses manage the two disks supported by the primary core I/O card set. A single controller and SCSI bus manage the second pair of disks supported by the secondary core I/O card set. If use of more than two internal disks is needed, the HP 9000 rp7420-16 server will require both core I/O card sets.



HP 9000 rp8420-32 server

HP 9000 rp8420-32 servers:

These are industry-leading midrange servers offering high-end, mission-critical performance and capabilities.

Designed to meet high-end performance requirements at midrange pricing, the highly scalable HP 9000 rp8420-32 server offers unsurpassed performance density in the UNIX marketplace. HP's dual-core technology has allowed us to double the density—to a maximum of 32 processors—of what was already the highest-density UNIX server on the market. Superior performance and high availability make the HP 9000 rp8420-32 server ideal for virtually any mission-critical workload—from databases to ERP applications, such as enterprise-wide SAP installations.

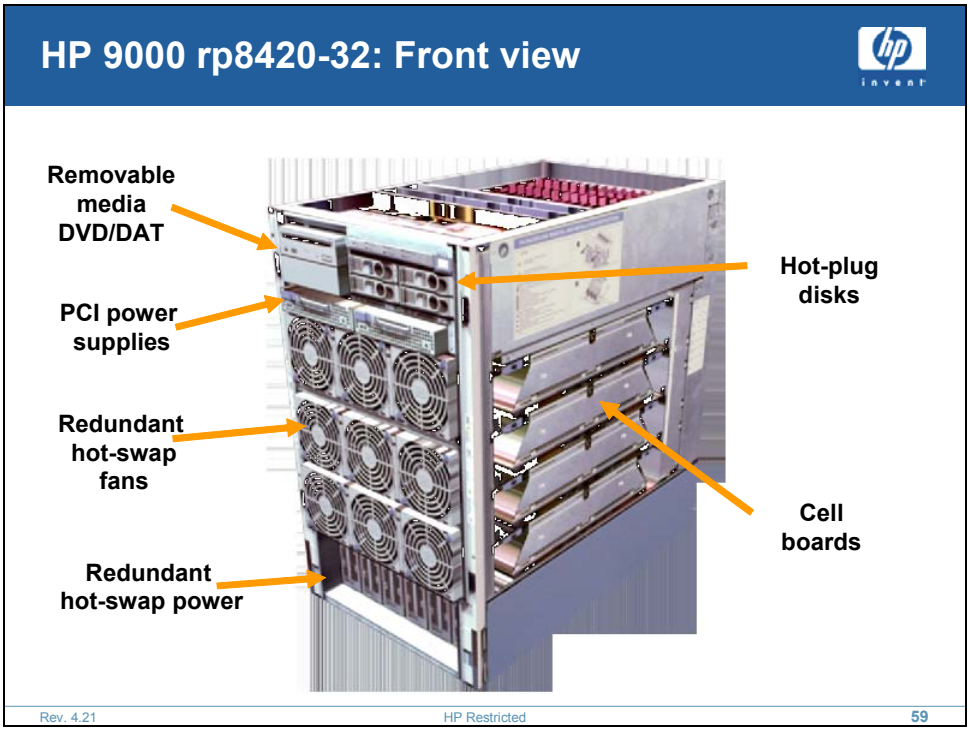
The HP 9000 rp8420-32 server offers an excellent opportunity to meet your business's high-end computing requirements at a lower TCO. Because of its physical density and both hard and virtual partitioning capabilities, the HP 9000 rp8420-32 server is ideal for server consolidation. Multiple OS instances on the HP 9000 rp8420-32 server can provide the same failover protection as multiple physical servers while reducing the complexity, administration costs, maintenance, and power consumption associated with multiple servers. For existing HP 9000 rp8400 customers, the new HP 9000 rp8420-32 server offers a low-cost upgrade to their IT infrastructure that not only offers significant capability improvements, but also is an ideal stepping stone for an in-box upgrade to the Itanium-based HP Integrity rx8620 server.

Features

- Leading midrange performance based on PA-8800 processors and the HP sx1000 Chipset.
- HP-UX 11i Virtual Server Environment with HP Workload Manager, the industry's only automatic goal-based workload management for UNIX, and on HP-UX 11i partitioning continuum (vPars, nPars, HP Process Resource Manager).
- Solid UNIX leadership in high availability, security, and quality: HP Serviceguard, rated as the #1 disaster recovery/disaster-tolerant solution among UNIX vendors; the most secure commercial UNIX; #1 UNIX best quality.
- Industry-leading high-availability features and solutions.
- Broad portfolio of ISV applications available.
- Industry-leading services and support to build your highly available infrastructure.
- In-chassis upgradable to future generations of PA-RISC and Intel Itanium processors.
- Superb rack density—up to two 32-way servers per rack!
- Consistent management tools.
- Built-in HP-UX 11i v1 binary, source, and data compatibilities and Linux and Windows interoperability.

Benefits

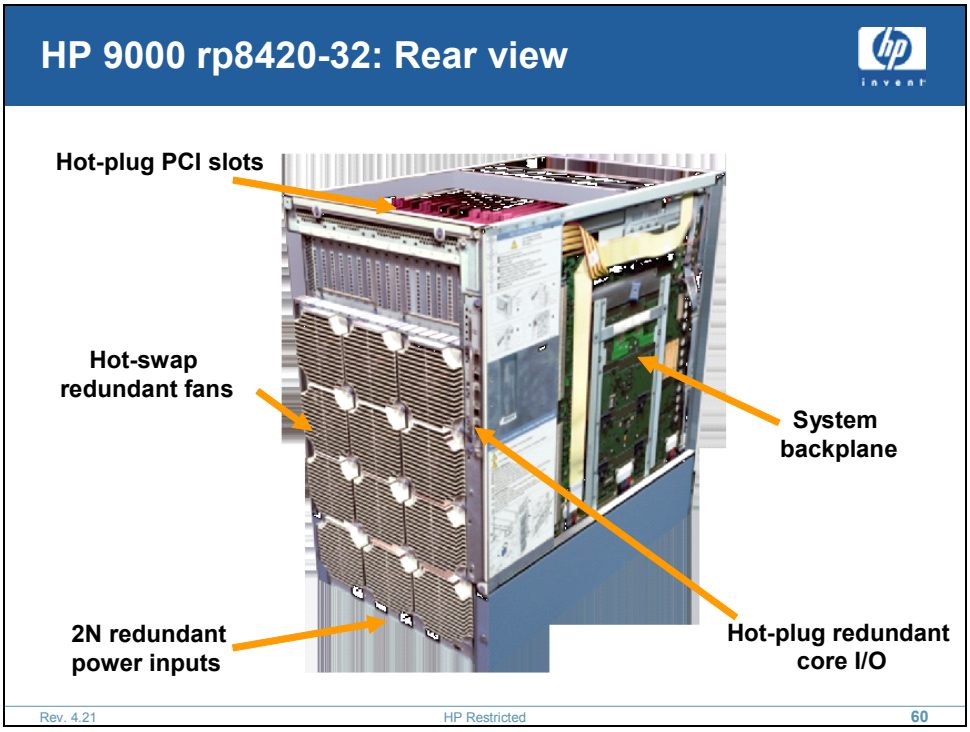
- Blazing fast application performance to meet your demanding business needs
- Allocates resources automatically and improves system usage while maintaining service levels
- Unprecedented reliability to protect your business from unforgiving interruptions
- Wide range of application choices to meet critical business and IT requirements
- Reduced time to solution deployment; proactive and reactive support services help maintain availability and reliability of IT environments
- Assured future performance without costly box swaps
- Reduced costs and increased operating efficiency
- Common and simplified management to reduce costs
- Investment protection and lasting value for future growth



HP 9000 rp8420-32: Front view

A peripheral bay located at the top front of the HP 9000 rp8420-32 server provides space for four hot-plug disk drives and two removable-media devices (DVD or DAT). Directly below the peripheral bay are two PCI-X power bricks, which supply DC power for the PCI-X backplane. Below the power supplies are nine redundant hot-swappable cooling fans. These fans pull cool air in from the front and force air to the rear, cooling the system's internal components. At the bottom is the bulk power supply bay, which houses up to six redundant (2N+1) hot-swap power supplies.

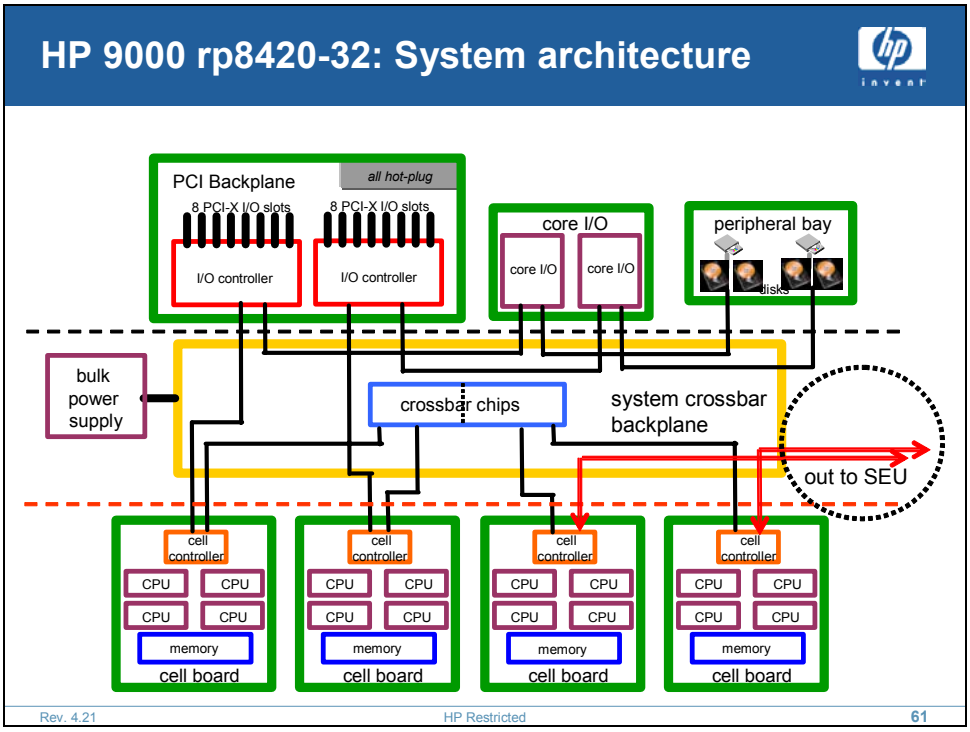
The slide also shows the side of the HP 9000 rp8420-32 server with a view of the cell card cage. This cage supports up to four cell boards that processors, memory, and cell controller chips reside on.



HP 9000 rp8420-32: Rear view

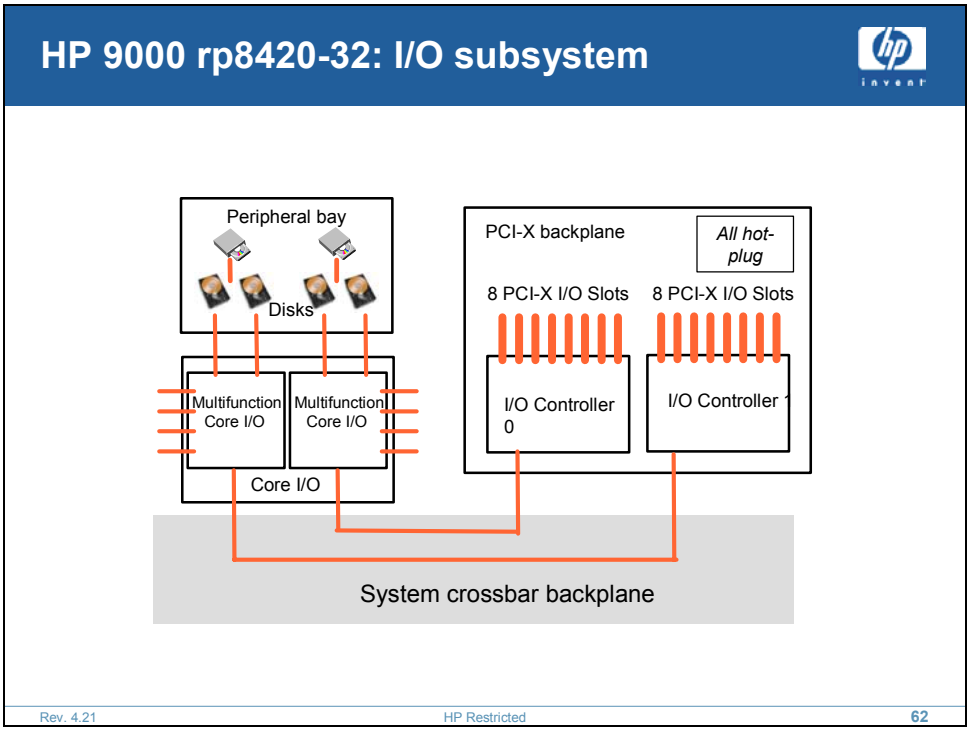
Visible here is the system backplane board, which houses the high-bandwidth crossbar used for communications between cell cards, I/O, and internal peripherals. The HP 9000 rp8420-32 server's I/O card bay is located at the top rear of the system. It contains 16 PCI-X card slots, all currently supporting hot-plug functionality.

The bottom rear of the HP 9000 rp8420-32 server has inputs for the 2+2 redundant line cords. Because of the high degree of connectivity offered in the HP 9000 rp8420-32 server, a cable management arm is provided for dressing cables and simplifying cable routing (The cable management arm is not shown here and is available only on HP 9000 rp8420-32 server racked systems.).



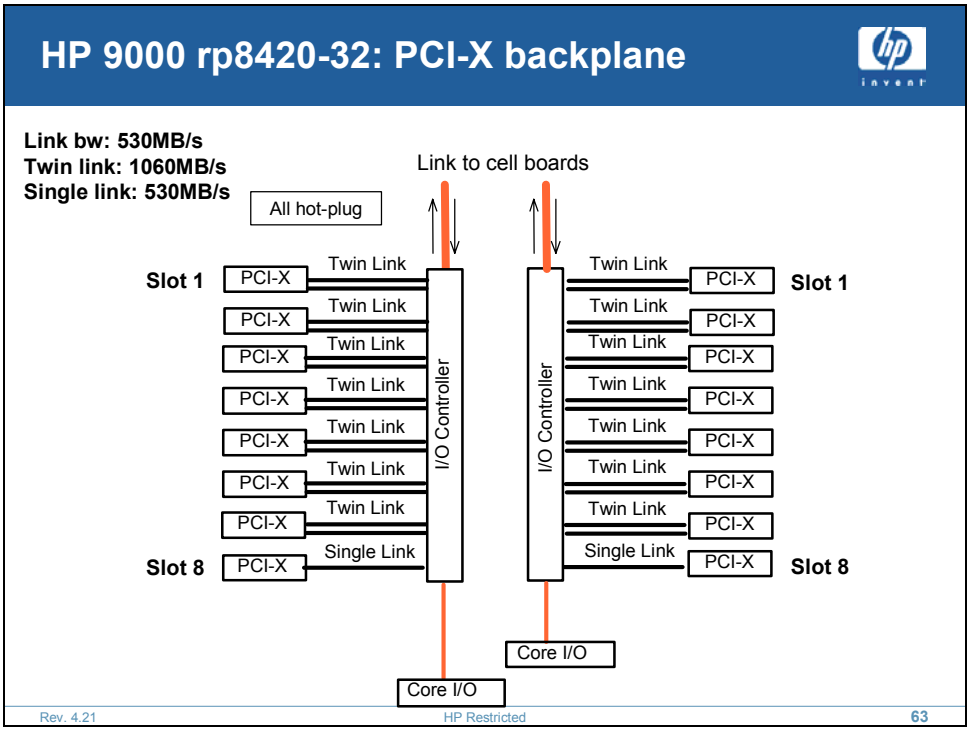
HP 9000 rp8420-32: System architecture

The crossbar backplane provides a non-blocking connection between up to four cells, plus connection to the external I/O resources in the HP Server Expansion Unit (SEU). Like the HP 9000 rp7420-16 server, the HP 9000 rp8420-32 server can be configured as one 2- to 32-way SMP, or it can be divided into smaller independent nPars. The HP 9000 rp8420-32 server can be divided into four hardware isolated partitions when connected to the SEU.



HP 9000 rp8420-32: I/O subsystem

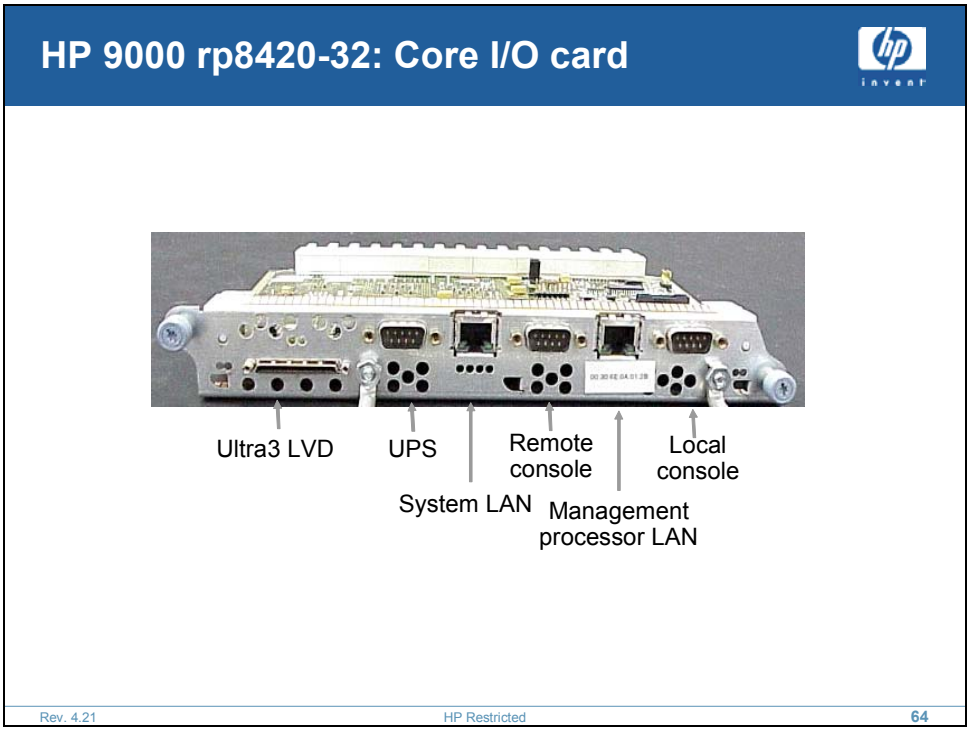
Each HP 9000 rp7420-16 and rp8420-32 server contains an embedded high-performance I/O subsystem. In addition, the HP 9000 rp8420-32 server can optionally connect to external I/O resources located in the HP Server Expansion Unit (SEU) through a high-performance I/O cable link. The components within the I/O subsystem are the I/O controllers, internal peripheral bay, and multifunction core I/O.



HP 9000 rp8420-32: PCI-X backplane

The I/O slot implementations between the rp7420 and the rp8420 servers are almost identical—the difference is the use of one or two slots by the rp7420-16 core I/O. In both figures, note that 14 of the 16 I/O card slots are supported by dual high-performance links. These dual-link I/O slots provide a maximum of 1.06 GB/s of peak bandwidth for the slot. The remaining two I/O slots are single links and provide a maximum of 530 MB/s of peak bandwidth. Aggregate I/O slot bandwidth is 15.9 GB/s.

Every PCI-X slot in the HP 9000 rp7420-16 and rp8420-32 servers is capable of running at 133 MHz x 64 bits. This means that every I/O slot will allow the industry's highest-performing PCI-X cards to run at their maximum design speed.



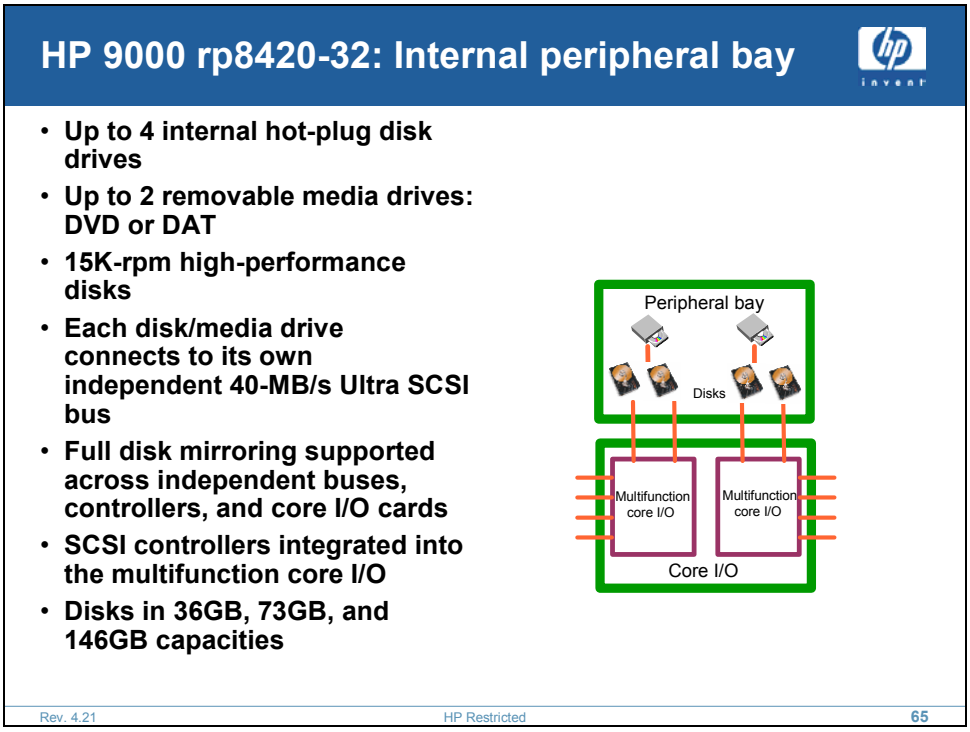
HP 9000 rp8420-32: Core I/O card

The HP 9000 rp8420-32 server chassis supports up to two core I/O cards, installed in core I/O slots located along the right-rear vertical edge of the chassis. A minimum of one core I/O card is ordered with each system; the optional second core I/O card can be used to enable hardware partitioning or to utilize the full capacity of the built-in mass storage bays.

The core I/O management processor, external LAN port, and external SCSI port functionality in the HP 9000 rp8420-32 server is the same as described above in the HP 9000 rp7420-16 server core I/O section. However, there are slot count and bus routing differences in the peripheral bay implementation. The following section pertains specifically to the HP 9000 rp8420-32 server peripheral bay.

Access to internal peripheral bay:

The first core I/O card enables half of the HP 9000 rp8420-32 server peripheral bay, which includes one removable-media and two low-profile disks. The second core I/O card enables the remaining internal peripherals, two disks, and one removable-media bay. Customers who require access to more than two internal disks or more than one removable-media slot will need the second core I/O card and a minimum of two cell boards.



HP 9000 rp8420-32: Internal peripheral bay

The HP 9000 rp8420-32 server internal peripheral bay is located at the top front of the system chassis. The peripheral bay holds up to four low-profile hot-plug disks and two removable-media devices.

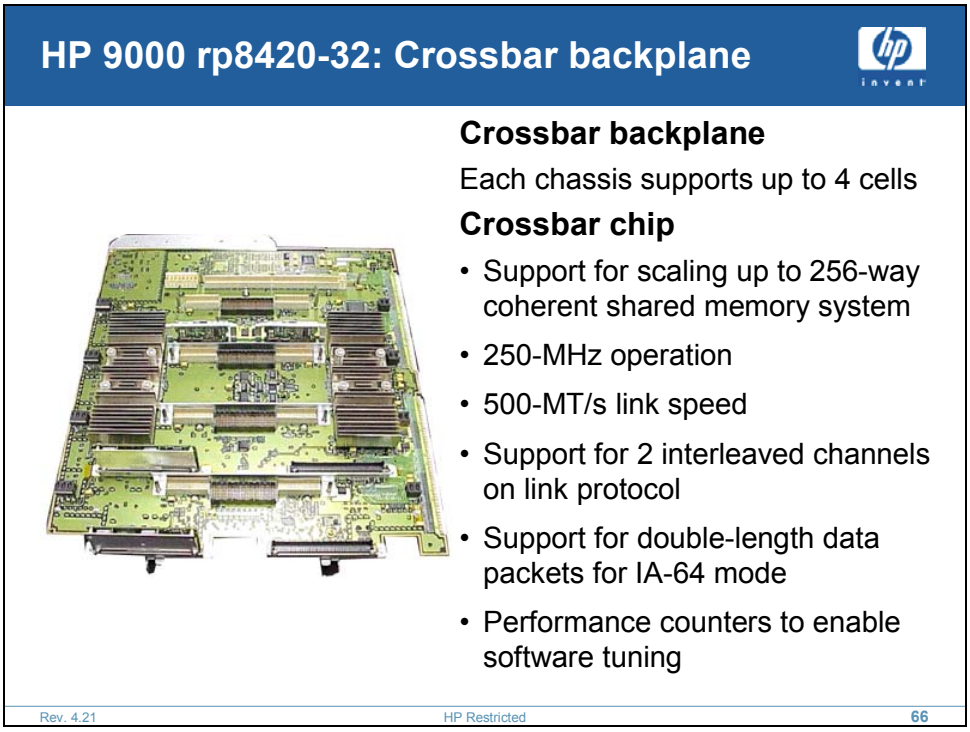
Each HP 9000 rp8420-32 server core I/O card contains two dual-channel SCSI controller chips that support the SCSI devices in the internal peripheral bay. Each core I/O card supports two internal disks and one removable-media device, each on a dedicated 40 MB/s SCSI channel. If use of more than two internal disks or one removable-media device is needed, the HP 9000 rp8420-32 server will require both core I/O cards. This architecture also provides an added degree of availability in that full disk mirroring is supported across independent buses, controllers, core I/O cards, and master I/O controller chips.

Hot-plug disk drives

The HP 9000 rp8420-32 server holds up to four SCSI disks, which are accessible from the front of the server. These are hot-plug disks, so they can be removed and inserted while the HP 9000 rp8420-32 server continues to operate. Three disk sizes are currently supported: 36 GB, 15K rpm; 73 GB, 15K rpm; and 146 GB, 10K rpm.

Removable-media bays

The HP 9000 rp8420-32 server contains two removable-media bays, which support either a DVD drive or DDS-4 DAT drive. Access to these devices is also from the front of the server. The DVD drive provides enhanced features while preserving backward read compatibility with CD-ROM drives. Data transfer rates of up to 6.75 MB/s are achieved with the DVD format; 4.8 MB/s can be achieved using the CD-R format. The DDS-4 drive has a maximum storage capacity of 40 GB, with a peak transfer rate of 21.6 GB/hour (compressed).



HP 9000 rp8420-32: Crossbar backplane

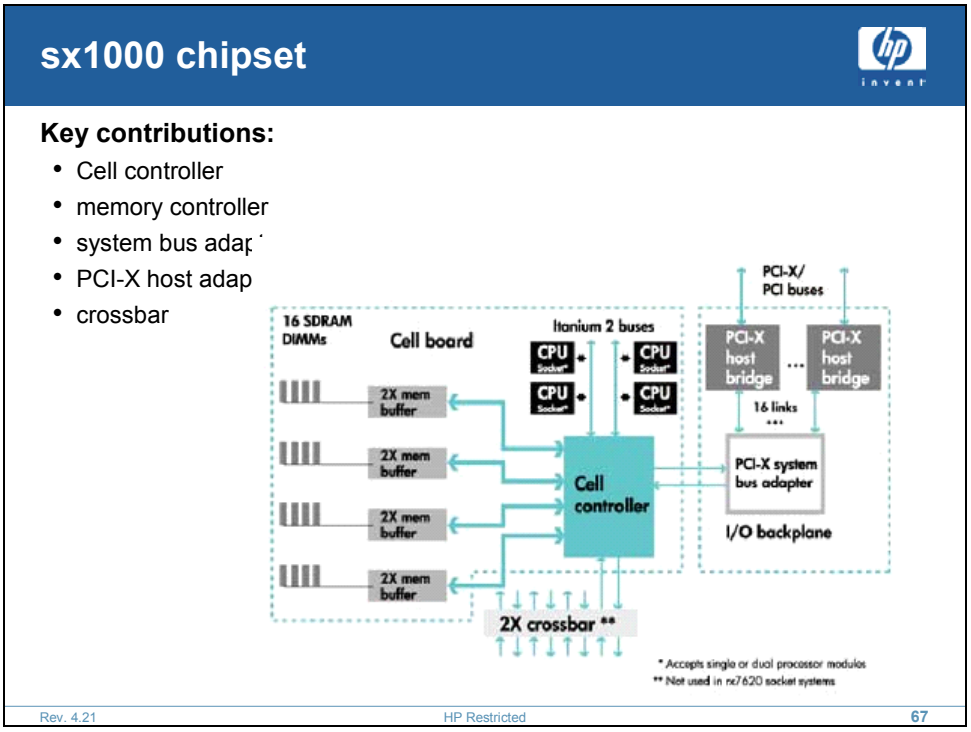
Crossbar chips

The crossbar ASIC is yet another part of the HP sx1000 Chipset. The HP 9000 rp8420-32 server crossbar consists of two chips. Each chip implements a high-performance, 8-port, non-blocking crossbar and the 500 MHz crossbar link protocol. Together, the two crossbar chips provide 16 high-performance ports for cell-to-cell communication, with 8 GB/s of bandwidth available for each cell.

All ports are functionally and electrically identical. Some of the features of the crossbar chip that contribute to performance include the following:

- Support for scaling up to a 128-way coherent shared memory system
- 250 MHz speed of operation
- 500 MT/s (megatransfers/second) link speed
- Support for 2 interleaved channels on link protocol
- Support for double-length data packets for Intel Itanium Processor Family architecture
- Performance counters to enable software tuning

The crossbar mesh implements a global point-to-point packet filtering network. This mesh features an extremely high level of integrity, with each crossbar port fully independent. The crossbar mesh has dedicated paths for data and control. Each port can be reset, assigned, or reconfigured fully independently of other ports. The crossbar mesh of the HP 9000 rp8420-32 server is an excellent foundation for resource isolation.



sx1000 chipset

HP super-scalable processor chipset sx1000

To support the growing needs in performance, scalability, and functionality, HP has developed the new HP Super-Scalable Processor Chipset sx1000. The HP sx1000 Chipset consists of five distinct ASICs: The cell controller, memory controller, system bus adapter, PCI-X host bridge adapter, and crossbar. The HP sx1000 Chipset provides connectivity to PA-8800 processors as well as existing and future Intel Itanium processors. In addition, the HP sx1000 Chipset provides higher CPU and memory bandwidth, faster low-level error correction, and PCI-X support.

The sx1000 chipset:

- Supports PA-8800 and Intel® Itanium® 2 (Madison) processors

  Benefit: HP-UX customers can choose when to transition from PA-RISC to Intel Itanium 2 architecture

- Enables HP-UX 11i v2, Microsoft Windows Server 2003, and Red Hat Linux Advanced Server v3 operating systems to run on HP Integrity midrange and high-end servers

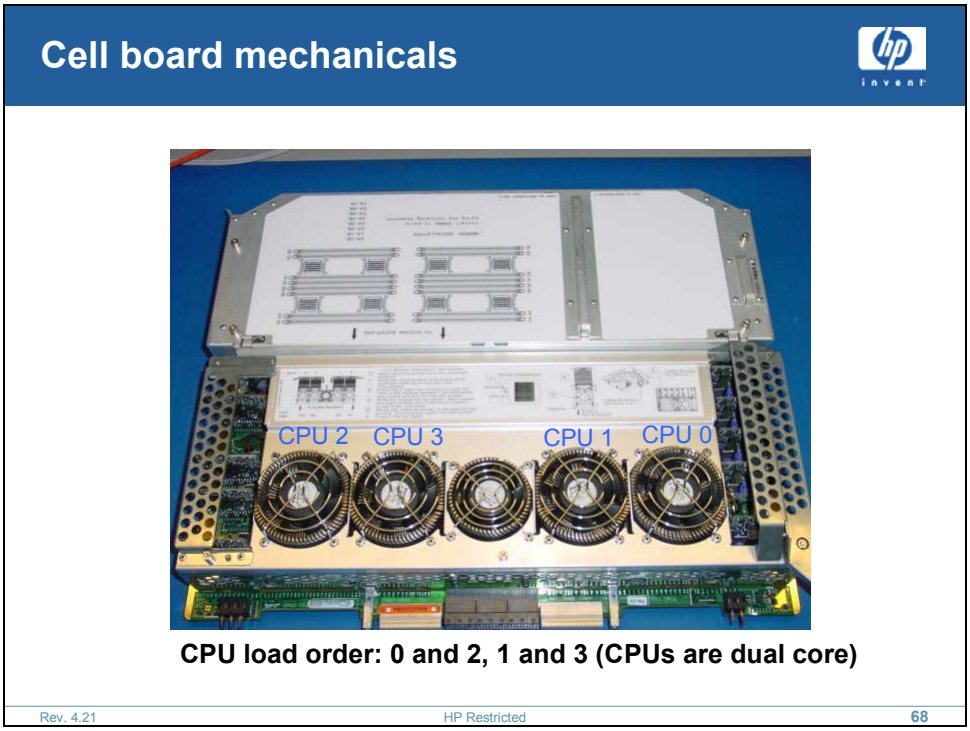
  Benefit: Gives customers even more flexibility when building IT solutions with HP systems

- Increases scalability with support of dual-processor modules: PA-8800 (dual core) and HP mx2 daughter card

  Benefit: Higher performance by doubling processors in the same server

- Increased memory and processor bus bandwidth

  Benefit: Increased performance



Cell board mechanicals

A cell or cell board is one of the basic building blocks of a rp8420-32 and a rp7420-16. It is a hot-plug module (multiple cells needed), which primarily houses processors and memory. Upgrades to future PA-RISC and Itanium Processor family cell boards will be available for rp8420 and rp7420 systems. Current memory DIMMS will be transferable to new cell boards. This slide shows the architecture of the rp8420 PA8800 cell board.

Cell design details

Each cell board is a self-contained unit with a symmetric multiprocessor, main memory, and all necessary hardware:

- CPUs (up to four 900 MHz or 1 GHz PA-8800 processor modules)
- Cell controller ASIC
- Memory controller (buffer) ASIC
- Main memory DIMMs (up to 16 DIMMs per cell board)
- Voltage regulator modules (VRMs)

Data buses

The cell controller ASIC (CC) is at the heart of each cell board. The CC provides the communications link between processors, memory, I/O, processor-dependent hardware (PDH), and adjacent cells. The cell controller chip contains interface logic and maintains cache coherency throughout the system. Adjacent to the cell

controller ASIC are up to four PA-8800 chip modules (2 processors in each chip module) and up to 32 GB of main memory. Each cell interfaces with adjacent cells and I/O resources either directly or, in the case of the HP 9000 rp8420-32 server, through the crossbar backplane.

The primary function of the memory controller ASIC is to multiplex and de-multiplex data between the cell controller ASIC and the SDRAM in the memory subsystem. When the cell controller ASIC issues a read transition to the memory interface command bus, the memory controller ASIC buffers the DRAM read data and returns it as soon as possible. When the cell controller issues a write transaction, the memory controller ASIC receives the write data from the cell controller ASIC and forwards it to the DRAMs. Note that only the data portion of the memory subsystem goes through the memory controller ASIC. All address and control signals to the DIMMs are generated by the cell controller ASIC and sent directly to the DIMM via the memory interface address bus.

The memory subsystem is a quad-ported implementation. It supports memory DRAM fault tolerance, in which a discrete SDRAM chip can fail without compromising data. The memory subsystem provides 16 GB/s of peak bandwidth to the cell controller ASIC and minimizes the overhead typically associated with directory coherency.

Cell configurations

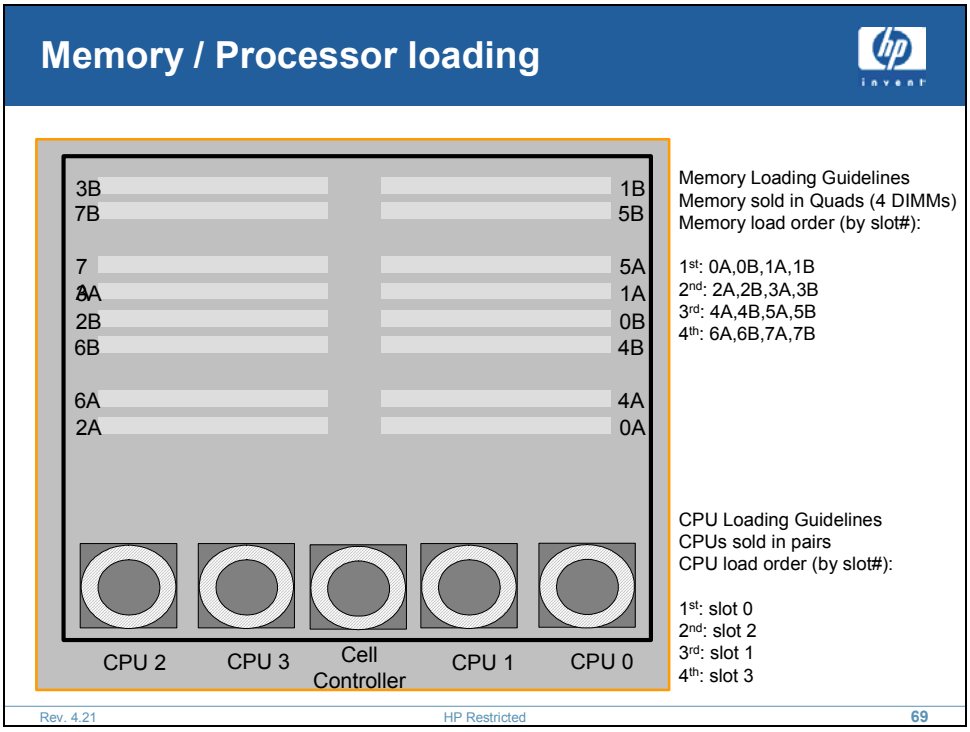
The HP 9000 rp7420-16 server supports a minimum of one and a maximum of two cells. The HP 9000 rp8420-32 server supports a minimum of one and a maximum of four cells. Each cell can be purchased with one, two, three, or four active PA-8800 processors, or with active processors in combination with Instant Capacity on Demand (iCOD) processors.

Both systems support PA-8800 processor modules in two speeds: 900 MHz with 3 MB of L3 cache or 1 GHz with 3 MB of L3 cache. The ability to mix processor speeds within a chassis is supported, but processors within a cell or partition must be of the same speed.

Within the cell, CPU-to-CC peak bandwidth is 12.8 GB/s, a greater than 50% improvement over previous-generation systems.

The minimum supported cell configuration is two active CPUs and 2 GB of memory per cell board. The maximum configuration includes four active CPUs and 32 GB of memory per cell board. Memory DIMM modules are sold in sets of four (quads), with available DIMM sizes of 512 MB, 1 GB, and 2 GB. Memory quads of different sizes can be mixed within a chassis and within a cell. However, for optimum memory interleaving and performance, it is recommended that one memory size be selected, distributed evenly across available cells, and loaded in increments of 8 DIMMs (2 quads).

Within a cell, the CC-to-memory peak bandwidth is 16 GB/s, a 4X improvement compared to earlier releases. Memory is accessed directly through the CC, so all memory slots are accessed regardless of the number of processors loaded on the cell.



Memory/Processor loading

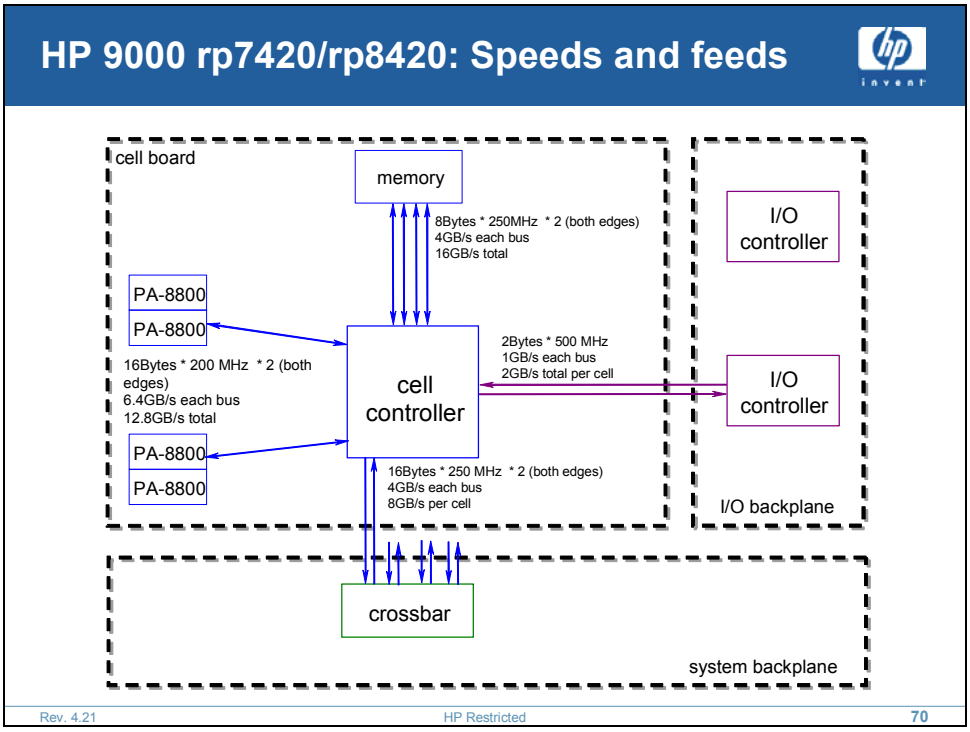
Memory latency

There are two types of memory latencies within the HP 9000 rp7420-16 system:

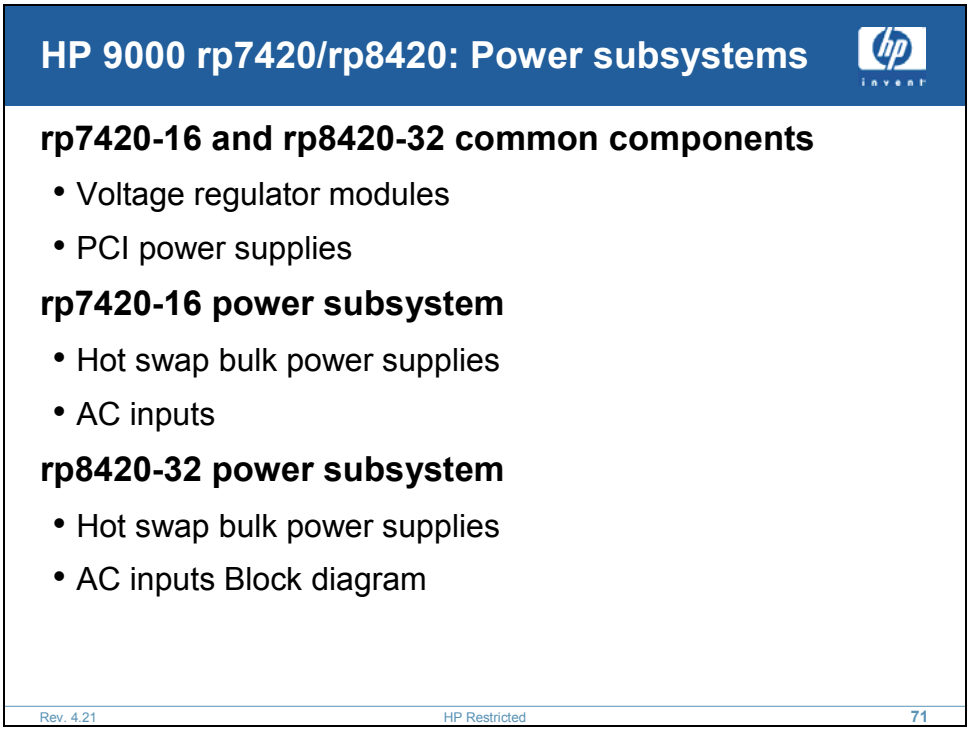
1. Memory latency within the cell — Refers to the case where an application either runs on a partition that consists of a single cell, or uses cell local memory.
2. Memory latency between cells — Refers to the case where the partition consists of two cells and cell interleaved memory is used. In this case 50% of the addresses are to memory on the same cell as the requesting processor, and the other 50% of the addresses are to memory on the other cell.

There are two types of memory latencies within the HP 9000 rp8420-32 system:

1. Memory latency within the cell — Refers to the case where an application either runs on a partition that consists of a single cell, or uses cell local memory.
2. Memory latency between cells — Refers to the case where the partition consists of two or more cells and cell interleaved memory is used. For example, for an HP 9000 rp8420-32 system with four cells in the partition, 25% of the addresses are to memory on the same cell as the requesting processor, and the other 75% of the addresses are to memory on the other three cells.



HP 9000 rp7420/rp8420: Speeds and feeds



HP 9000 rp7420/rp8420: Power subsystems

AC power subsystem

The HP 9000 rp7420-16 and rp8420-32 servers were both designed to take full advantage of the multi-grid power inputs found in today's high-end data centers. This means that both servers can connect to two independent power grids at the same time and are able to tolerate a grid failure without causing computing interruptions. The power subsystems are so robust that they both are certified (without deviations) under The Uptime Institute's Fault Tolerant Power Compliance Specification. The specific AC power subsystem details are covered separately in the following section.

Fault-tolerant power compliance in the HP 9000 rp7420-16 server

The AC input to the HP 9000 rp7420-16 server is divided into four separate circuits. Each circuit is fed by any 50 to 60 Hz high line source through four line cords. "High line" refers to 200–240 volts. A minimum of two power cords is used to maintain normal operation of the HP 9000 rp7420-16 server. A second set of two cords is added to improve system availability by protecting, for example, against power grid failures, failed power supplies, or accidentally tripped circuit-breakers. Four power cords are used in order to enable redundancy and hot-swap functionality of the bulk power supplies. This power is routed from four individual 20-ampere circuit breakers via input line filters to two internal bulk power supplies (BPSs). These four lines are labeled A0, B0, A1, and B1 at the line filter inputs on the back panel of the HP 9000 rp7420-16 server.

Each AC power configuration inlet feeds one HP 9000 rp7420-16 server bulk power supply (BPS) and that two separate AC inlets feed each bulk supply. The design of the individual BPSs and the configuration of the interconnect meet all the conditions for fault-tolerant power compliance

The benefit of this design is that when utilizing all four power cords, the HP 9000 rp7420-16 server has 2N redundant power protection.

The dual AC modular bulk power supplies provide:

- Redundancy for both hardware failures and power input failures
- Hot-plug capability for any BPS in a redundant configuration
- Better data security, maintenance scheduling, and maintenance operations without system interruption

Fault-tolerant power compliance in the HP 9000 rp8420-32 server

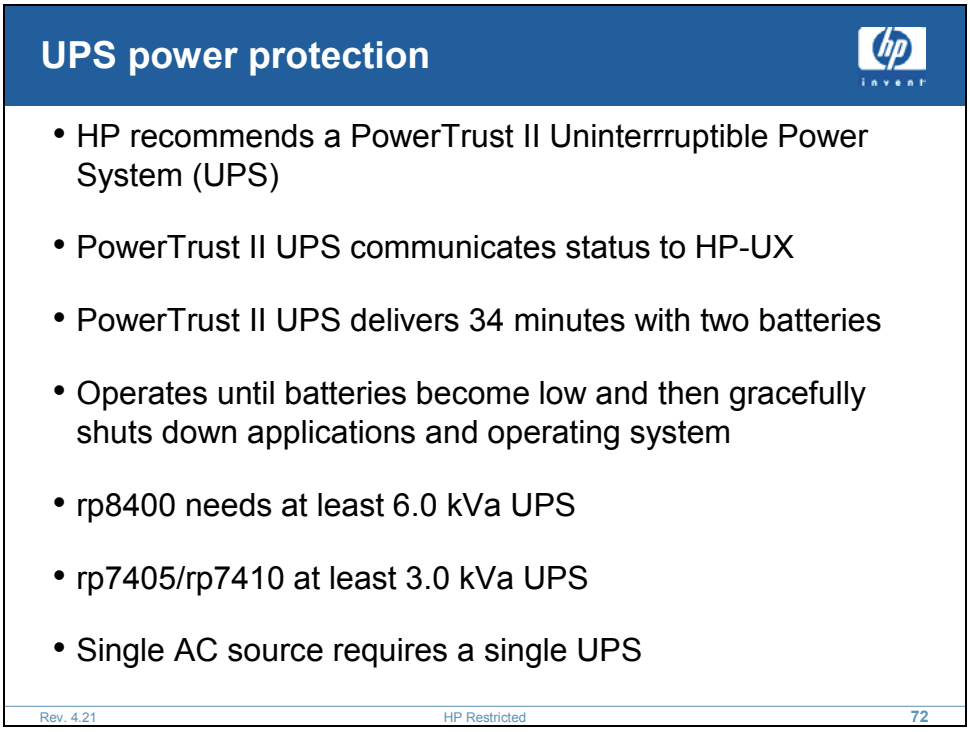
The AC input to the HP 9000 rp8420-32 server is divided into four separate circuits. Each circuit is fed by any 50 to 60 Hz high line source through four line cords. (“High line” refers to 200–240 volt operation.) A minimum of two power cords is used to maintain normal operation of the HP 9000 rp8420-32 server. A second set of two cords is added to improve system availability by protecting, for example, against power grid failures or accidentally tripped circuit breakers. Four power cords are used in order to enable redundancy and hot-swap functionality of the bulk power supplies. This power is routed from four individual 20-ampere circuit breakers via input line filters to six internal bulk power supplies (BPSs). These four lines are labeled A0, B0, A1, and B1 at the line filter inputs on the back panel of the HP 9000 rp8420-32 server.

Each AC power inlet feeds three HP 9000 rp8420-32 server bulk power supplies and that two separate AC inlets feed each bulk supply. The design of the individual BPSs and the configuration of the interconnect meet all the conditions for fault-tolerant power compliance.

Each BPS can be thought of as two sub-power supplies housed in a single BPS module. If only Grid A power cords is used, only one of the two sub-power supplies is in use. The other supply is off until a second set of Grid B cords is used. The benefit of this design is that when utilizing all four power cords, the HP 9000 rp8420-32 server has 2N+1 redundant power protection.

The dual AC modular power supplies provide:

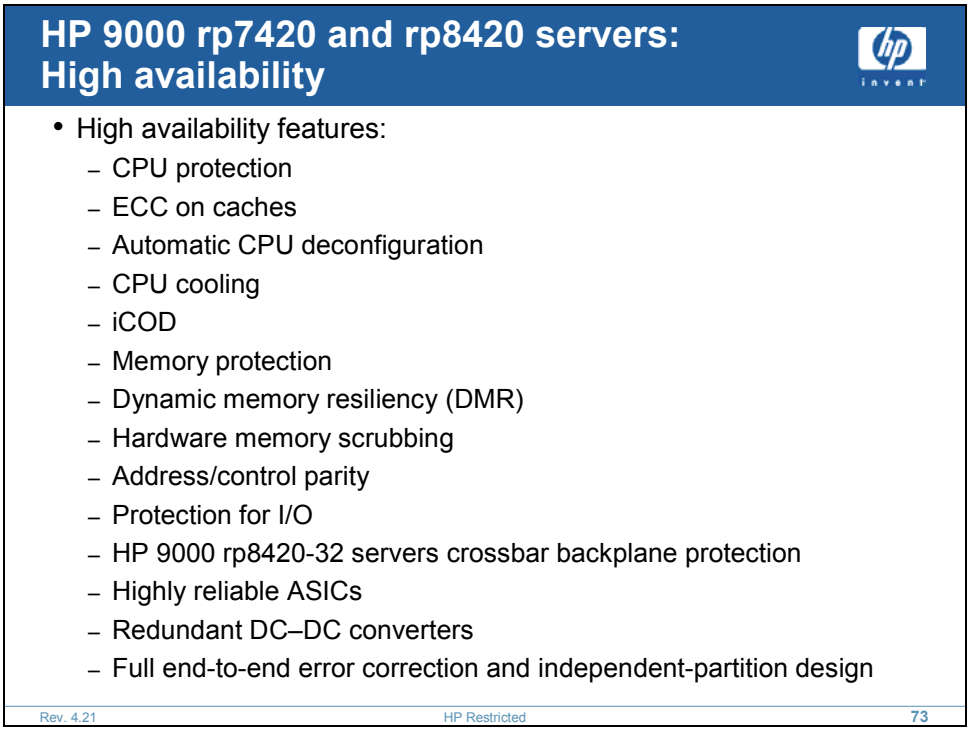
- The ability to purchase only the amount of power conversion necessary for the intended HP 9000 rp8420-32 server configuration
- Redundancy for both hardware failures and power input failures
- Hot-plug capability for any BPS in a redundant configuration
- Better data security, maintenance scheduling, and maintenance operations without system interruption



UPS power protection

HP PowerTrust II UPS units communicate power status to the UPS monitoring and control software that is standard with the HP-UX operating system. In the event of a power failure an HP PowerTrust II UPS will deliver uninterrupted power to the server and protected peripheral devices. This ensures continued transaction activity during power outages until the UPS batteries become low, at which time the HP PowerTrust II UPS will signal this status allowing the graceful shutdown of applications and operating system.

HP PowerTrust II UPS units can be ordered with the initial order and factory integrated into the server's rack-mount cabinet.



HP 9000 rp7420 and rp8420 servers: High availability

HP rp7410 and rp8420 servers have far advanced HA features needed to run mission-critical data centers.

High availability (HA) continues to be the hallmark of HP computer systems. But HP knows that delivering solutions that fully enable the highly available 24 x 7 operations demanded of today's businesses requires more than just delivering laundry lists of unusable HA features—or HA features with limited utility. The high availability features of the HP 9000 rp7420-16 and rp8420-32 servers actually address the real causes of customer downtime, as determined by actual field data from midrange computer users.

The HA features of the HP 9000 rp7420-16 and rp8420-32 servers can be classified as those that address per-partition reliability and those that address intra-partition reliability—that is, single points of failure between hard partitions.

Partition reliability

The HP 9000 rp7420-16 and rp8420-32 servers have a design that is significantly "hardened" over other systems in its class. In fact, many of the features in this midrange system can only be found in mainframes (or HP 9000 Superdome). The reliability features within each HP 9000 rp7420-16 and rp8420-32 server partition have been field-proven to provide high system reliability. And many customers who have taken advantage of these features report significantly lower hardware failure rates than with competitive systems.

CPU protection

The central processing unit is often a major cause of system downtime. For instance, CPU cache errors are demonstrated to be a large contributor (in many cases, the greatest contributor) to unplanned system downtime. Furthermore, addition or modification of CPU resources is among the highest-ranking causes of planned hardware downtime. But in the HP 9000 rp7420-16 and rp8420-32 servers, HP has designed specific features to combat CPU-caused downtime, including the following:

- Full error checking and correcting (ECC) on all caches
- Automatic deconfiguration of "faulty" CPUs—known as dynamic processor resilience (DPR)
- A highly effective and reliable CPU cooling scheme
- CPU hot-spares using HP iCOD
- Redundant CPU power converters

ECC on caches

The CPU caches in the HP 9000 rp7420-16 and rp8420-32 servers are fully protected from single-bit hard errors and random soft errors resulting from cosmic rays or other intermittent error-generation sources. Some competitive systems in the same class are not similarly protected, resulting in errors that are hard to debug and that are, in many cases, blamed on the customer environment. Such cache errors in these unprotected systems can result in failures that bring down multiple partitions.

Another advantage of the HP 9000 rp7420-16 and rp8420-32 servers' CPU cache is its layout, which significantly reduces the chance of a multi-bit error due to a random cosmic ray strike. Such attention to detail is not found in many designs available from other vendors.

Automatic CPU deconfiguration

Dynamic processor resilience (DPR) refers to the ability of the system to detect, de-allocate, and swap in spare CPUs online for CPUs that are generating an excessive quantity of recoverable cache errors. This protects the customer against the extremely unlikely event of a double-bit cache error. This is one example of the self-healing features of the HP hardware. Implementation of this feature results in no downtime or performance loss.

CPU cooling

Heat is the big enemy of electronic components. But the HP 9000 rp7420-16 and rp8420-32 servers' two-level cooling scheme offers outstanding cooling capacity at a nominal cost. The servers' turbo-cooler fans draw air directly into the heat

sinks of the CPU and cell VLSI. At the extreme operating ranges of the HP 9000 rp7420-16 and rp8420-32 servers, the turbo-cooler fans keep temperatures well below the maximum values allowed. Even though the turbo-coolers may not be required under normal operating conditions, running them causes the silicon chips to operate at a lower temperature, supporting a longer lifetime.

To further improve reliability of the HP 9000 rp7420-16 and rp8420-32 servers, manageability software monitors the speeds of all fans, including turbo-cooler fans. The HP 9000 rp7420-16 and rp8420-32 servers' Smartfan controller can detect the first hint of slowdown associated with bearing wear, therefore you get plenty of warning before a fan fails.

iCOD

Instant Capacity on Demand (iCOD) is a means of adding and removing CPUs in a partition. With iCOD, you don't need to worry about the following:

- Interleaved memory
- Application-locked memory
- Server switchovers due to false failures
- Physically handling CPU or memory boards
- Rebooting

iCOD is the most reliable means of reducing planned downtime for hardware upgrades.

Memory protection

Main memory failures are the single largest cause of customer downtime. The HP 9000 rp7420-16 and rp8420-32 servers have several features designed to reduce or eliminate failures of memory:

- Chip spare tolerance
- Dynamic memory resiliency (DMR)
- Automatic deconfigure on reboot
- Hardware memory scrubbing
- Industry leadership address/control parity protection

Chip spare tolerance is the ability of the system to continue to run in the face of any single- or multi-bit chip error on a DRAM. The DRAMs in the HP 9000 rp7420-16 and rp8420-32 servers can be thought of as N+1 per set of 128 DRAMs. This functionality is essential in the design of reliable memory systems, and systems without this feature are doomed to fail at an alarming rate compared to the HP 9000 rp7420-16 and rp8420-32 servers. (This has been demonstrated at customer sites that use both chip spare tolerance and less reliable architectures.)

There are many ways that DRAMs can fail, especially when a system has hundreds of them. It is hopeless to try to design around (or explain away) this simple fact. With HP's chip spare technology, the HP 9000 rp7420-16 and rp8420-32 servers' memory is extremely reliable.

Dynamic memory resiliency (DMR)

Dynamic memory resiliency is the system's ability to de-allocate failed memory pages online. This feature is similar to dynamic processor resiliency; if a location in memory proves to be questionable (that is, exhibits persistent errors), the memory is de-allocated online with no customer-visible impact. Assuming the HP 9000 rp7420-16 and rp8420-32 servers are equipped with adequate memory to begin with, it is likely that the failed memory will never have to be replaced over the life of the product, resulting in a significant reduction in both planned and unplanned downtime. DMR is superior to industry available hardware-only techniques because hardware-only techniques can quickly run out of spares. HP's page de-allocation technique solves this problem, resulting in more spares than can possibly be used over the life of the machine.

Hardware memory scrubbing

Software-based memory scrubbers are limited in function due to the fact that many operating systems and applications "lock down" memory, resulting in no possible access. HP's hardware scrubber "cleans" memory without OS or application knowledge, resulting in much better coverage.

Address/control parity

The address control path of the memory system is protected from spurious bit flips in the address/control path, which can cause the correct data to be written to the wrong location, resulting in data corruption. HP is the leader in delivering this functionality to the mission-critical marketplace.

Protection for I/O

I/O errors are another significant cause of hardware errors and downtime because the number of I/O cards in a typical system is significant, and the I/O cards themselves are a part of the system most exposed to frequent human interaction in the data center. In order to prevent downtime due to I/O errors, HP has designed the following features into the HP 9000 rp7420-16 and rp8420-32 servers:

- Online replacement of PCI-X cards
- Hardware "firewall" of I/O errors to cell
- High mean time between failures (MTBF) for I/O cards
- Separate PCI-X buses for each I/O card

Taken together, these features will reduce hardware downtime by at least 20 percent over similar servers.

HP 9000 rp8420-32 servers crossbar backplane protection

The backplane ties CPU and memory together. Because all partitions share the backplane, high reliability and true domain isolation are very important. The specific features that address these areas are as follows:

- Highly reliable ASICs
- Redundant DC–DC converters
- Full end-to-end error correction and independent-partition design

Highly reliable ASICs

The backplane ASIC is manufactured and tested with a process that results in 10X demonstrated reliability improvement over comparable chips. This reliability results in virtually zero backplane ASIC failures in the field.

Redundant DC–DC converters

The DC–DC converters that power the backplane chips are fully redundant, reducing downtime associated with power conversion. (Power conversion is normally a significant contributor to failure rate.)

Full end-to-end error correction and independent-partition design. The backplane is built from a single crossbar with point-to-point connections. Traffic within a partition is contained in that partition, so there is no sharing of links in a properly configured system. Each port of the crossbar chip is fully independent, allowing cells of different partitions to coexist without affecting each other in any way. In other bus-based systems, all domains participate in the coherency scheme and share address buses. Therefore, in these systems all domains are linked in some fashion, resulting in shared failure modes that might crash multiple partitions.

Also, unlike other “snoopy” coherency systems that must accept and respond to all coherency requests from all domains, HP 9000 rp8420-32 server partitions have hardware firewalls dedicated to guarding partitions from errant transactions generated on failing partitions. A failure in one HP 9000 rp8420-32 server partition will not affect any other partitions.

Finally, all data paths in the fabric are resistant to both random single-bit errors and persistent single-wire “stuck-at” faults. Therefore, the fabric is resilient to any single-bit failure, including pin, connector, or solder problems.

Reliability in the cabinet infrastructure

In keeping with their focus on maintaining high availability (HA), the HP 9000 rp7420-16 and rp8420-32 servers include protection against failure within the cabinet infrastructure. The HA features in this area include true dual AC line cord support and complete resilience to service processor failures.

Dual AC line cord support

As described earlier in this paper, the HP 9000 rp7420-16 and rp8420-32 servers can run on one or two totally independent power sources. Moreover, these two power sources do not need to be in phase or the same voltage.

Resilience to service processor failures

The HP 9000 rp7420-16 and rp8420-32 servers' hardware has been designed to enable service processor failover when redundant core I/O cards are in place. Future firmware and manageability code releases will allow a slave service processor to take over for a failed master and will also enable a resilient console (on reboot). Future OS releases may allow the console to fail-over as well.

HP 9000 rp7420-16 and rp8420-32: Feature comparison

	rp7420-16	rp8420-32
Processors (cores)	2-16 PA-8800 cores	2-32 PA-8800 cores
memory	2-64 GB	2-128 GB
nPars (hard partitions)	1-2	1-2 1-4 w/SEU
I/O card slots	15 PCI-X	16 PCI-X 32 w/SEU
internal disks	4 bays	4 bays 8 bays w/SEU
removable media	1 slot	2 slots 4 slots w/SEU
density	4 per 2M rack 10U each	2 per 2M rack 17U each

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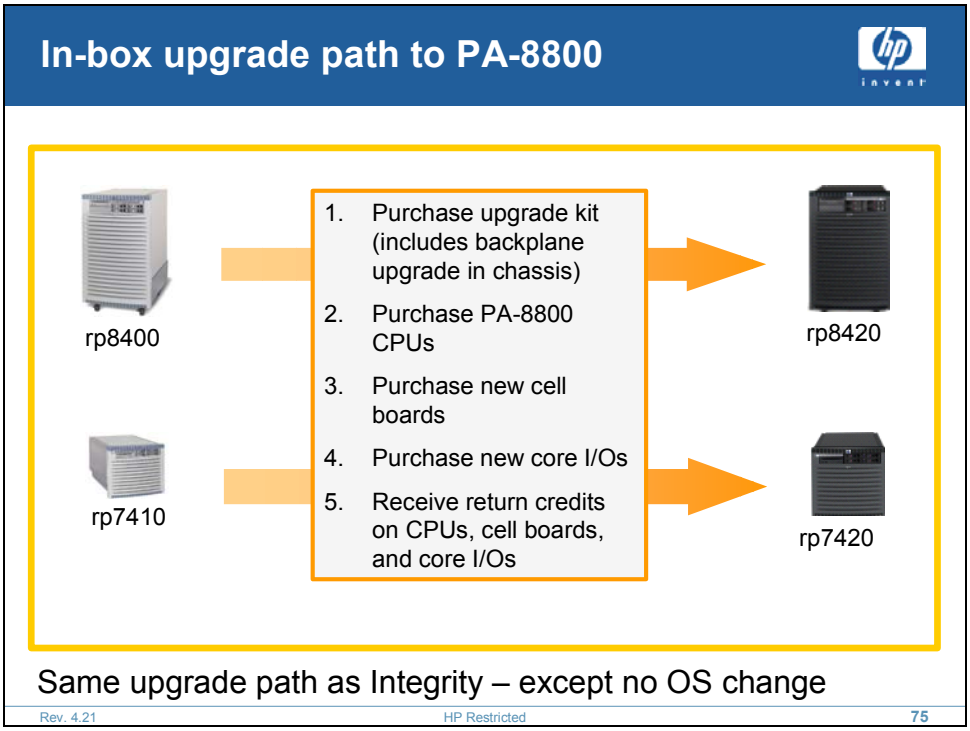
HP 9000 rp7420-16 and rp8420-32: Feature comparison

	HP 9000 rp7420-16 server16-way (8 socket)	HP 9000 rp8420-32 server32-way (16 socket)	HP Server Expansion Unit (SEU)
1-, 2-, 3-, or 4-processor	(dual-core) cell boards	1–2 1–4	900 MHz or 1.0 GHz
PA-8800 processors	2–16 processors	(1–8 processor modules)	2–32 processors
(1–16 processor modules)	Memory (with 512 MB,	1 GB, or 2 GB DIMMs)	2–64 GB 2–128 GB
Hot-plug PCI-X I/O slots 15 slots 16 slots 16 slots	Aggregate I/O slot	bandwidth	15.4 GB/s 15.9 GB/s 15.9 GB/s
PCI-X slot single bus	bandwidth (qty.)	533 MB/s (1) 533 MB/s (2) 533 MB/s (2)	PCI-X slot dual bus
bandwidth (qty.)	1066 MB/s (14) 1066 MB/s (14) 1066 MB/s (14)	Internal disk storage slots/	max. capacity
4/584 GB 4/584 GB 4/584 GB	Internal removable media	slots (DVD, DAT)	1 2 2
Hard partitions 2 2 (4 with SEU) N/A	Hot-swap redundant power	supplies (N+1 included)	2 6 2
Hot-swap redundant fans	(N+1 included)	Yes Yes Yes	



In-box upgrade path to PA-8800

Mid-range in-box upgrade path to PA-8800

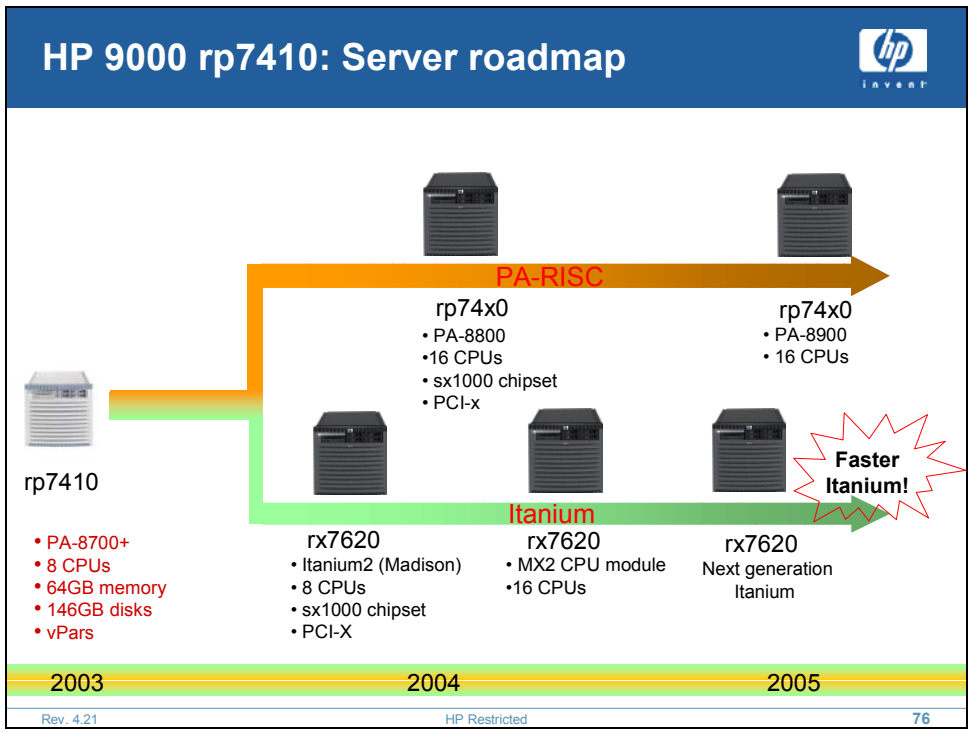
- HP rp8400 and rp7410 servers may also require core I/O upgrade (with return credits for old core I/O)
- Firmware update required

In-box upgrades

- rp7410 and ro7420
- rp8400 and rp8420
  - Remove cell boards
  - Transfer memory to new cell board
  - Install cell boards
  - Install new PCI-X backplane
  - Install new core I/O card
  - Replace system bezel

What stays the same when upgrading to IPF

- Chassis
- Memory
- Internal disk, DVD, and DAT drives
- Power supplies
- Most I/O cards



HP 9000 rp7410: Server roadmap

HP rp7410 server upgrades to HP Integrity rx7620 server

The HP rp7410 server was designed to be easily upgradeable to Intel Itanium 2 and future PA-RISC processors. With the release of the Intel Itanium 2 Madison processor, HP rp7410 server customers can now upgrade their systems as desired. The following are the upgrade details:

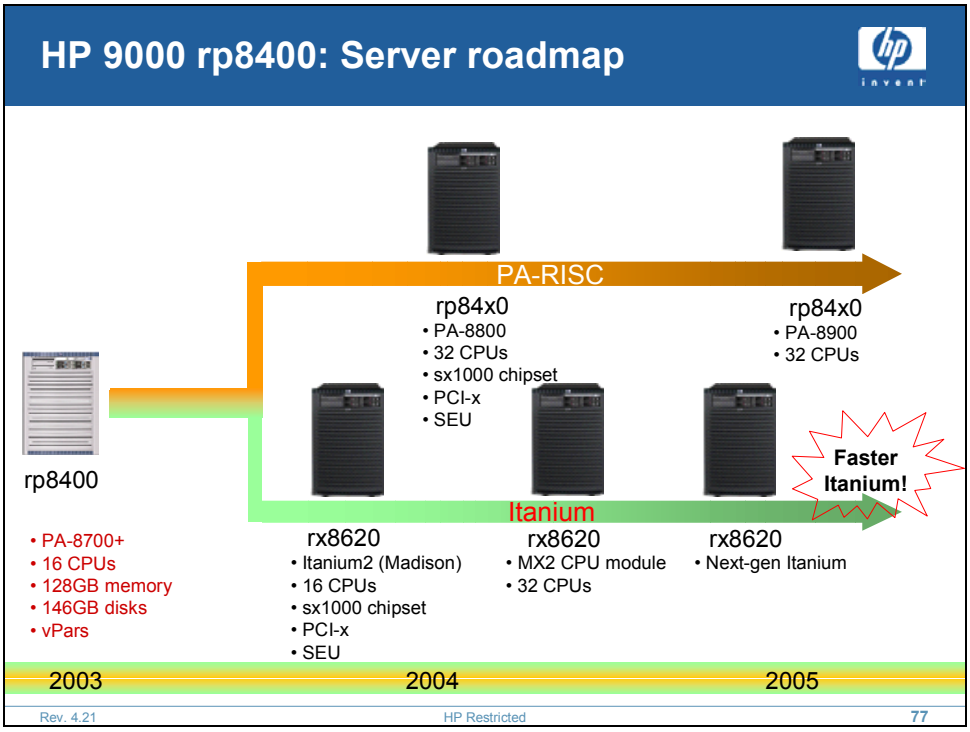
- HP Integrity rx7620 Upgrade Kit.A9790A (upgrade HP rp7410 server to HP Integrity rx7620 server).
- Included in the upgrade kit:
  - New PCI backplane board (upgrades PCI backplane to higher performing PCI-X).
  - New front bezel (graphite color scheme).
  - New labels (rx7620 nameplate and labels).

Additional items ordered separately:

- A6913A.cell board (new cell board required for supporting Intel Itanium 2 Madison processors)
- A9765A.1.3GHz or A6438A.1.5GHz Intel Itanium 2 Madison processors
- A9918A.new core I/O card (s)
- Must use HP-UX 11i version 2

The following HP rp7410 server add-in components are supported in the HP rp7410 server to HP Integrity rx7620 server upgrade:

- Memory
- Internal disks
- Removable media drives (DVD, DAT)
- PCI cards
  - Several PCI adapters supported in the HP rp7410 server are not supported in the HP Integrity rx7620. Please refer to the “Supported I/O Cards” table in the HP Integrity rx7620 Configuration Guide for further details.



HP 9000 rp8400: Server roadmap

HP rp8400 server upgrades to HP Integrity rx8620 server

The HP rp8400 server was designed to be easily upgradeable to Intel Itanium 2 and future PA-RISC processors. With the release of the Intel Itanium 2 Madison processor, HP rp8400 customers can now upgrade their systems as desired. The following are the upgrade details:

- HP Integrity rx8620 Upgrade Kit.A9785A (upgrade HP rp8400 server to HP Integrity rx8620 server).
- Included in the upgrade kit:
  - New PCI backplane board (upgrades PCI backplane to higher performing PCI-X)
  - New front bezel (graphite color scheme)
  - New labels (HP Integrity rx8620 nameplate and labels)

Additional items ordered separately:

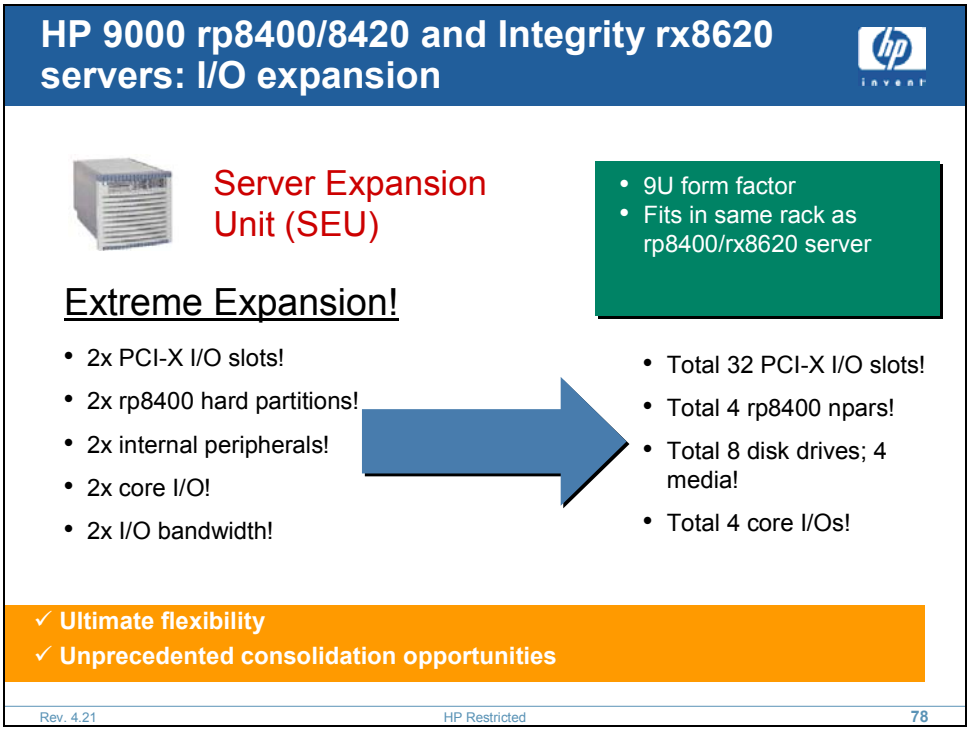
- A6913A.cell board (new cell board required for supporting Intel Itanium 2 Madison processors)
- A9765A.1.3GHz or A6438A.1.5GHz Intel Itanium Madison processors
- AB306A.new core I/O card (s)

Note: HP rp8400 servers ordered before September 2003 will require a core I/O board upgrade. These servers were ordered with core I/O product A6096A, which is not supported in the rp8400 to rx8620 upgrade. HP rp8400 servers ordered after

September 2003 will be delivered with core I/O product A7109A, which is supported in the rp8400 to rx8620 upgrade. You must use HP-UX 11i version 2.

The following HP rp8400 server add-in components are supported in the HP rp8400 server to HP Integrity rx8620 server upgrade.

- Memory
- Internal disks
- Removable media drives (DVD, DAT)
- A7109A.core I/O
- PCI cards
    - Several PCI adapters supported in the HP rp8400 server are not supported in the HP Integrity rx8620 server. Please refer to the "Supported I/O Cards" table in the HP Integrity rx8620 Configuration Guide for further details.



HP 9000 rp84xx and Integrity rx8620 servers: I/O expansion

The HP Server Expansion Unit (SEU) was specifically designed to enhance the I/O and partitioning capabilities of the HP rp8400 and HP Integrity rx8620 servers. The SEU is an add-on chassis containing 16 I/O card slots, 4 disk bays, and 2 removable media slots.

The Server Expansion Unit provides for doubling of:

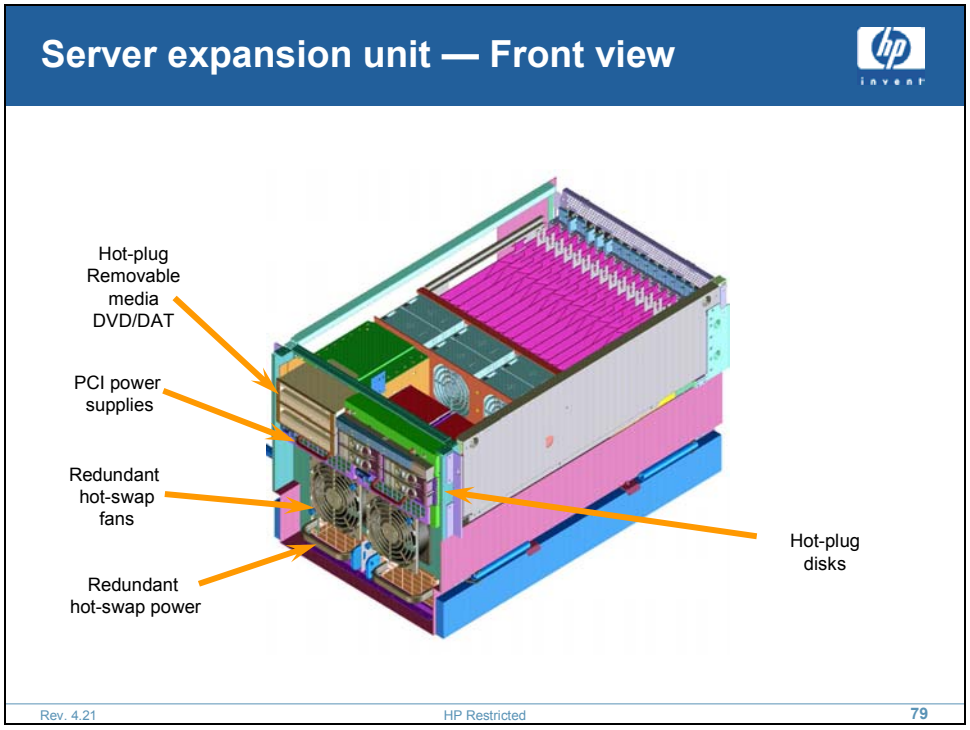
- PCI-X I/O slots
- Hard partitions
- Internal peripherals
- Core I/O

This capability provides outstanding flexibility and unprecedented consolidation opportunities.

Hardware partitioning (nPars)

A hardware partition corresponds roughly to a single, stand-alone system. Without an SEU, the HP rp8400 and HP Integrity rx8620 servers can be divided into two independent hardware partitions. When configured with an SEU, each HP rp8400 and HP Integrity rx8620 servers can be subdivided in up to four partitions, each containing one cell and a dedicated set of I/O resources (including 8 I/O slots, 2 internal disks, 1 removable media drive, and 1 core I/O). The number of possible nPars within the server is based upon the number of cell boards.

For instance, a server loaded with three cell boards can be configured into one, two, or a maximum of three nPars. A server loaded with four cell boards can be configured into one, two, three, or four nPars. Any combination of cells can be configured into an nPar.



Server expansion unit — Front view

Maximum SEU configuration

- 16 hot-plug 33, 66, or 133MHz x 64-bit PCI-X slots—with adaptive signaling technology
- Two core I/O cards
- Two hot-swap power supplies, providing 2N+1 protection
- Two power cords, providing 2N power and dual grid support
- Four internal hot-plug Single-Ended SCSI disks
- Two removable media drives, DVD or DAT

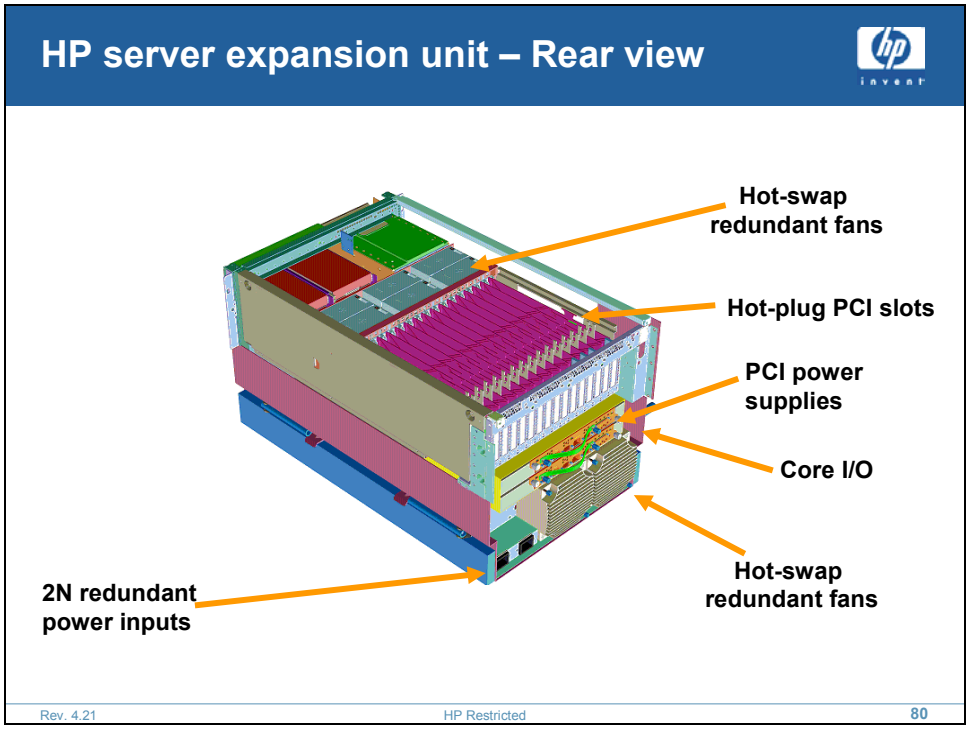
Standard system features

- Supported with the following Operating Systems
  - 64-bit HP-UX 11i operating system
  - Windows Server 2003 Datacenter and Windows Server 2003 Enterprise Edition (1H2004)
  - Linux Red Hat v3.0 (1H2004)
- Two external Ultra3 LVD SCSI channel
- Four internal Ultra SCSI channels, one channel to each internal disk

- Two external 10/100/1000Base-T LAN (with auto speed sensing)
- Management Processor technology with integrated web console and LAN console
- Rack-mountable into HP 19-inch cabinets (factory or field integration, must be placed directly above the server)
- Rack-mountable into some 3rd party cabinets
- Enables two additional hardware partitions (nPartitions) within the rp8400/rx8620 (total 4 nPartitions)
- Factory integration of disk drives, removable media drives, and I/O cards
- Virtual partitioning 1 (vPars) supported 1H2004 (PA-RISC only)
- HP site planning and installation
- One-year warranty with same business day on-site service response

High availability

- N+1 hot-swap cooling
- Redundant and hot-swap power supplies
- Hot-plug disks
- 2N power inputs
- Online addition and replacement of PCI I/O cards
- Four independent UltraSCSI buses to internal disks for mirroring across disks and controllers
- Online diagnostics and system health monitor



Server expansion unit — Rear view

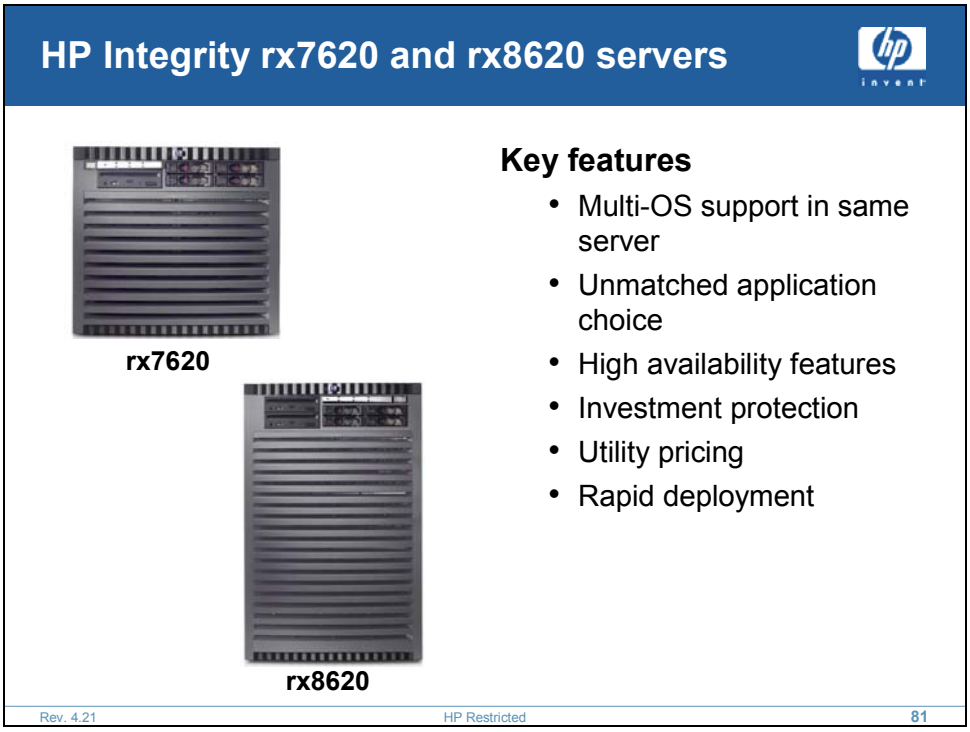
Host server requirements

- Minimum HP-UX release: HP-UX 11i version 1 (version 2 for rx8620 host).
- HP rp8400 servers ordered before September 2003 will require a core I/O board upgrade.
  - These servers were ordered with core I/O product A6096A (XE "A6096A"), which is not supported when configured with an SEU. A new core I/O board, A7109A, must be ordered.
- All HP rp8400 servers ordered in September 2003 or later will contain the A7109A core I/O board.

Racking

The HP Server Expansion Unit industrial design and packaging was designed to allow easy and quick access to all of the system's components. The most frequently handled devices, removable media and disks, are directly accessible at the system's front. By removing the front bezel, hot-swap fans, hot-swap power supplies, and PCI power supplies can be completely serviced. At the rear, core I/O and more hot-swap fans are directly accessible. For access to all other components, the rack-mounted SEU comes with rack sliders. These rack sliders enables the SEU to be slid forward out of the HP cabinet for servicing of internal components such as fans and I/O cards, while the system is still running. The sliders also allows for servicing or replacement of any FRU (field replaceable unit) without removing the chassis from the cabinet.

The SEU must be mounted directly above the host server. Due to safety and RIO cable length limitations, the SEU is not supported when mounted below the host server or in an adjacent cabinet.



HP Integrity rx7620 and rx8620 servers

Customer base

For commercial markets that require faster secure transactions and business processing and HPTC markets that require raw performance, the HP rx7620 and rx8620 servers provide the industry's leading application availability, performance, and flexibility to best address today's demanding technical and business workloads.

Product message

OS choice

- Support for 4 different operating systems—HP-UX 11i, Linux, Windows Server, and OpenVMS (not immediately available) enables tremendous application availability.
- Ability to run multiple operating systems in the same server at the same time gives customers unparalleled flexibility and opportunity for consolidation.

High availability

- Chip-spare technology
- Fault-tolerant power compliance
- HP Serviceguard for in-box and cluster failover

Investment protection

- In-box upgradeable to future generations of Itanium processors (including dual-core CPUs).
- In-box upgradeable to future high-performance chipsets.
- And, the current HP 9000 rp7410 and rp8400 models, based on PA-RISC processors, will be in-chassis upgradeable to the HP Integrity mid-range models (rx7620 and rx8620 respectively), providing customers with leading investment protection.

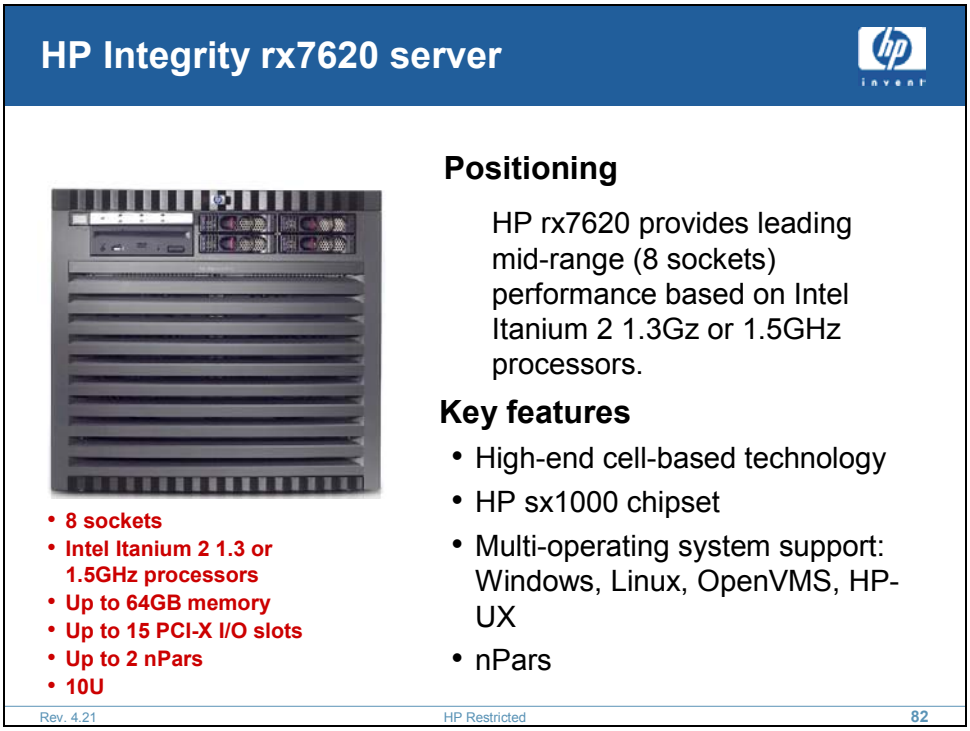
Utility pricing

- Pay per Use*
- Pay per Forecast*
- Instant Capacity on Demand*
- Temporary Capacity*
- Cell iCOD*

(* Initially supported on HP-UX partitions only)

Rapid deployment

- Includes site prep and installation
- Includes custom configuration



HP Integrity rx7620 server

Configuration

A minimum of one and a maximum of two cells can be ordered in an HP Integrity rx7620. Each cell can be purchased with up to four active 64-bit Intel Itanium 2 Madison processors, or in combination with iCOD processors. Two processor speeds are supported; 1.3GHz and 1.5GHz. The ability to mix processor speeds within a chassis is supported (but processors within a within a cell or partition must be of the same speed). The HP Integrity rx7620 and rx8620 (16 socket) servers share the same cell board.

Features

- 2 to 8 sockets Itanium 2
- 64GB memory
- 15 PCI-X slots

  Fourteen of sixteen I/O card slots are supported by dual high-performance links. Each link is capable of providing 530MB/s of bandwidth. This means that most HP Integrity rx7620 I/O slots are capable of sustained 1.06GB/s. Aggregate I/O slot bandwidth is 15.9GB/s. In addition, because each I/O slot has a dedicated bus, any slot can be “hot-plugged” or serviced without affecting other slots. The hot-plug operation is very easy, and can be done with minimal training and effort.
- 1 removable media device (DAT/DVD)
- 4 internal disk drives

- Dual core I/O

  The HP Integrity rx7620 chassis supports up to two core I/O board sets. Each board set contains two cards (MP/SCSI and LAN/SCSI), which are installed in different locations. MP/SCSI cards are installed along the right-rear vertical edge of the chassis. The LAN/SCSI cards are installed in the PCI card bay. A minimum of one core I/O board set must be ordered with each system; the optional second core I/O board set can be used to enable hardware partitioning or to utilize the full capacity of the built-in mass storage bays.

- Up to 2 hard partitions

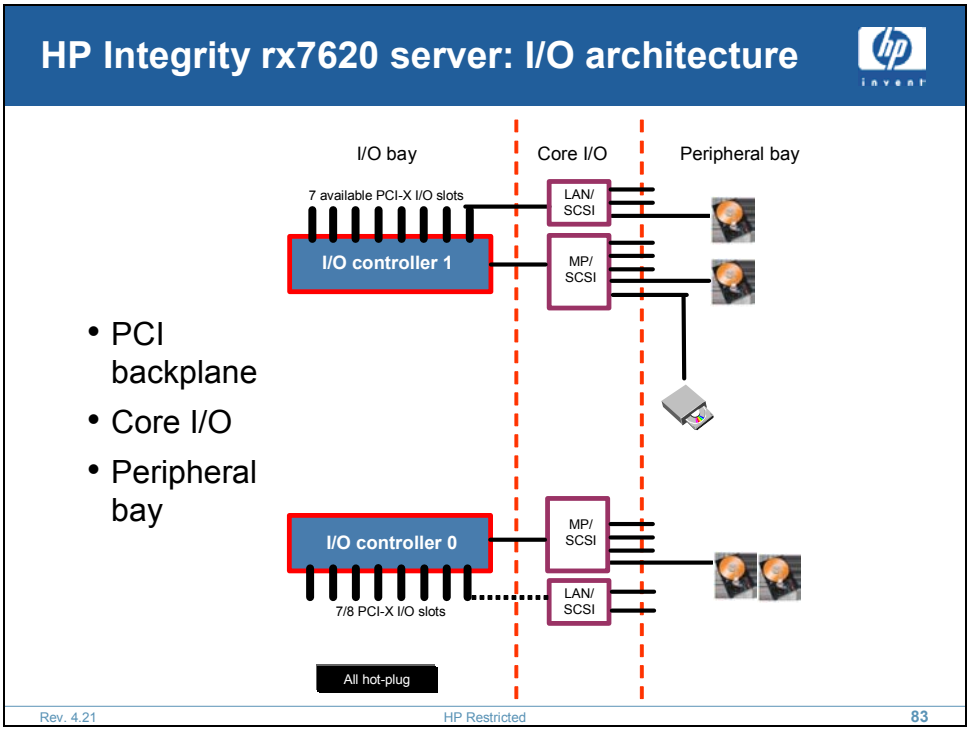
Standard system features

- 64-bit HP-UX 11i v2 operating system
- External Ultra160 LVD SCSI channel
- Four internal SCSI controllers
- 10/100/1000Base-T LAN (with auto speed sensing)
- Management Processor technology with integrated web console and LAN console
- RS-232 local and remote (modem) console and UPS ports
- 10/100Base-T LAN port for LAN console and web console
- Rack-mountable into HP 19-inch cabinets (factory or field integration)
- Rack-mountable into some 3rd party cabinets
- Pedestal configuration
- One or two hardware partitions (nPartitions)
- Factory integration of CPUs, memory, disk drives, removable media drives, and I/O cards
- HP site planning and installation
- One-year warranty with next business day onsite service response
- Owner’s Guide and General Usage media set

High availability

- N+1 hot-swap cooling
- Redundant and hot-swap power supplies
- Cell hot-plug
- Hot-plug disks

- 2N power inputs (redundant line cords/dual power grid support)
- Online memory page de-allocation
- ECC protected SyncDRAM memory
- Full parity protection of data and address buses
- On-chip CPU cache with ECC protection
- Memory “chip spare”, “chip kill-like”
- CPU de-allocation on failure
- On-line addition and replacement of PCI I/O cards
- UPS power management
- Three independent Ultra160 buses to internal disks for mirroring across disks and controllers
- Journal file system
- Auto reboot
- Online diagnostics and system health monitor



HP Integrity rx7620 server: I/O architecture

I/O architecture

Components within the I/O subsystem are the I/O controllers, internal peripheral bay, and multi-function core I/O. The figure shows the basic block diagram of the I/O subsystem. The HP Integrity rx7620 I/O architecture utilizes industry standard PCI buses in a unique design for maximum performance, scalability and reliability.

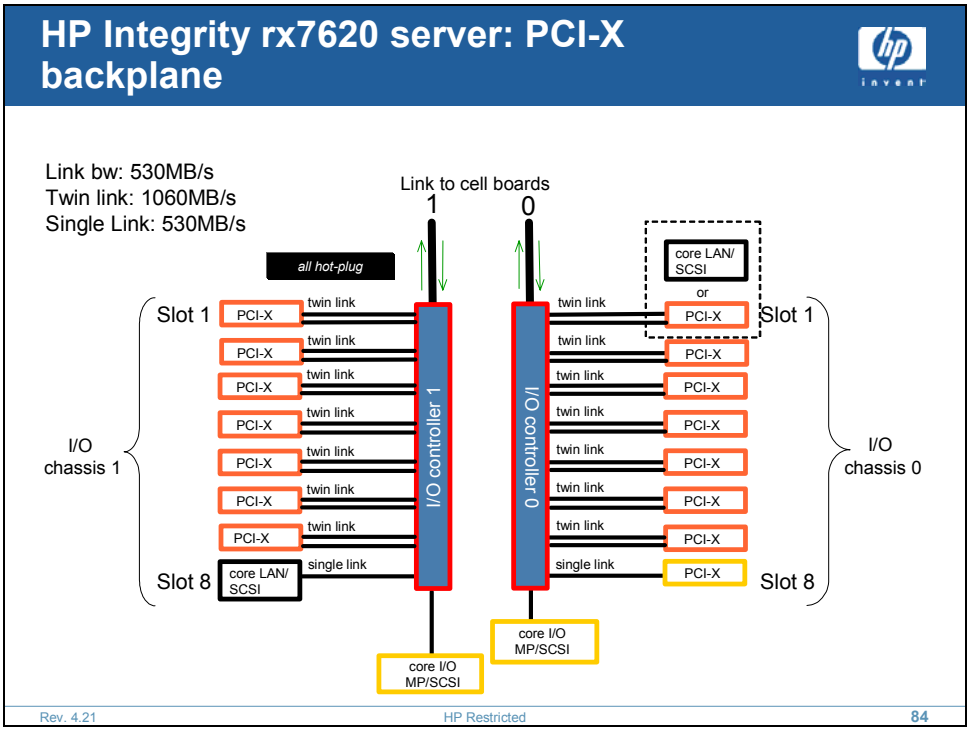
The HP Integrity rx7620 contains two master I/O controller chips located on the PCI-X backplane. Each I/O controller contains 16 high-performance, 12-bit wide links. These links connect to 18 slave I/O controller chips supporting the PCI card slots and core I/O. In the HP Integrity rx7620, two links, one from each master controller, are routed through the system backplane and are dedicated to core I/O. The remaining 30 links are divided among the sixteen 133MHz x 64-bit PCI-X card slots, with each slot on a PCI bus by itself. This one-card-per-bus architecture leads to greater I/O performance, better error containment, and higher availability.

Each controller chip is also directly linked to a host cell board. This means that both cell boards must be purchased in order to access all 15 available I/O card slots. (With only one cell board, access to seven expansion slots is enabled.)

The HP Integrity rx7620 can be purchased with either one or two core I/O board sets. Each core I/O product contains two boards, a MP/SCSI and a LAN/SCSI card. The core I/O boards provide console, Ultra160 SCSI, Gigabit LAN, serial, and management processor functionality. If you opt for the second core I/O board set, it can be used to enable dual hard partitioning (nPars) in the HP Integrity rx7620 and to provide access to a second set of disk drives.

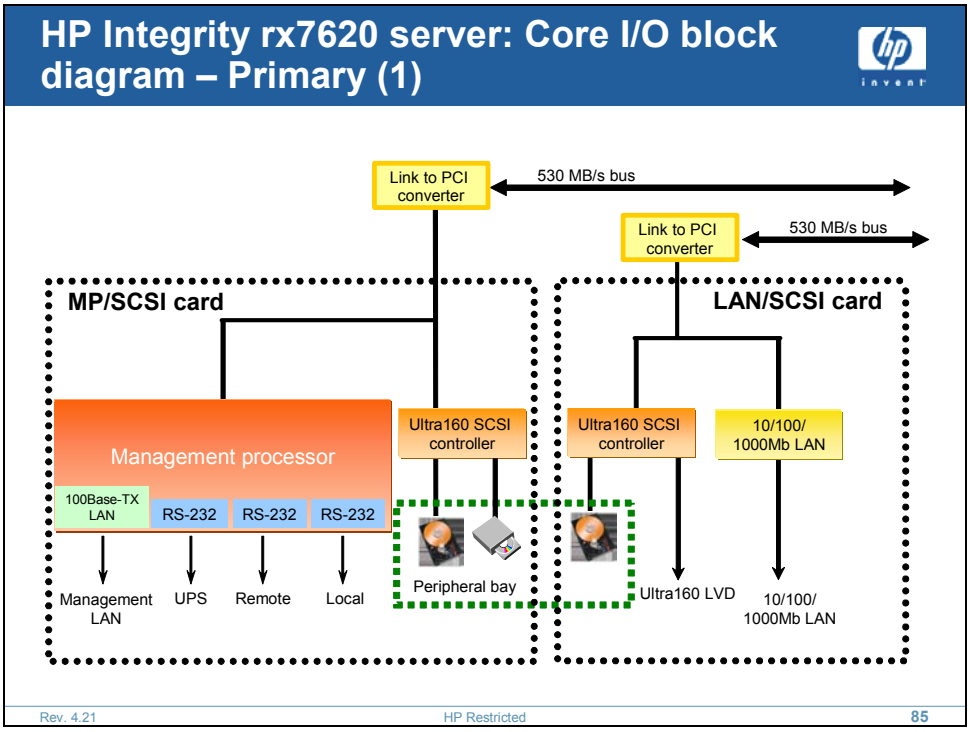
The LAN/SCSI card provided with each core I/O product occupies one of the sixteen PCI slots. Since there must always be at least one core I/O board set, the HP Integrity rx7620 has fifteen available PCI slots for expansion cards. If the second core I/O product (board set) is purchased, there are fourteen remaining slots available for expansion cards.

The internal peripheral bay supports up to four low-profile disks and one removable-media device. The internal disks are electrically divided into two pairs. SCSI controller chips located on each core I/O board set supports each pair of internal disks. This means that you must have both board sets in order to access both halves of the peripheral bay. This also means that I/O paths are not shared, and disks are electrically isolated, providing for optimal isolation between partitions.



HP Integrity rx7620 server: PCI-X backplane

Fourteen of sixteen I/O card slots are supported by dual high-performance links. Each link is capable of providing 530MB/s of bandwidth. This means that most HP Integrity rx7620 I/O slots are capable of sustained 1.06GB/s. Aggregate I/O slot bandwidth is 15.9GB/s. In addition, because each I/O slot has a dedicated bus, any slot can be hot-plugged, or serviced without affecting other slots. The hot-plug operation is very easy, and can be done with minimal training and effort.



HP Integrity rx7620 server: Core I/O block diagram — Primary (1)

The HP Integrity rx7620 chassis supports up to two core I/O board sets. Each board set contains two cards (MP/SCSI and LAN/SCSI), which are installed in different locations. MP/SCSI cards are installed along the right-rear vertical edge of the chassis. The LAN/SCSI cards are installed in the PCI card bay. A minimum of one core I/O board set must be ordered with each system; the optional second core I/O board set can be used to enable hardware partitioning or to utilize the full capacity of the built-in mass storage bays.

Both core I/O board sets are identical. However, the electrical connections to internal peripherals and the I/O controller are slightly different. In the primary core I/O the LAN/SCSI board is supported by a single 530MB/s link, whereas the LAN/SCSI board in the secondary core I/O is supported by two 530MB/s links. In addition, in the primary core I/O, a SCSI controller from both the LAN/SCSI board and MP/SCSI board each support a single internal disk drive. In the secondary core I/O, only the MP/SCSI board is used to support both disk drives off of a single SCSI controller and bus.

Management processor

The management processor (MP), located on each MP/SCSI card, is a dedicated processor that simplifies and extends system management, and also enhances serviceability. The MP minimizes or eliminates the need for the system administrator to be physically at the system to perform tasks such as diagnostics, system management, or even hard resets. Here are some of the features enabled by the HP Integrity rx7620 management processor:

- System management over the Internet or intranet (telnet or web)
- System console redirection

- Console mirroring
- System configuration for automatic restart
- Viewing history log of system events
- Viewing history log of console activity
- Setting MP inactivity timeout thresholds
- Remote system control
- Remote power cycle (except for MP housekeeping power)
- Viewing system status
- Event notification to system console, e-mail, pager, and/or HP Response Centers
- Automatic hardware protection of critical environmental problems
- Access to management interface and console(s) on LAN failure (modem required)
- Remote resetting of hardware partitions
- Forward progress indicator (Virtual front-panel)
- Out-of-band Manageability and PDC firmware update
- Configure manageability and console security
- MP failover (systems with both core I/O boards)
- SSL

HP Integrity rx8620 server

Server Expansion Unit

- 16 sockets
- Intel Itanium 2 1.3 or 1.5GHz processors
- Up to 128GB memory
- Up to 16 PCI-X I/O slots
- Up to 4 nPars (with SEU)
- 17U

Positioning

The outstanding performance of the rx8620, coupled with its multi-OS agility and partitioning capabilities, makes it an ideal entry into high-end computing.

Key Features

- Intel Itanium 2 processors, high-end, cell-based technology, HP sx1000 chipset
- Choice of HP-UX, Linux, OpenVMS, and Windows operating systems

Rev. 4.21 HP Restricted 86

HP Integrity rx8620 server

Configuration

A minimum of one and a maximum of four cells can be ordered in an HP Integrity rx8620. Each cell can be purchased with up to four active 64-bit Intel Itanium 2 Madison processors, or in combination with iCOD processors. Two processor speeds are supported; 1.3GHz and 1.5GHz. The ability to mix processor speeds within a chassis is supported (but processors within a within a cell or partition must be of the same speed). The HP Integrity rx8620 and rx7620 (8 socket) servers share the same cell board.

Additional I/O resources can be obtained by adding the HP Server Expansion Unit (SEU). The SEU is an add-on chassis containing I/O resources that complement the I/O and partitioning capabilities within the HP Integrity rx8620 server. The SEU mirrors the I/O resources embedded within the HP Integrity rx8620 chassis, adding 16 I/O card slots, 4 disk bays, 2 removable media slots, and enabling 2 additional hard partitions.

Performance and scalability

- 280000+ OLTP performance (estimate)
- Leading Java, web, DW, and ERP/CRM/SCM performance

Investment protection

- In-box upgrades to future PA-RISC and IPF releases
- Up to 32-way SMP
- Utility pricing (including Pay per Forecast, Pay per Use, and processor and memory iCOD)

Features

- 2- to 16-way Itanium 2
- 128GB memory
- 16 PCI-X slots
- 2 removable media devices (DAT/DVD)
- 4 internal disk drives
- Dual core I/O
- Up to 2 hard partitions (up to 4 with optional SEU)
- Optional server expansion unit (SEU)

Server Expansion Unit

- 16 PCI-X slots
- 4 internal disk drives and 2 removable media devices (DAT/DVD)
- Dual core I/O
- Enables up to 2 additional rp8400/rx8620 hard partitions
- 9U height (fits in same rack as rp8400/rx8620 server)

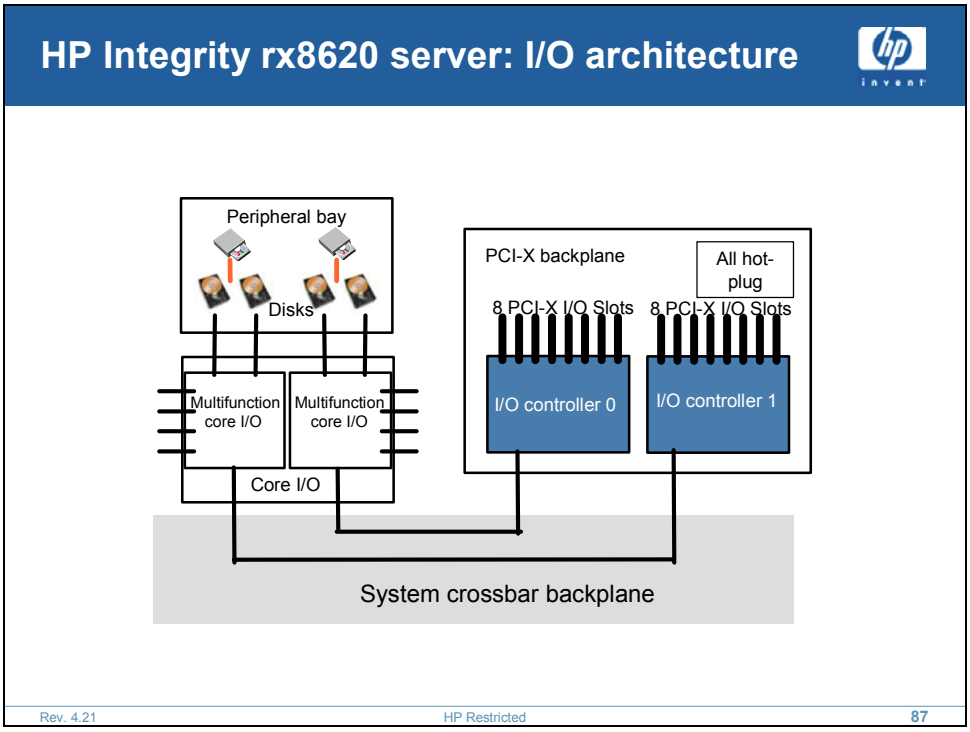
Standard system features

- 64-bit HP-UX 11i v2 operating system
- Windows Server 2003 Datacenter and Windows Server 2003 Enterprise Edition (1H2004)
- Linux Red Hat v3.0 (1H2004)
- External Ultra3 LVD SCSI channel
- Four internal Ultra SCSI channels, one channel to each internal disk
- 10/100/1000Base-T LAN (with auto speed sensing)
- Management Processor technology with integrated web console and LAN console
- RS-232 local and remote (modem) console and UPS ports
- 10/100Base-T LAN port for LAN console and web console
- Rack-mountable into HP 19-inch cabinets (factory or field integration)

- Rack-mountable into some 3rd party cabinets
- Pedestal configuration
- Two hardware partitions (nPartitions)
- Four hardware partitions when configured with the Server Expansion Unit
- Factory integration of CPUs, memory, disk drives, removable media drives, and I/O cards
- HP site planning and installation
- One-year warranty with same business day on-site service response
- Owner's Guide and General Usage media set

High availability

- N+1 hot-swap cooling
- Redundant and hot-swap power supplies
- Cell hot-plug
- Hot-plug disks
- 2N power inputs
- Online memory page de-allocation
- ECC protected SyncDRAM memory
- Full parity protection of data and address buses
- On-chip CPU cache with ECC protection
- Memory "chip spare", "chip "kill-like"
- CPU de-allocation on failure
- Online addition and replacement of PCI I/O cards
- UPS power management
- Four independent UltraSCSI buses to internal disks for mirroring across disks and controllers
- Journal file system
- Auto reboot
- Online diagnostics and system health monitor



HP Integrity rx8620 server: I/O architecture

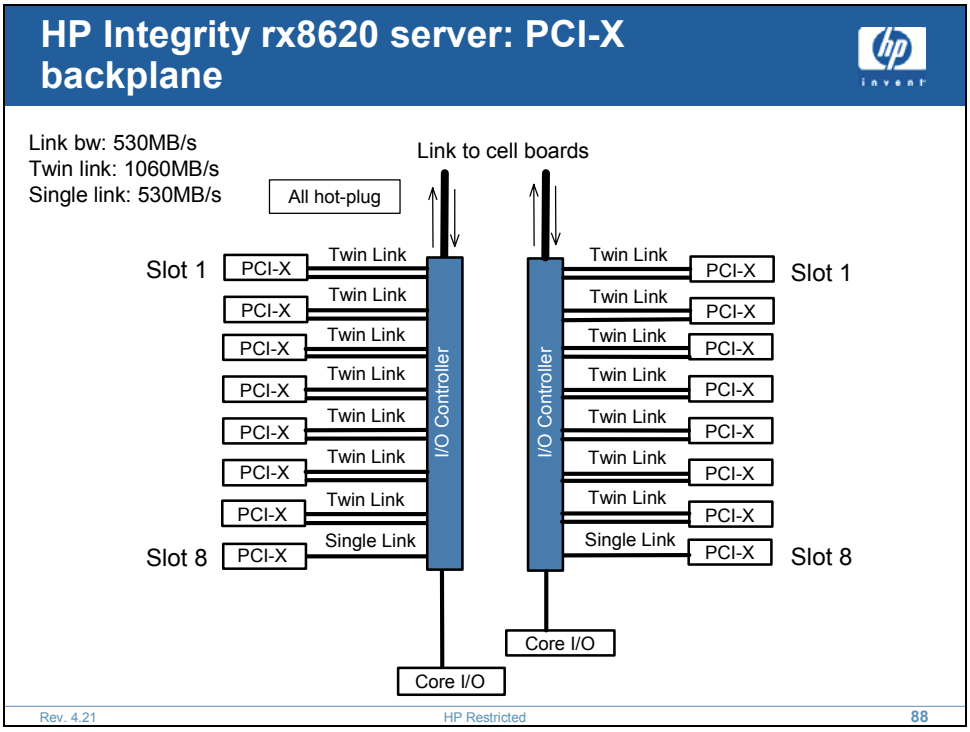
I/O architecture

Components within the I/O subsystem are the I/O controllers, internal peripheral bay, and multi-function core I/O. The figure shows the basic block diagram of the I/O subsystem. The HP Integrity I/O architecture utilizes industry standard PCI buses in a unique design for maximum performance, scalability and reliability.

The HP Integrity rx8620 contains two master I/O controller chips located on the PCI-X backplane. Each I/O controller contains sixteen high-performance 12-bit wide links, which connect to sixteen slave I/O controller chips supporting the PCI-X card slots and core I/O. Two links, one from each master controller is routed through the crossbar backplane and is dedicated to core I/O. The remaining thirty links are divided among the sixteen I/O card slots. This one card per link architecture leads to greater I/O performance and higher availability. Each controller chip is also directly linked to a host cell board. This means that at least two cell boards, located in cell slots 0 and 1, must be purchased in order to access all sixteen I/O card slots. With one cell board, access to eight slots is enabled.

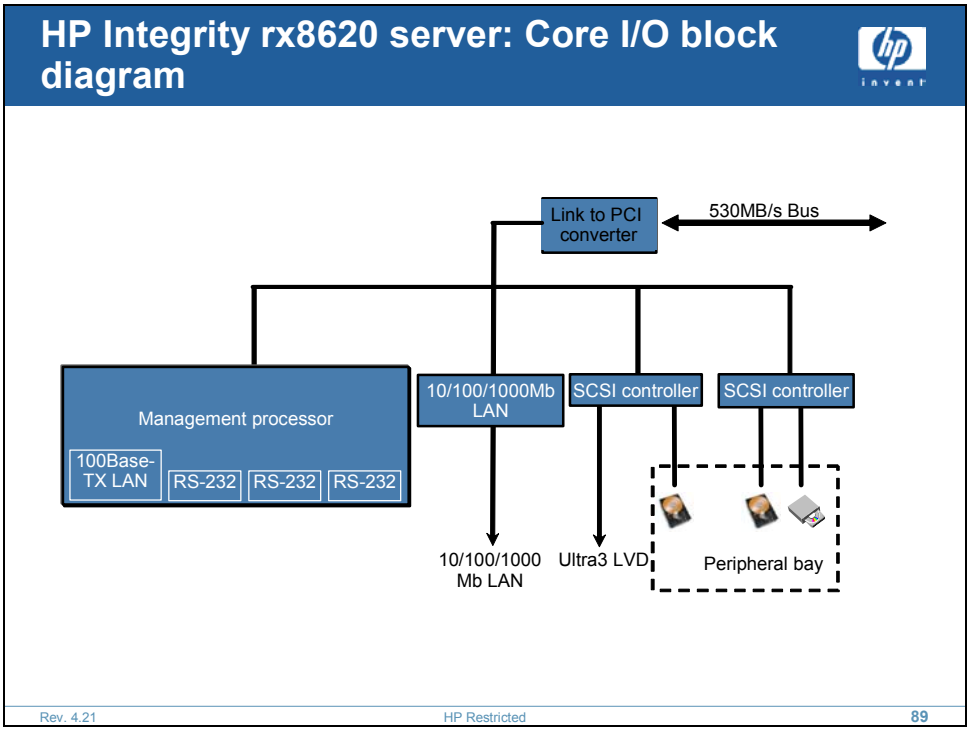
The HP Integrity rx8620 can be purchased with either one or two core I/O boards. Both core I/O boards are identical and provides console, SCSI, serial, and Management Processor (MP) functionality. The second core is used to enable the dual partitioning in the HP Integrity rx8620 and provide access to a second set of disk drives.

The internal peripheral bay is divided into two identical halves. Each half supports up to two low-profile disks and one removable media device. A SCSI controller chip located on each core I/O board supports each half of the internal peripheral bay. This means that both core I/O boards must be purchased to access both halves of the peripheral bay.



HP Integrity rx8620 server: PCI-X backplane

Fourteen of sixteen I/O card slots are supported by dual high-performance links. Each link is capable of providing 530MB/s of bandwidth. This means that most HP Integrity rx8620 I/O slots are capable of sustained 1.06GB/s. Aggregate I/O slot bandwidth is 15.9GB/s. In addition, because each I/O slot has a dedicated bus, any slot can be hot-plugged or serviced without affecting other slots. The hot-plug operation is very easy, and can be done with minimal training and effort.



HP Integrity rx8620 server: Core I/O block diagram

HP Integrity Core I/O Card

Management processor

The Management Processor (MP) is a dedicated processor that simplifies and extends system management, as well as, enhances serviceability. The MP feature set was designed to minimize or eliminate the need for the System Administrator to be physically at the system to perform tasks such as diagnostics, system management, or even hard resets.

Features:

- System management over the Internet or intranet
- System console redirection
- Console mirroring
- System configuration for automatic restart
- Viewing history log of system events
- Viewing history log of console activity
- Setting MP inactivity timeout thresholds

- Remote system control
- Remote power cycle (except for MP housekeeping power)
- Viewing system status
- Event notification to system console, e-mail, pager, and/or HP Response Centers
- Automatic hardware protection of critical environmental problems
- Access to management interface and console(s) on LAN failure (modem required)
- Auto system restart
- Remote resetting of hardware partitions
- Forward progress indicator (virtual front-panel)
- Out-of-band manageability and PDC firmware update
- Configure manageability and console security
- MP failover (systems with both core I/O boards)
- SSL

External LAN port

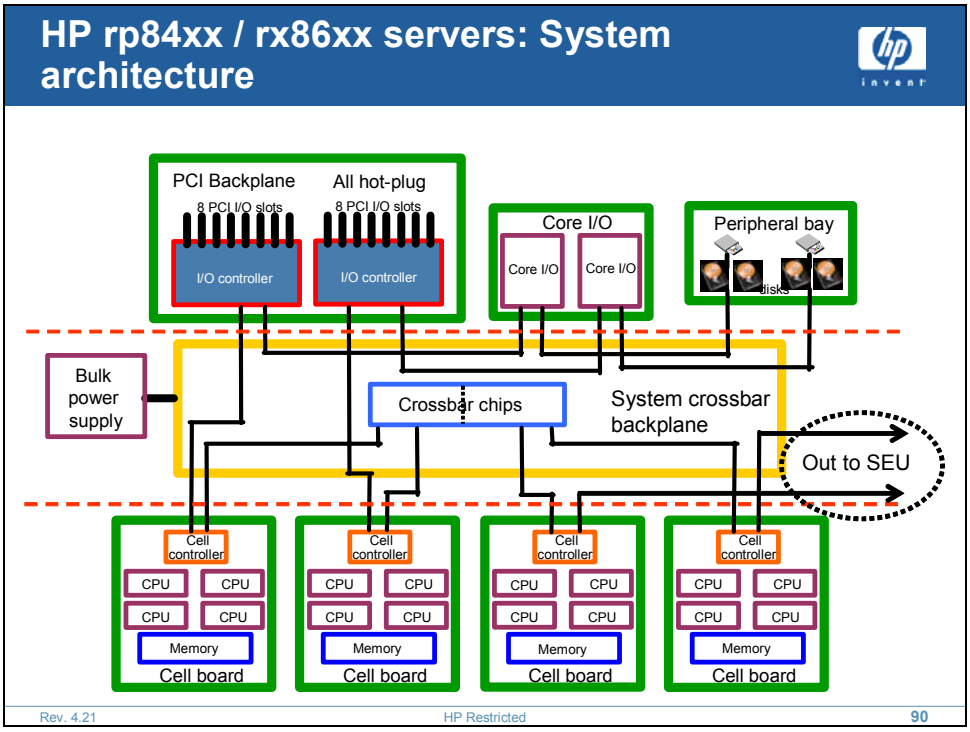
- 10/100/1000Base-T LAN port using an RJ-45 connector

External SCSI port

- Ultra3 LVD SCSI port for connections to mass storage or media

Access to internal peripheral bay

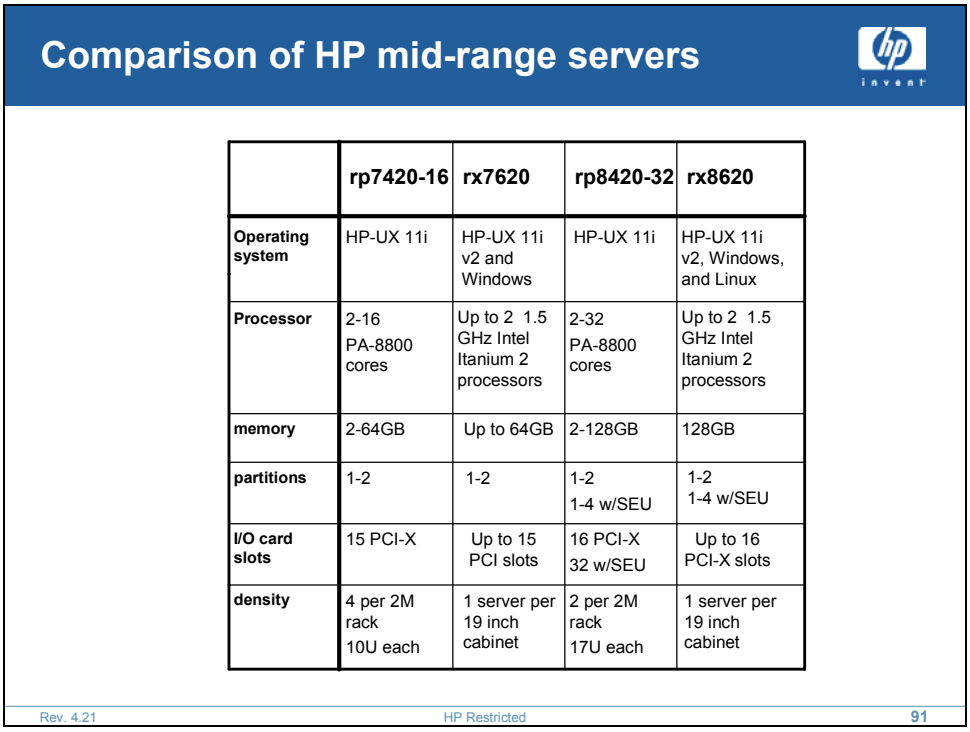
- The first core I/O card enables half of the HP Integrity rx8620 peripheral bay, which includes one removable media and two low profile disks. The second core I/O card enables the remaining internal peripherals, two disks and one removable media bays. Customers that require access to more than two internal disks and/or one removable media slot must purchase the second core I/O card and more than one cell board.



HP rp84xx / rx86xx servers: System architecture

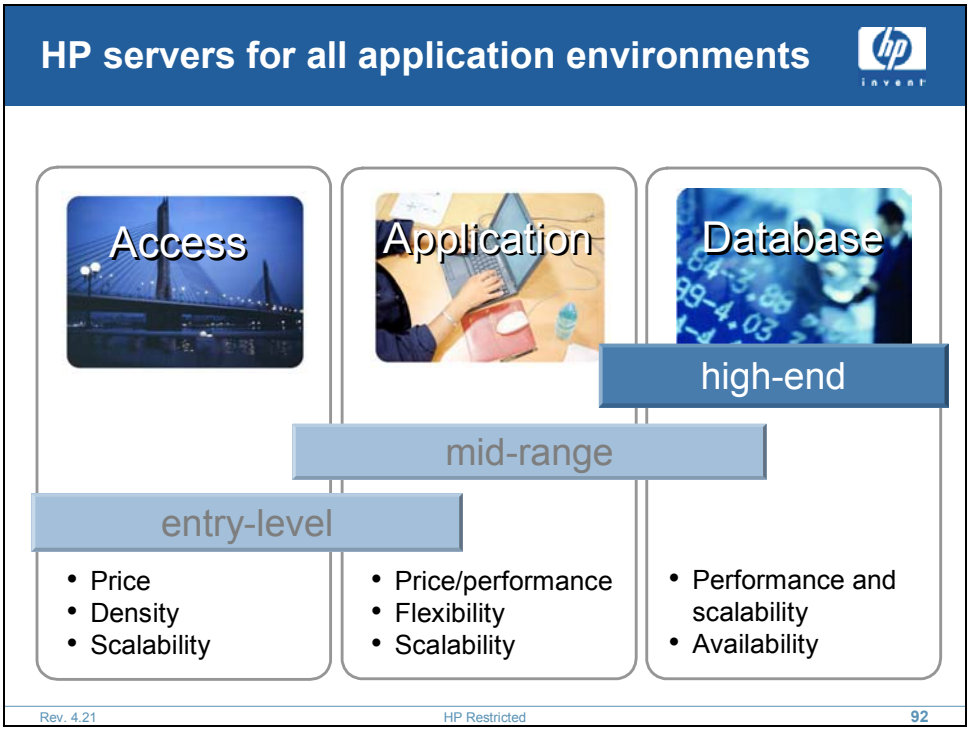
The rp8400 system architecture is based on a modular set of building blocks, which when put together, forms a high performance, scalable, highly available, and flexible computing platform. The system is designed around a cell-based crossbar architecture that can be configured as one large symmetrical multi-processor (SMP) server or as two hardware independent partitions.

There are three primary building blocks in the rp8400 system architecture: The cell, the crossbar backplane, and the PCI-based I/O subsystem. This slide shows the rp8400 building blocks and the buses that connect them.



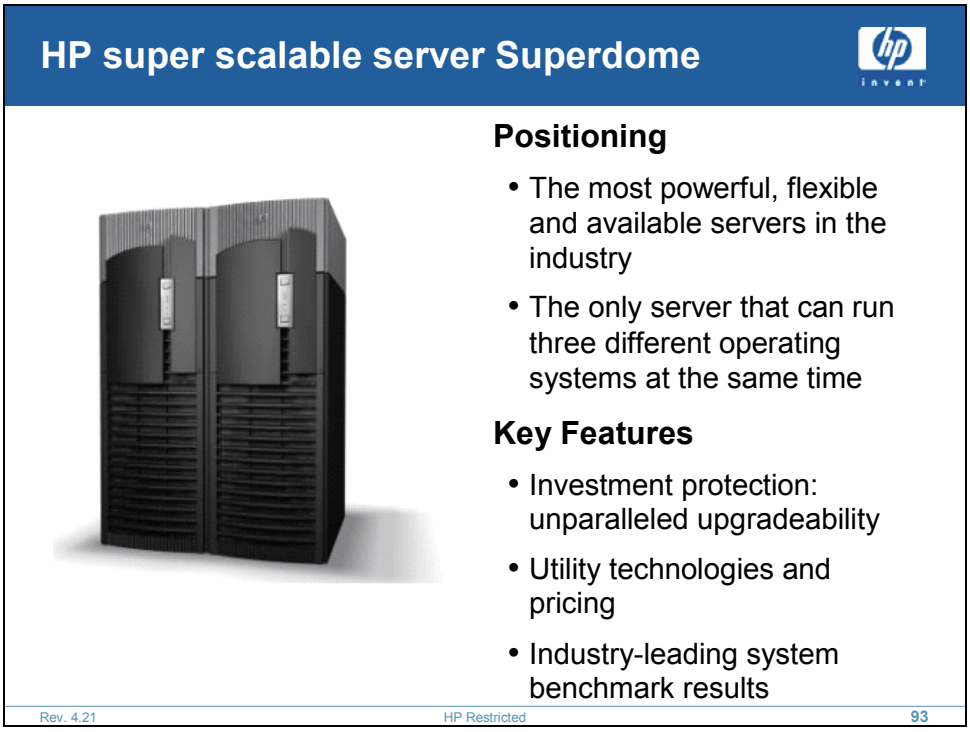
	rp7420-16	rx7620	rp8420-32	rx8620
Operating system	HP-UX 11i	HP-UX 11i v2 and Windows	HP-UX 11i	HP-UX 11i v2, Windows, and Linux
Processor	2-16 PA-8800 cores	Up to 2 1.5 GHz Intel Itanium 2 processors	2-32 PA-8800 cores	Up to 2 1.5 GHz Intel Itanium 2 processors
memory	2-64GB	Up to 64GB	2-128GB	128GB
partitions	1-2	1-2	1-2 1-4 w/SEU	1-2 1-4 w/SEU
I/O card slots	15 PCI-X	Up to 15 PCI slots	16 PCI-X 32 w/SEU	Up to 16 PCI-X slots
density	4 per 2M rack 10U each	1 server per 19 inch cabinet	2 per 2M rack 17U each	1 server per 19 inch cabinet

Comparison of HP mid-range servers



HP servers for all application environments: High-end

The Database Tier is where the bulk of the processing, manipulation and storage of data takes place. This is the realm of our high-end servers, although, in some cases, you will see customers selecting high performing mid-range systems for these applications.



HP super scalable server Superdome

Positioning

HP Superdome is the industry's leading high-end UNIX server. The Superdome value proposition lists Superdome's differentiation in all major areas:

- **Performance and scalability** — Superior single system performance
- **Partitioning continuum** — Comprehensive partitioning offering
- **Connectivity** — Broad range of high performance solutions
- **High availability** — Unprecedented high availability
- **Utility technology and pricing** — First Pay per Use pricing model

Built for the future—investment protection with PA-RISC, IA-64, and multiple OS support.

HP provides unprecedented investment protection with in-box upgradeability and by being designed for board upgrades to Itanium. This will provide customers with the choice of three operating systems: HP-UX, Windows and Linux.

Superdome leads the way in performance. Its balanced design makes it a world record holder in performance metrics:

- #1 in single server Oracle 9i TPC-C results
- #1 in TPC-H 1TB and 3TB Oracle
- #1 in Java performance on SPECjbb2000

- #1 in SAP ATO tier 3
- #1 in throughput on 64 processor SPEC_INT_rate

Ideal environments, problems and requirements

HP Superdome high-end UNIX server is engineered for large-scale applications and databases, or as compute engines. Its high-end architecture is ideal for the specific demands of online transaction processing workloads, system consolidation, decision support systems, and collaborative product development.

HP Integrity Superdome features new Itanium 2 6M processors

HP Integrity Superdome offers customers the ability to run multiple operating systems simultaneously. This multi OS capability is especially useful for heterogeneous server consolidation. Superdome is the only high-end server in the IT industry that can simultaneously run Windows, HP-UX, and Linux in the same box, providing this capability to an existing installed server through an in-box upgrade. Benefits include:

- Improved system resource utilization
- Cost savings and improved ROI
- Greater business agility
- Faster time-to-market and enhanced competitive ability due to rapid application deployment
- Faster commercial transaction response times, web commerce response times and shorter batch windows for enhanced customer service and satisfaction

Differentiators

The Superdome server provides excellent performance and scalability, with up to 64 CPUs, 256GB of memory, and 192 hot-swap PCI I/O slots. A 64-way configuration with the PA-8700 processor achieved a TPC-C benchmark of 389,434 @ $21.24 per transaction in late 2001. In June of 2002, HP released the PA-8700+ processor, which was a simple speed bump to the PA-8700. With this new iteration of the PA-8700, HP posted a record breaking TPC-H benchmark of 25,805 QppH (Query performance per Hour) at $213/QppH.

Superdome is based on a "cell" architecture that supports up to four CPUs, 16GB memory and an optional connection to a 12-slot PCI card cage per cell. The cell controller connects processors, memory, I/O, and a crossbar switch for communications to other cells.

The Superdome server offers additional investment protection to customers through its support for future releases of PA-RISC and IA-64 processors. The cell controller chip supports both PA-8600 and PA-8700 processors simultaneously within the system, as long as the chips reside on different cell boards. For Intel’s Itanium architecture, the Superdome server will require new versions of the cell

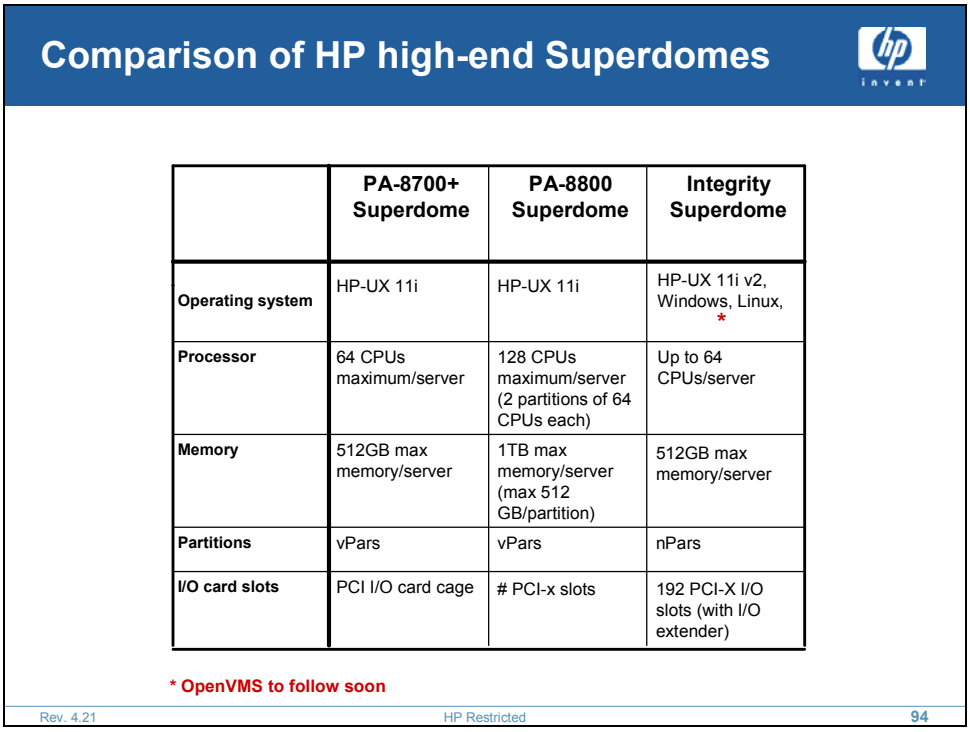
controller chip and cell boards. HP promises that HP-UX applications will be able to run unmodified on IA-64. Customers can also take advantage of two new pricing models—instant Capacity on Demand (iCOD) and Pay per Use utility pricing.

Superdome is the first HP server to support partitions, with support for up to 16 hard partitions in a 64-way configuration. Failover between partitions is supported for increased availability. HP will also offer support for up to 64 soft partitions (virtual partitions). When IA-64 is available, Superdome will support simultaneous UNIX, Linux and Windows partitions on a single system, providing excellent configuration flexibility. HP plans on supporting fully dynamic partitions in a later release.

Superdome offers excellent standard high availability features, including N+1 hot-plug fans and power supplies, hot-swap PCI I/O cards, ECC on all CPU and memory paths, support for a dual power source, and parity protected I/O data paths. OLAR (Online Add/Replace) of CPU and memory cells is scheduled for a future release.

Capitalizing on HP Superdome opportunities

Channel Partners must be certified to sell HP Superdome. Certified Partners have the ability to engage TCE (Total Customer Experience) Managers directly and are responsible for providing the architectural component of the Solution Lifecycle (the model for end-to-end solution fulfillment).



Comparison of HP high-end Superdomes

HP NonStop S76 server: Mid-range

NonStop S76

Positioning

- The NonStop S76 is a high availability, data integrity, high performance computer used primarily for development.

Key features

- NonStop Kernel
- 2 MIPS R12000 processors (up to 255 nodes)
- 1GB main memory
- 1GB memory per node
- 1 multifunctional I/O per node
- Cabinet

Rev. 4.21 HP Restricted 95

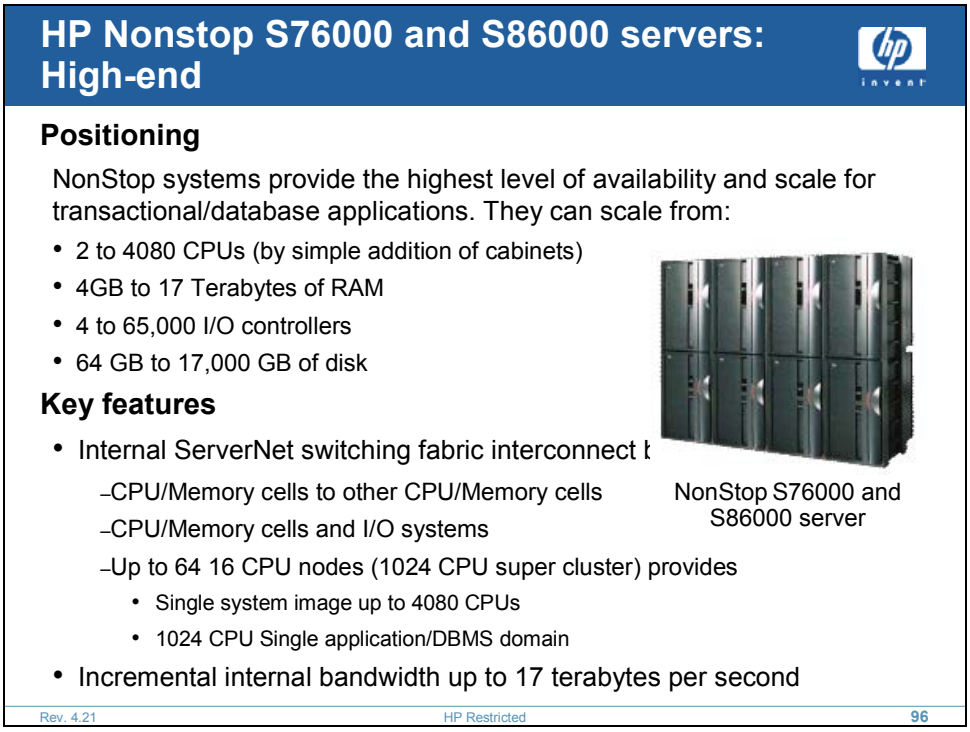
HP NonStop S76 server: Mid-range

Positioning

The entry-level servers are intended as low-cost entry points for distributed branch applications that require continuous availability and data integrity but not scalability.

All NonStop systems are based on ServerNet technology and designed for high data throughput with high availability, data integrity, high performance, and compatibility across the product line.

Based on independent analyst reports, the NonStop server has the best total cost of ownership (TCO) and highest availability of any other comparable system.



HP NonStop S76000 and S86000 servers: High-end

Positioning

All NonStop systems are based on ServerNet technology and designed for high data throughput with continuous availability, unlimited scalability, absolute data integrity, extreme manageability, and high performance through parallelism. They are a solid platform for customer-visible systems.

- **Unlimited scalability**: Some customers are being confronted with steep ramps in their business models. Accommodating this growth effortlessly is key to mutual success, theirs and ours.
- **Extreme manageability**: If customers are living on the edge, the core of their IT infrastructure better be easy to manage. This includes diagnosing and solving problems, tuning performance, deploying new capabilities, and accommodating change.
- **Lowest total cost of ownership**: Based on independent analyst reports, NonStop has the lowest lifetime total cost of ownership (TCO) when taking into account the cost of downtime, manageability, and upgrades.

NonStop development resources focus on providing solutions that can meet operational requirements for 24x365 service and the ability to support and expand transaction volumes as business grows.

The HP NonStop S76000 represents a 50 percent processor performance increase and the S86000 represents a 90 percent processor performance increase over NonStop S74000 servers.

To protect your investment in existing solutions, NonStop S-series servers are fully application compatible with all NonStop K-series servers. You can move applications among servers with little or no modification.

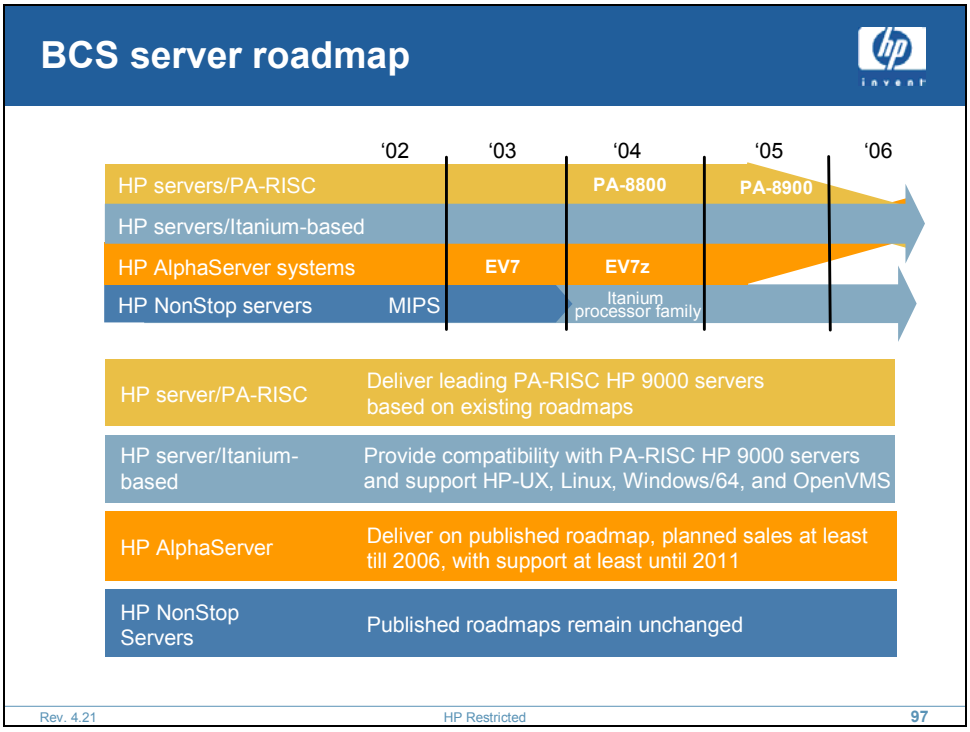
To minimize operating costs, many components of NonStop S-series servers can be installed and serviced with minimal training. The TSM toolset and remote support make it possible to perform problem analysis and incident reporting and to replace components without disrupting server operation.

Ideal environments, problems and requirements

Target markets for NonStop servers are any industry where there is a need for powerful, high-end servers to run business-critical and mission-critical applications. The industries where NonStop servers are dominant players include financial services, security and commodities exchanges, and telecommunication providers. Emerging business-critical markets include healthcare, travel and leisure, government, manufacturing and retail.

Customer base includes:

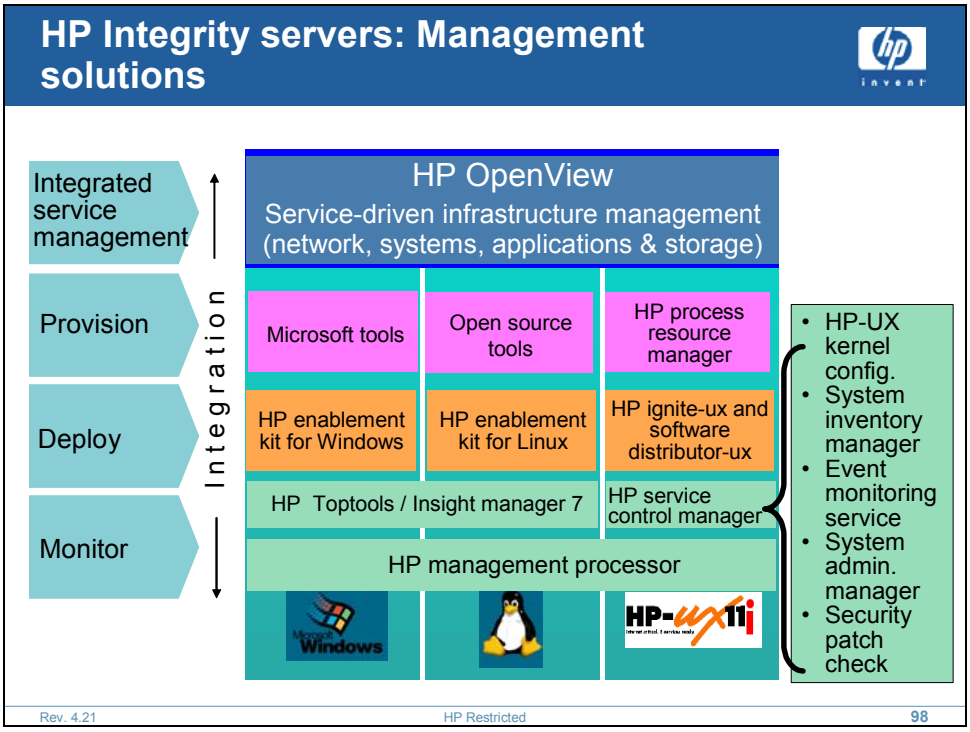
- Businesses where unpredictable or explosive growth of application and associated transaction rates
- An environment where customer loyalty is low; this is especially true when doing business online
- Significant risk that visible application downtime could cause a loss of revenue or investor confidence
- A business environment where any data loss or corruption would be disastrous
- A business requirement for secure e-business transactions



BCS server roadmap

The HP strategy is to converge server roadmaps on the Itanium architecture, supporting HP-UX with Tru64 UNIX features, Linux, Windows2003, and OpenVMS operating systems. We will also provide compatibility with our PA-RISC HP 9000 family of servers.

- For our PA-RISC HP 9000 customers, we will protect their investment by providing in-box upgrades. We plan long-term support for five years after the last PA-RISC HP 9000 server is sold.
- For our AlphaServer customers, we will deliver the planned roadmap, including EV7 and EV7z-based systems, and provide sales as long as there is customer demand, at least through 2006 with ongoing support until at least 2011. We will protect our customers' investment through best-in-class migration and upgrade programs.
- For our NonStop customers, we remain committed to delivering our roadmap and continue to drive market leadership in NonStop computing with a focus on the total customer experience



HP Integrity servers: Management solutions

Insight Manager 7 is very popular manageability software that ships with ProLiant servers. Insight Manager was designed to provide simple yet powerful fault, performance and configuration management for devices, including ProLiant Servers and attached storage, PCs and AlphaServers.

HP customers using Insight Manager 7 can download a guide entitled, "Operational Management Interoperability Guide" from the HP website outlining how to incorporate HP servers into their existing Insight Manager management environment. The customer will need to perform some work compiling the HP MIB (Management Information Base) in order to enhance its capabilities.

Some functions, such as Version Control, will not be available. For more details, please see the aforementioned guide. In addition, more information about Insight Manager 7 is available on the external website. Please see: http://www.compaq.com/products/servers/ management/cim7-description.html#overview

Why is the inclusion of Insight Manager 7 in the HP Integrity Server launch so significant?

Inclusion of Insight Manager 7 in the HP Integrity server launch demonstrates to analysts, press, and customers that we are truly “the new HP,” a company that is absolutely capable of integrating important technologies and bringing them to market, from Day 1. It also supports the investment protection and management consistency messages by enabling ProLiant customers to manage HP Integrity servers with their existing tools.

Which tool should I use to manage my HP Integrity servers, Servicecontrol Manager (SCM), Toptools, or Insight Manager 7?

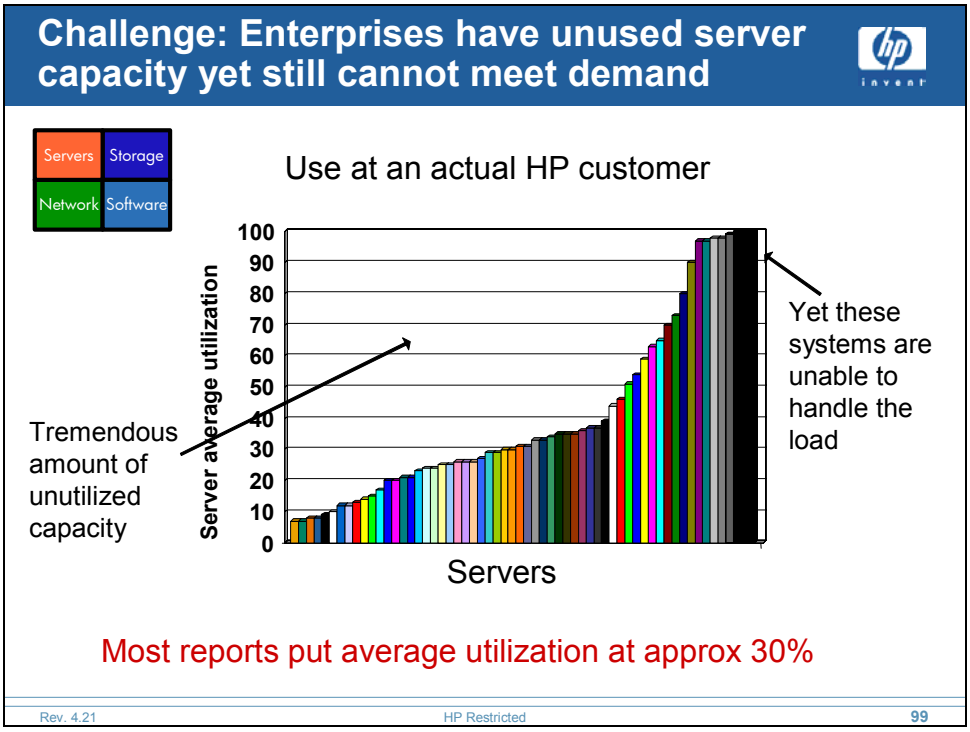
If your customer is running HP-UX on their new HP Integrity servers, use Servicecontrol Manager (SCM). If they are running Windows or Linux, they may use either Toptools or Insight Manager 7. Customers already running Toptools should continue to use Toptools to manage their new servers. Toptools has been optimized to manage HP Integrity servers. HP customers that would like to continue using Insight Manager 7 can continue to use the tool they are familiar with. All of these management tools ship with HP Integrity servers at no extra cost.

Can I run Insight Manager 7 on my HP Integrity server?

No. Insight Manager 7 will only run on IA-32 servers but it can be used to manage HP Integrity servers.

What is HP planning to offer by way of common server management tools?

At HP, we are well on our way to achieving our goal of offering customers a complete family of common server management tools. Last year we integrated Toptools and Servicecontrol Manager, our applications for managing Windows, Linux, and HP-UX, thus enabling administrators to switch between operating environments with the greatest efficiency. Now the Management Processor, one of our remote system manageability tools, is common for HP-UX, Linux, and Windows-based Itanium servers. With the tight integration of key management tools from Compaq, such as Insight Manager, the new HP has the opportunity to deliver the strongest, most cohesive server management package in the industry..



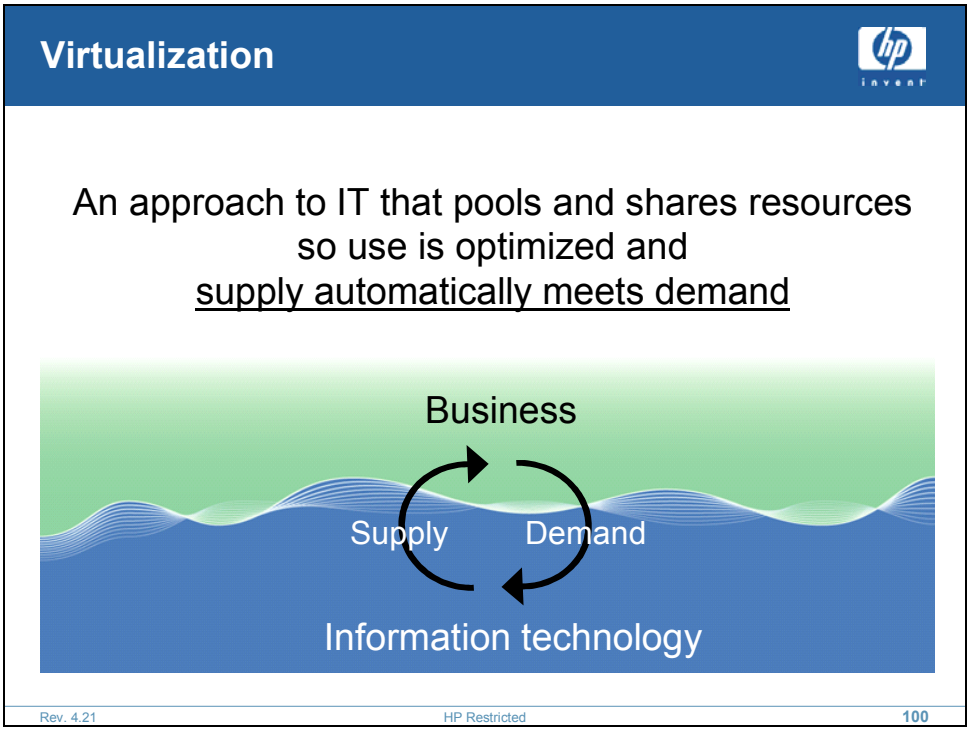
Challenge: Enterprises have unused server capacity yet still can't meet demand

Reasons for under use

- Customer might use one application per server and over provision based on peak work load.
- High availability contributes to under utilization as well, for example: stand by systems are very common.

Customers want to address the utilization issue – in other words address this cost issue and get better RoIT, but they definitely don't want to do it with increased risk and at the expense of quality of service.

HP definitely considers in the server virtualization solution space all of these typical CIO issues, i.e. cost, quality and risk. In addition, HP delivers the additional dimension of agility – the enablement to fast anticipate and react to change.



Virtualization

What is it?

Pooling and sharing: from a technology perspective, that's what virtualization is.

To move from vertical silos of infrastructure to horizontal pools of resources, enterprises need to virtualize their IT infrastructure. This also includes the 'abstraction layer for the physical hardware.

- Pooling: Can be thought of as "many-to-one" (e.g. Clustering several servers to act as one virtual server).
- Sharing: Can be thought of as "one-to-many: (e.g. A single large server server multiple users/application in an optimized way)
- One can also extend the thinking to a "many-to-many" optimized environment.

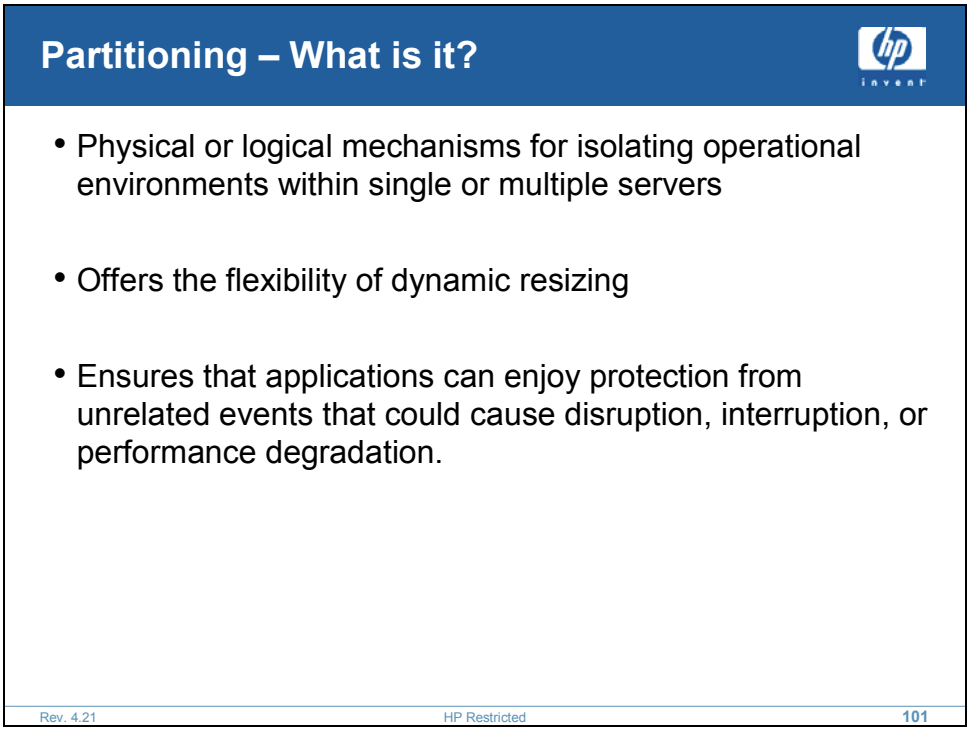
Approach

Virtualization is more than just the implementation of technology, it is an approach, a way of thinking about IT infrastructure. To truly take advantage of the technological innovations that are coming to market, enterprises need to address their people and processes.

Virtualization is inextricably closely tied with Adaptive Management

Within the HP model for the Adaptive Enterprise, Adaptive Management is the process for translating business need into demand for IT resources

Virtualization is the process for allocating the supply of IT resources to meet that demand.



Partitioning — What is it?

HP Partitioning

Partitions are physical or logical mechanisms for isolating operational environments within single or multiple servers to offer the flexibility of dynamic resizing while ensuring that applications can enjoy protection from unrelated events that could otherwise cause disruption, interruption, or performance degradation. The types of partitions are:

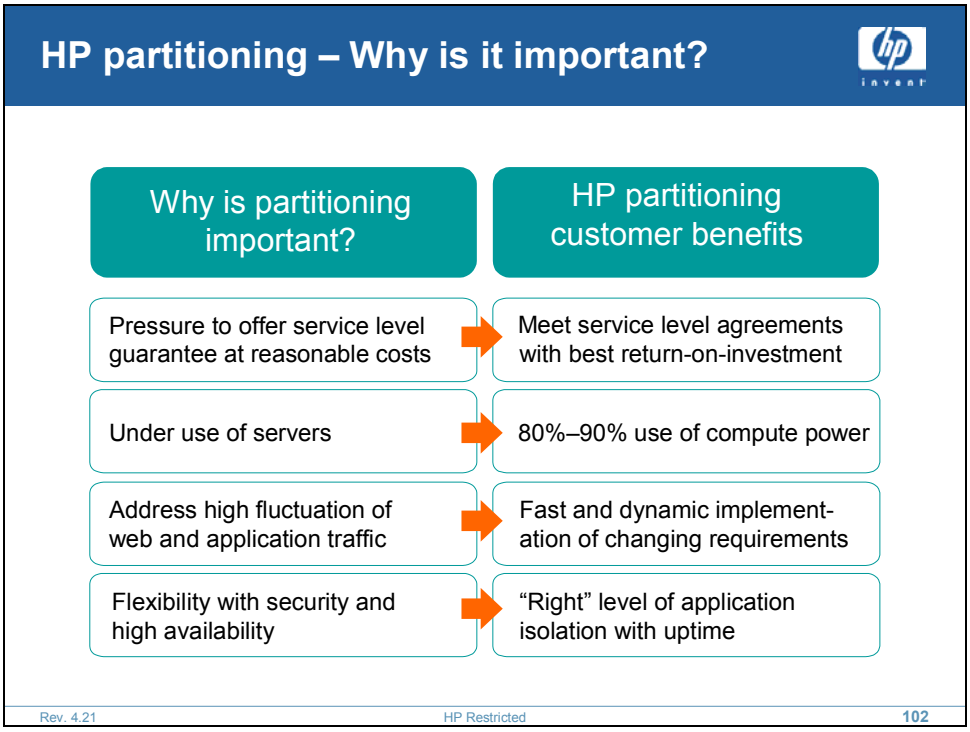
- Hard partitions—with multiple nodes
- Hard partitions (nPars)—within a node
- Virtual partitions—within a hard partition
- Resource partitions

HP offers a wide range of partitioning technologies that can be used either on their own or in conjunction with other partitioning products.

Hard partitions are designed to provide hardware fault isolation, whereas virtual and resource partitions are designed to deliver software fault isolation.

Both hard and virtual partitions enable you to execute multiple images (and releases) of the operating system with unique parameter settings within a single node.

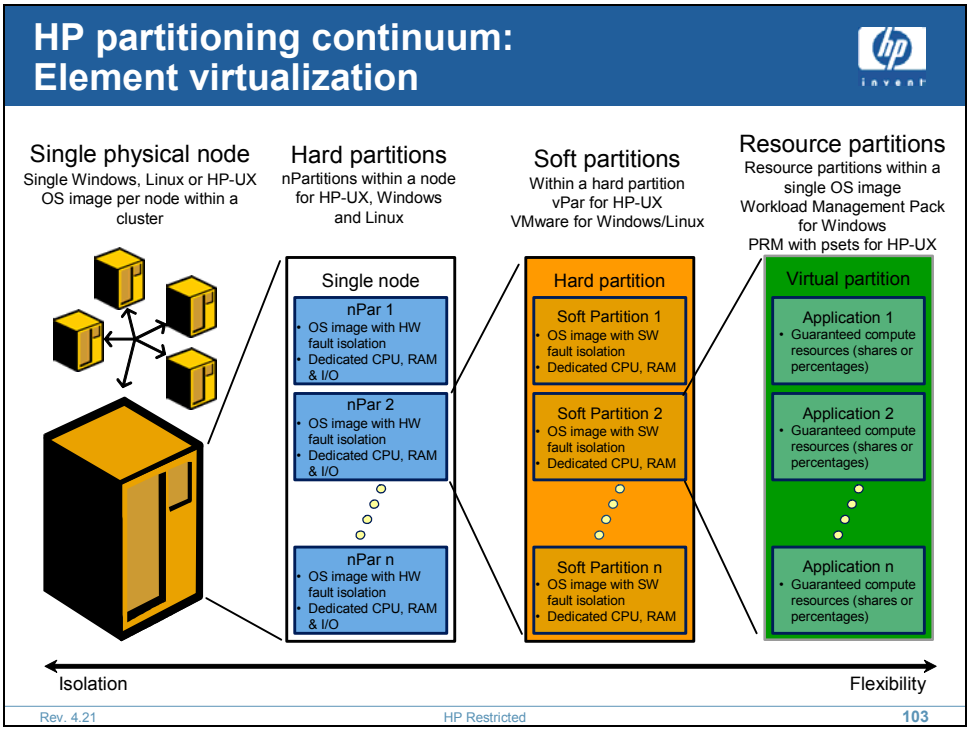
It is also important to recognize that different partitioning solutions provide different benefits and that tradeoffs exist.



HP partitioning — Why is it important?

Partitioning provides a number of benefits to your IT organization:

- Reduced hardware and facilities costs through server consolidation, (for example: reduced TCO)
- Increased server utilization and the elimination of replicated hardware for development and testing environments
- Reduced system management complexity
- Improved consolidated application availability by providing protection from faults in other partitions
- Improved application performance through resource optimization
- Improved system flexibility through dynamic creation, reconfiguration, and re-allocation
- Improved responsiveness to fluctuating business conditions
- Increased server manageability and flexibility



HP partitioning continuum: Element virtualization

The HP Partitioning Continuum solution offers a range of features that provide:

- "**Business" isolation** for applications while simultaneously optimizing utilization of server resources.
- **Protection for applications** from either failure or performance degradation due to server hardware or software problems.
- **Optimized application performance** by isolating each application within its own dedicated operating environment.
- **Resource isolation** within an operating environment so that applications sharing an operating system image can receive dedicated system resources in order to meet service-level objectives.

An increasingly popular approach to confronting the provisioning challenges of 24x7 computing has been to implement partitioning of the server's computing resources.

Partitions are physical or logical mechanisms for isolating operational environments within single or multiple servers.

Partitioning provides IT managers with the flexibility to dynamically resize an application's resource footprint while ensuring that all applications enjoy protection from disruptive events that could cause service interruption or performance degradation.

The HP Partitioning Continuum, which combines the most far-reaching partitioning solutions in the industry, overcomes one of the major challenges of the enterprise—namely, managing diverse workloads while maximizing the return on computing assets.

Driven by our customers' demand for greater scalability and flexibility, as well as the need to deliver a lower TCO, the HP Partitioning Continuum makes it possible for small, medium, and large organizations to make much more effective use of their computing resources by providing more-flexible isolation of applications, as well as more-effective resource sharing and workload management.

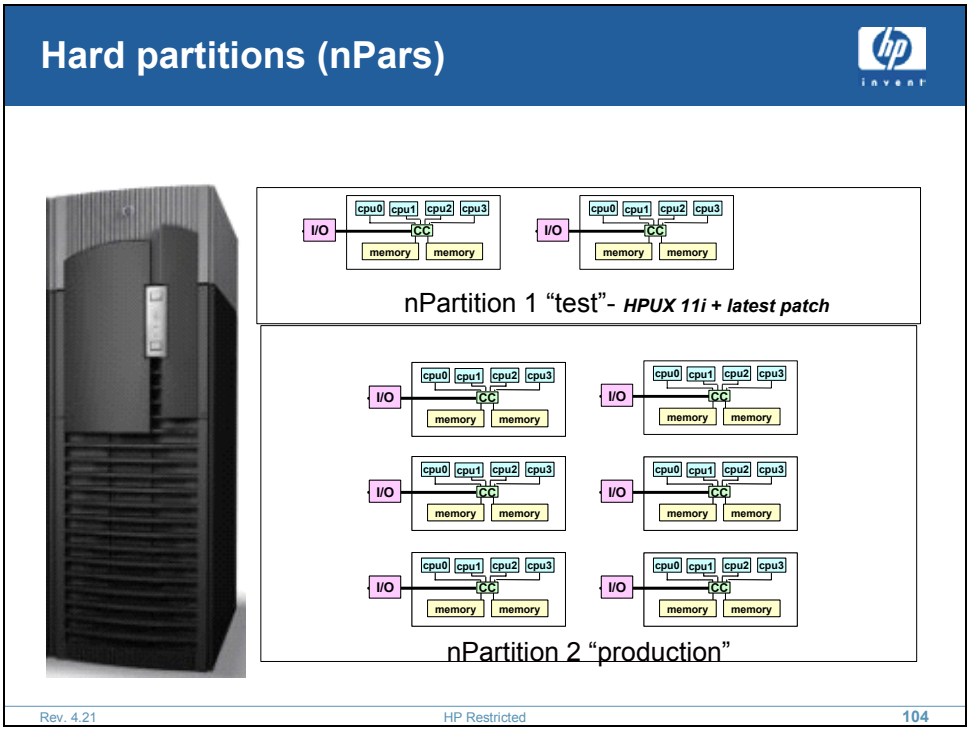
By focusing on these attributes, HP has been the first to solve the problems inherent in managing large data centers with diverse capacity requirements, unpredictable workloads, and stringent availability requirements.

The HP Partitioning Continuum helps your customers isolate operational environments to ensure data center privacy and uptime, while at the same time maintaining the highest degree of flexibility by re-allocating resources quickly.

This solution is unique in that it operates across the HP UNIX server range, and it can be configured as hard, virtual, or resource partitions.

When an application is isolated within a partition, it can make dedicated use of server resources, be managed separately or within a group, and take advantage of unique configuration requirements.

Partitions, though simple in concept, have proven difficult to develop and deploy. HP is the only computer manufacturer that has mastered partitions in the UNIX world, making it possible for enterprise service providers to deliver utility computing solutions to customers with total confidence.



Hard partitions (nPars)

Types

Hard partitions (with multiple nodes)

- Provides complete hardware and software isolation.
- Each hard partition runs its own version of the operating system (multiple OS images).
- Multiple nodes can function within a hard partition, providing node granularity.

Hard partitions (within a node)

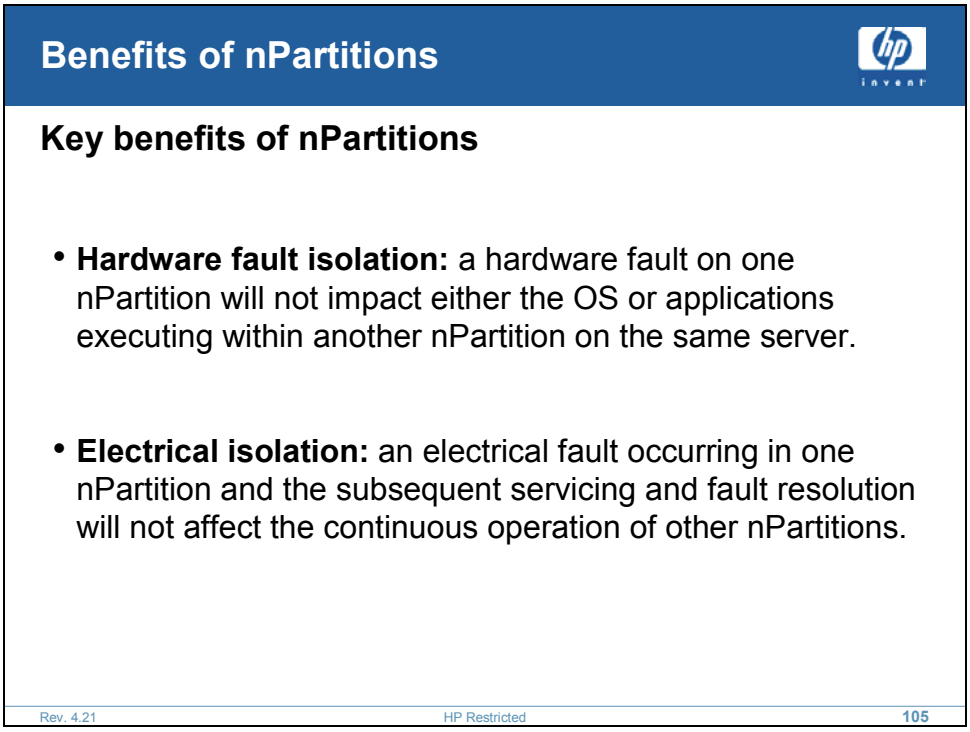
- Hard partitions are accomplished by breaking up a large server into smaller servers (hardware isolation per cell).
- Each nPartition (the equivalent of a smaller server) runs its own version of the operating system (multiple OS images).
- These hard partitions are designed to provide complete electrical and software isolation so that any fault within one partition cannot impact any other partition.
    - Electrical isolation is necessary in a partitioning solution. In the event of a hardware failure, only the partition with the fault should be impacted. Electrical isolation is also necessary to provide the ability to add hardware online or to do online hardware maintenance to a partition without affecting other partitions.

- Multiple vPars can function within an nPartition, providing cell granularity.
- nPartitions are widely used by Superdome and rp8400 customers.

nPartitions

- The HP nPartition system capabilities enable you to configure a single server complex as one large system or as multiple smaller systems.
  - These hard partitions are designed to provide for complete electrical and software isolation. For organizations where high availability is critical, this ensures that any fault within one partition cannot impact any other partition.
  - Applications running within hard partitions are not subject to hardware or software events in other partitions.
- Each nPartition has one or more cells (containing processors and memory) that are assigned to the partition for its exclusive use.
  - Any I/O chassis that is attached to a cell belonging to a partition also is assigned to the partition. (Each chassis has PCI card slots plus any I/O cards and attached devices, and may also have core I/O.)
- Since each nPartition has its own CPU, memory and I/O resources consisting of the resources of the cells allocated to the nPartition, resources may be removed from one nPartition and added to another without having to physically remove and add hardware.
  - Additionally, dynamic creation and modification of nPartitions is supported.
- These partitions operate in such a manner that they can be totally isolated from other hard partitions.
  - Each nPartition executes a single OS image, thus providing software isolation. Alternate nPartitions may, therefore, be executing different versions of the OS.

With the addition of IA-64 processors, HP-UX, Linux, and Microsoft Windows will be supported simultaneously in different nPartitions within a single Superdome, making the Superdome the only high-end server in the industry that includes both full IA-64 compatibility and binary application support.



Benefits of nPartitions

Hard partitions are partitions designed to isolate application environments from single points of failure (SPOFs). This means that applications running within hard partitions are not affected by hardware OR software events occurring in other partitions.

Reasons for using hard partitions

Electrical isolation

Hard partitions are completely isolated from one another. The need to reconfigure, reboot, or service a hard partition can be done independently with no impact on other hard partitions, either as individual systems or as multiple hard partitions within a single system.

Availability

The ability to isolate workloads from hardware or software failures is a requirement for users wishing to consolidate development, test, or production environments so as to reduce the total cost of ownership. Hardware and software errors in other partitions (hard or soft) will not generally affect a hard partition, enabling the configuration of hard partitions to manage workloads without fear of multiple application outages due to overall system failure.

Guaranteed performance and throughput

Hard partitions are used when batch workloads or online applications require dedicated resources in order to perform according to service-level objectives (SLOs). A combination of hard, virtual, and resource partitions offers significant benefits to service providers who must fulfill service-level agreements (SLAs) while sharing computing resources between customers. However, this may end up being more expensive, more complex to manage, as well as more prone to errors and incompatibilities. A thorough analysis of consolidation requirements is necessary in order to select the simplest yet most efficient partitioning.

Solution to meet consolidation requirements

- Relative flexibility: Hard partitions are reconfigurable, making it possible to start, stop, add, modify, and delete resources as required.
- In addition, hard partitions can host both "virtual" and "resource" partitions that can be utilized to dedicate server resources such as memory, CPU, and I/O to specific applications, thus providing greater flexibility in allocating the exact resources necessary to fulfill service-level agreements.

Additional benefits of hard partitions

- Improved system utilization through the ability to run multiple applications and/or different operating system images (including multiple OS versions) in multiple nPartitions within a single system. This enables the best use of computing resources while providing software fault and security isolation.
- Increased uptime by providing for complete electrical and software isolation. This ensures that applications continue to run when a different partition experiences hardware, software or maintenance downtime.
- Server consolidation by providing greater availability. Key to many consolidation efforts is the availability of the applications. By providing for electrical and software isolation, nPartitions enables these applications to be combined onto a single system.
- Independent resource controls for CPU, memory, I/O, and security in each partition.
- Ability to run multiple applications and/or different operating system images (including multiple OS versions) in multiple nPartitions within a single system, enabling the best use of computing resources while providing software fault and security isolation.
- Protection against software errors—a software error in one partition (for example, either an application or OS failure) will not bring down other partitions within the server.
- Protection against hardware errors in other nodes—a hardware error in a separate coherent node will not bring down a partition in any other node.
- Protection against hardware errors in the same node. Most hardware errors in the same node will not bring down a peer partition in the same node.

- Protection against downtime due to configuration changes in another partition—configuration changes in a different partition (such as online replacement or addition of a component, reboot, shutdown, and so on) will not affect other active partitions on the same or a different node.
- Development or test environments can be executed within an nPartition as opposed to a separate system, therefore reducing the requirement for hardware replication.
- Reliability and availability features:
  - Full memory chip "kill-like" protection (unique to HP).
  - Complete cache error protection (unique to HP).
  - I/O error isolation and recovery.

Integration capabilities

nPartitions provide support for vPars, psets, HP PRM, HP-UX WLM, and HP ServiceGuard. Moreover, owing to the fact that Superdome nPartitions are granular at the cell level and own dedicated CPU, memory, and I/O resources, there are no conflicts at the integration level either with other solutions within HP Partitioning Continuum or with HP Utility Pricing offerings (iCOD, Pay per Use and Pay per Forecast).

nPartitions and HP Serviceguard

HP Serviceguard provides high availability features in a multi-system environment. It ensures that critical applications are always available irrespective of system hardware, system software, and network or application failures.

HP Serviceguard will automatically fail over applications from a failed nPartition to an alternate nPartition as defined within the HP Serviceguard configuration.

nPartitions for the rp8400 and rp8410/7405

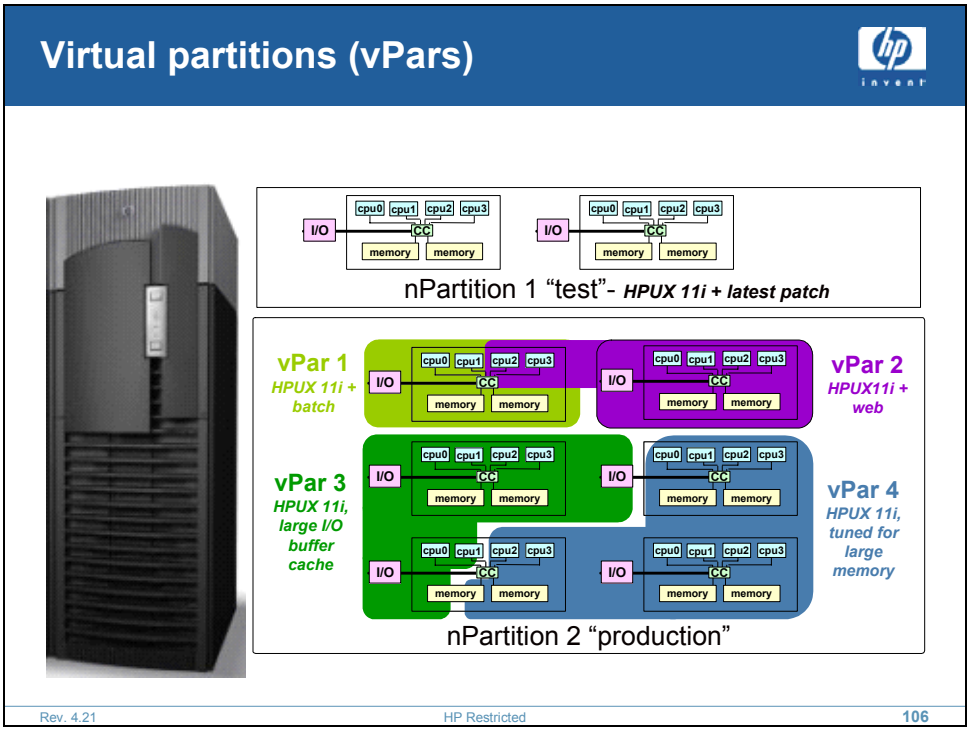
There is no flexibility to the resource splits between partitions listed below.

rp8400 Resource Split

	Cells (required)	I/O slots	Core I/O (required)	Disk/Media Bays	Optional Cells
Partition 0	Cell 0	8	1	2/1	Cell 2 and/or 3
Partition 1	Cell 1	8	1	2/1	Cell 2 and/or 3

rp7410/rp7405 Resource Split

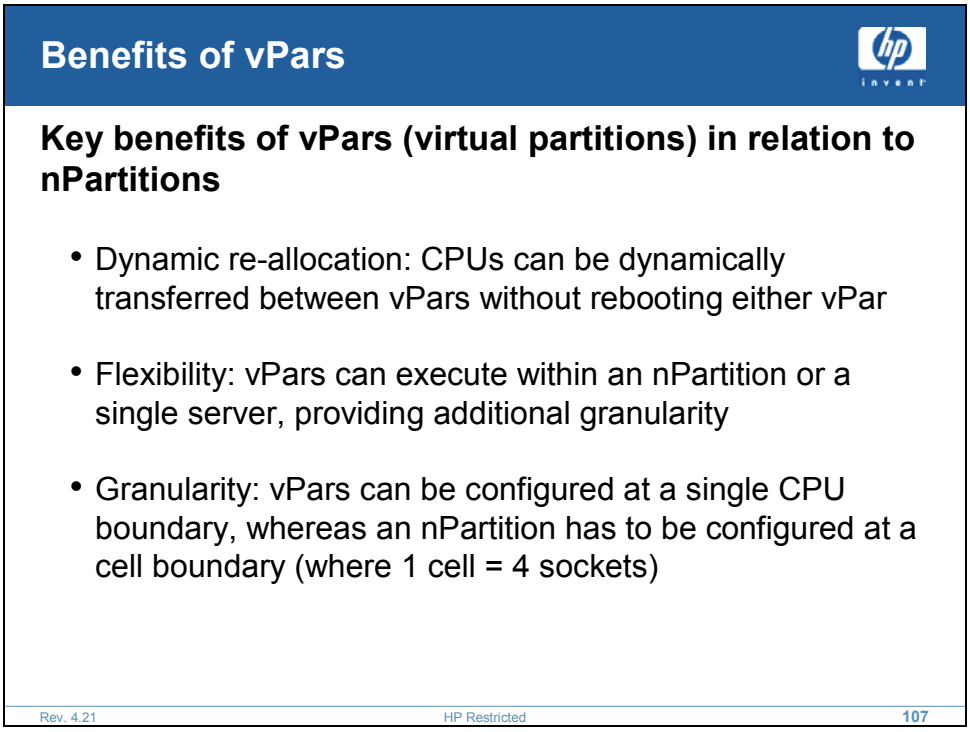
	Cells (required)	I/O slots	Core I/O (required)	Disk/Media Bays	Optional Cells
Partition 0	Cell 0	7	1	2/1	None
Partition 1	Cell 1	7	1	2/0	None



Virtual partitions (vPars)

Virtual partitions (within a hard partition)

- Each virtual partition runs its own image of the operating system (multiple OS images) and can fully host its own applications, offering complete software isolation.
- Dynamic CPU migration enable users to create, modify, or delete CPUs (without reboot) from one virtual partition to another without interrupting non-related partitions.
- Multiple vPars can function within an nPartition, providing CPU granularity.
- vPars provides greater flexibility and granularity while nPartitions provides greater fault isolation.
- The combination of both hard (nPars) and soft (vPars) partitions provides for the optimum availability and flexibility/manageability of key mission-critical servers.
  - vPars are used by Superdome and the rp8400 and is now available for the rp7400 and rp5400 series servers.



Benefits of vPars

A virtual partition (vPar) provides complete software fault isolation within a hard partition or an individual server. This means that any application or OS-related failure either impacts or can bring down only the partition in which it is executing—without having any effect on other virtual partitions executing on the same system.

Virtual partitions can even be used for testing new OS versions or applications without the necessity of replicating the deployment environment.

Primary reasons for using virtual partitions

Flexibility

- In the majority of systems consolidation initiatives, moving multiple users of different servers onto a single server tends to be the most complex part of the project, yet it yields the greatest return on investment.
- The challenge has always been tuning the OS to provide the best compromise for the most efficient execution of multiple applications, each having specific resource requirements. With HP-UX virtual partitions, multiple OS execution within a hard partition enables the allocation of dedicated resources per application within a single system.
- Moreover, resources within the partition can be dynamically created, allocated, modified, and deleted, each according to the specific needs of each application (OS version, kernel parameters, memory, etc.).

Availability

- Application software failures often impact other applications executing within the same OS, and, on occasion, may cause the OS to panic.
- The ability to minimize the effect of one application on other applications, within the same OS instance, is a critical factor when designing and configuring consolidated application environments.
- The implementation of virtual partitions limits the impact of application failures on overall availability. Virtual partitions enable complete application isolation, and even in the event of an OS panic, applications running in the other virtual partitions are not affected.

Capacity

- Due to the dynamic capabilities of virtual partitions, resources can be allocated and re-allocated according to the specific needs of any application executing within the hard partition.
- This functionality enables resources to be shared between applications according to peak workload requirements, without compromising performance, security, and availability.

Value proposition

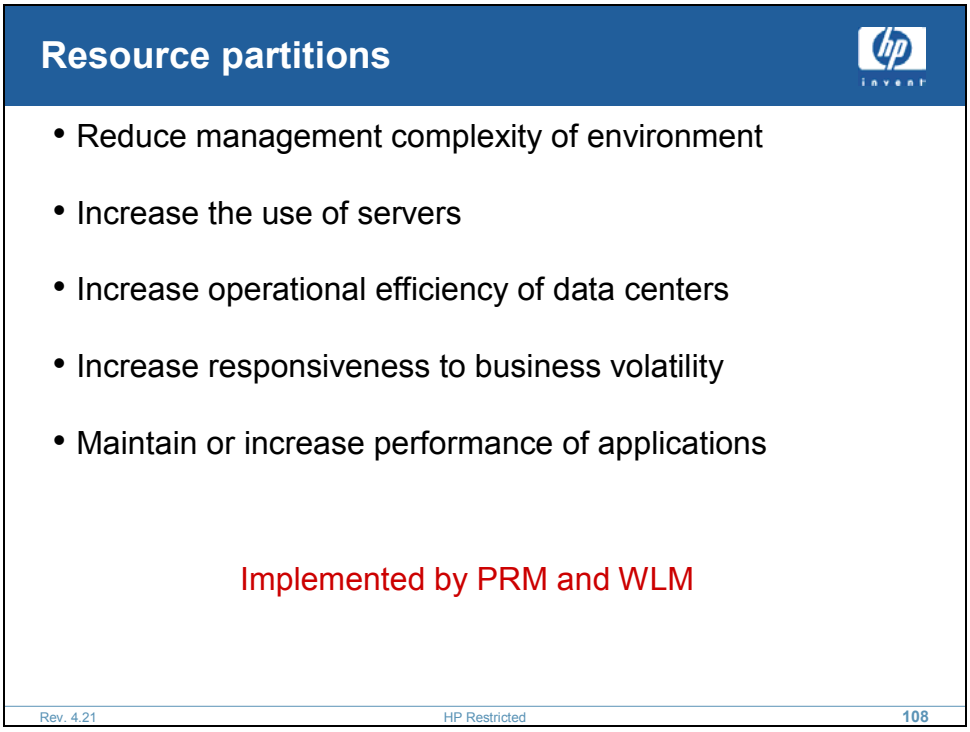
HP-UX vPars is a powerful, flexible tool, making it possible to consolidate multiple users or run multiple workloads—each with their own unique OS configuration requirements—simultaneously on a single server or within an nPartition. This ensures:

- Increased system utilization
  - Historically, servers have been dedicated to a specific application, resulting in the non-utilization of processing resources during non-peak times.
  - Owing to the dynamic resource allocation capabilities of vPars, dedicated resources can be allocated to a vPar according to a specific need.
  - A reboot is not required when adding or deleting CPU resources to a vPartition.
- OS and application isolation
  - In addition to specific OS versions and patch levels, the majority of applications require the OS to be tuned according to specific execution requirements. This has been a major obstacle to application stacking.
  - An application or OS failure may affect the entire system. With vPars, each partition runs a copy of the OS, enabling a single server to run multiple OS revisions. Each OS instance is isolated from all others, so in the event of an OS panic within one vPar, applications executing in other vPars are not affected.

- The implementation of vPars allows applications to exploit new OS features without having to wait for all system applications to be ported to the same OS version.
- vPars can be used for testing new versions of the OS or application without having to replicate the deployment environment. Future plans include the support of HP-UX, Linux, and Microsoft Windows vPars within a single Itanium-based system.

■ Security

- Each application executing in a vPar accesses the resources assigned to that vPar.
- Because all communication between vPars within the same system occurs via the LAN, each of the OS and executing applications within the vPar is isolated according to the security policies applied for that vPar. This provides the level of security required by customers of xSPs.
- However, as previously mentioned, the root user is able to access and reconfigure all vPars executing within a single server or hard partition.



Resource partitions

Overview

Resource partitions may be run within hard partitions or virtual partitions (one operation system image) and are controlled by resource management tools, such as HP PRM and HP-UX WLM. They enable dynamic and goal-based resource management, respectively.

- They enable dynamic resource allocation by allowing users to create resource partitions for applications that need guaranteed dedicated resources such as CPU, memory or disk I/O.
- The HP “resource” partitions within the partitioning continuum include HP Process Resource Manager and processor sets (psets). The psets do not compete with PRM, but rather enhance the functionality of PRM by providing a dedicated set of processor resources for a specific set of applications.

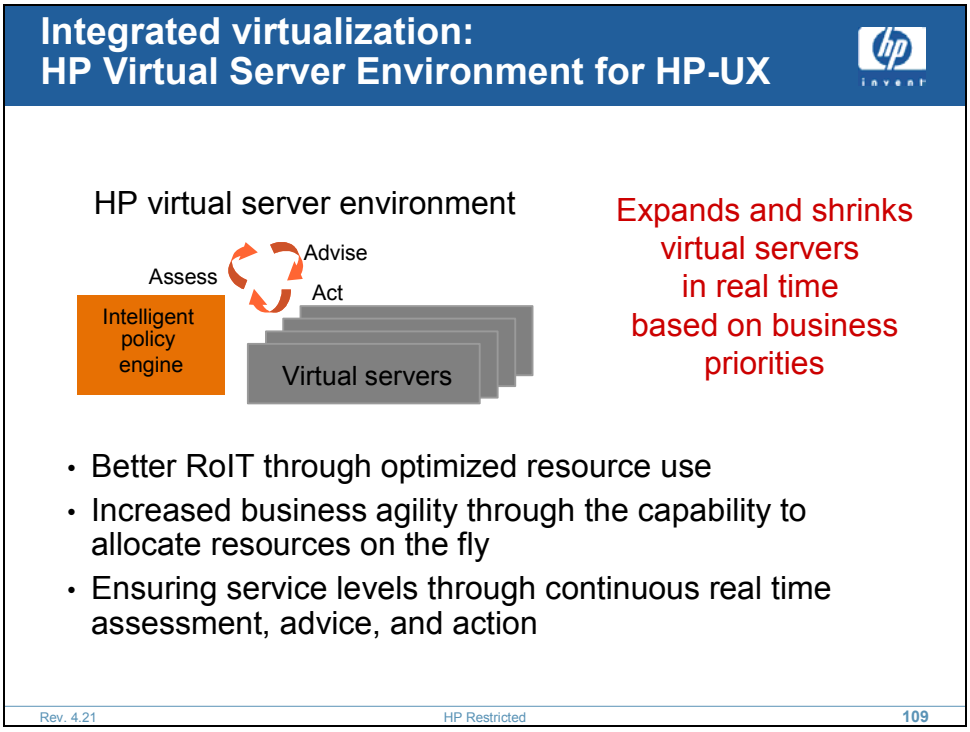
These solutions allow you to distribute system resources among different workloads on a single system or a single OS instance.

- HP PRM and HP-UX WLM are compatible with HP-UX Virtual Partitions, providing an additional degree of flexibility and control within a virtual partition.
- Within each virtual partition, up to 64 resource partitions can be created and utilized using solutions such as HP Process Resource Manager (PRM) and HP-UX Workload Manager (WLM).

Process Resource Manager (PRM)

- PRM allocates CPU, memory, and disk I/O resources to applications and/or users within a single OS instance. This guarantees a specified amount of resources to each application or user while allowing multiple applications to run in each vPar, increasing overall system utilization.
- The PRM allocations can be changed without rebooting the vPar.
  - For instance, a single OS instance can have two applications running, such as a sales application and a marketing application.

The sales application could be assigned 60% of the CPU resources in a vPar and the marketing application could be assigned 40% of the CPU resources in the vPar.

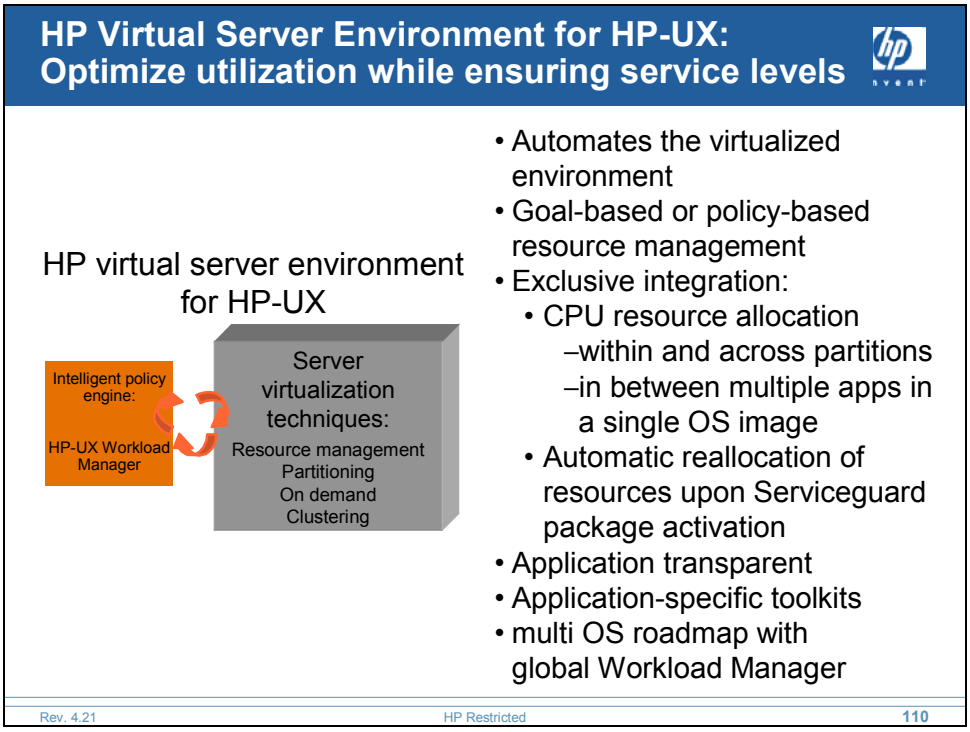


Integrated virtualization: HP Virtual Server Environment for HP-UX

HP Virtual Server Environment delivers dynamically sized virtual servers where each server intelligently grows or shrinks in size based on business priorities and service level objectives (SLOs). At the heart of the Virtual Server Environment is the intelligent policy engine, HP-UX Workload Manager, which performs real time assessment of the resource utilization, and then advises and acts in accordance with the preset SLOs and business priorities.

HP is the only UNIX vendor in the industry that offers this environment with HP-UX Workload. HP Virtual Server Environment:

- Addresses the key challenges customers face with their IT infrastructure:
- Has better return on IT investments through optimized server utilization
- Provides increased agility through the capability to allocate resources on the fly
- Gives highest quality of service through continuous real time assessment, advice, and action



HP Virtual Server Environment for HP-UX: Optimize utilization while ensuring service levels

As mentioned - at the heart of the Virtual Server Environment is the intelligent policy engine, HP-UX Workload Manager, which orchestrates the virtualized server resources.

To form the Virtual Server Environment HP-UX Workload Manager integrates with virtualization offerings such as resource management groups, partitioning, capacity on demand, and clustering. Within this environment the resource is either moved to the application or the application is moved to the resource.

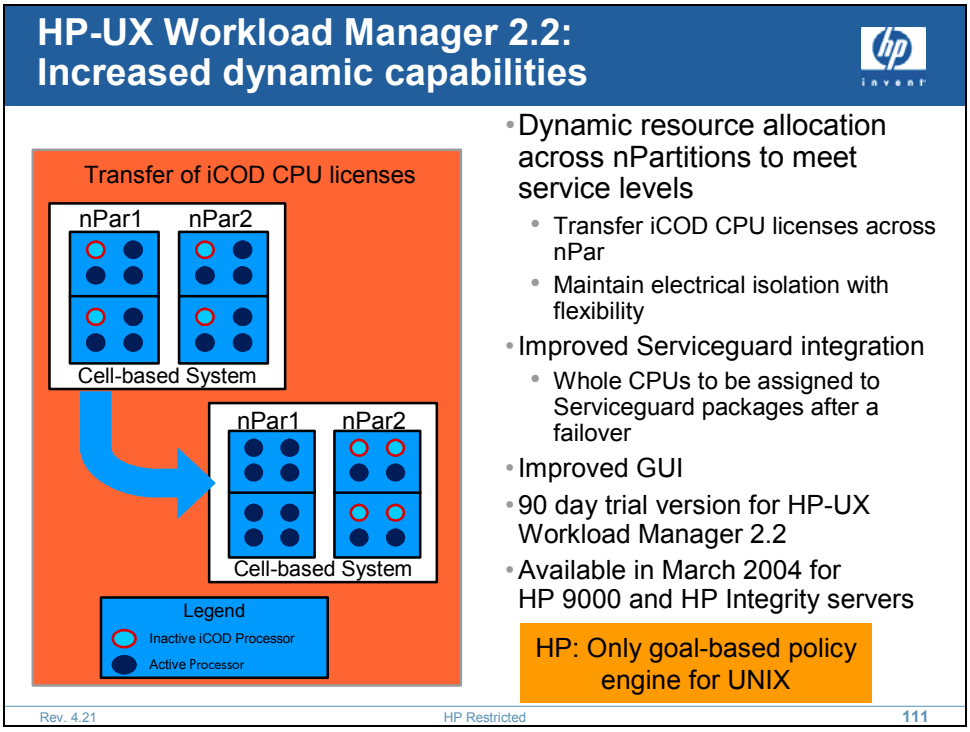
Resource Management groups form the smallest control point, which could be as small as a percent of a CPU, which is then accordingly allocated to a specific application.

HP-UX WLM integrates with partitions, for example HP-UX WLM can move 1 CPU from one virtual partition to another based on business priorities.

It integrates with Capacity on Demand and can turn on and off iCOD CPUs as needed to optimize resource usage and costs at the same time.

In a clustered environment the application can move from one server to another and HP-UX WLM flexes the resources to guarantee the right resources for the moved application based on the SLOs.

The power of HP's strategy lies in the integration of virtualization solutions, controlled by automated intelligent management software, to present a coherent, yet flexible, adaptive computing environment.

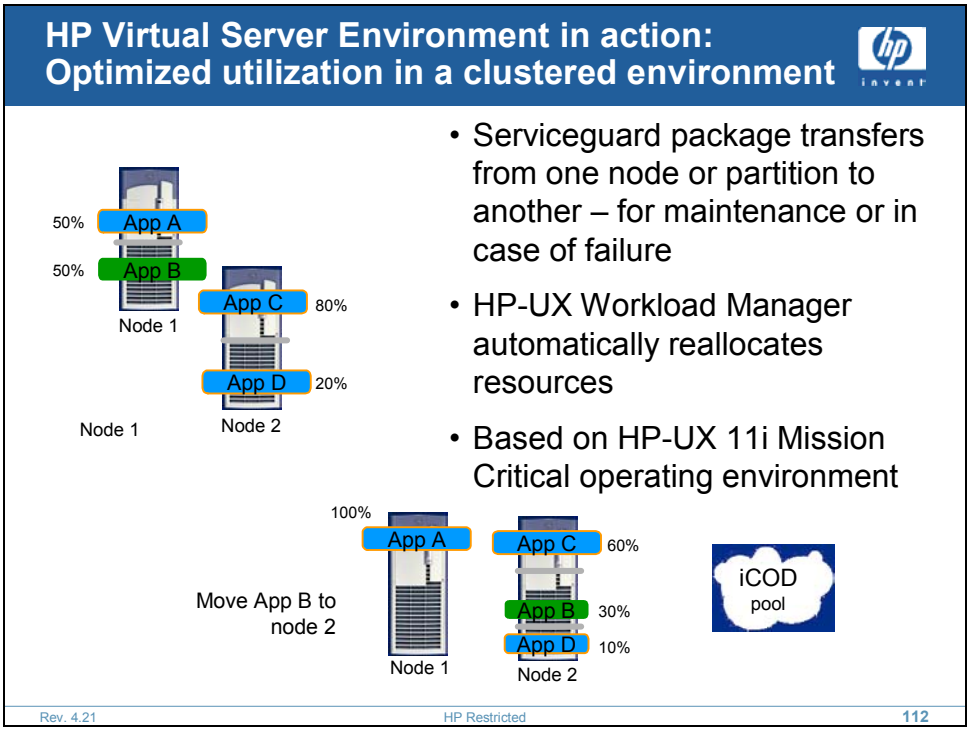


HP-UX Workload Manager 2.2: Increased dynamic capabilities

HP-UX WLM 2.2 capitalizes on the success of our WLM capabilities offered for years. The latest version today offers several enhancements for our customers:

- Automatically (without user intervention) and dynamically (without rebooting) move iCOD CPU licenses between nPars (this is shown on the pictorial example on the left)
- Improved Serviceguard integration allows whole, individual, dedicated CPUs to be assigned to Serviceguard packages after a failover
- Improved GUI
  - remote monitoring
  - complete creation and editing of configuration files
  - monitor changes in real time
- 90 day trial version of WLM 2.2

Available March 2004 on both HP9000 and HP Integrity (Itanium) servers



HP Virtual Server Environment in action: Optimized utilization in a clustered environment

The integration with Workload Manager provides resizing on-the-fly to your clustered environment. WLM dynamically allocates system resources to your most mission critical applications post-failure to ensure that your Service Level Agreements are maintained.

In this example, SAP running in Node 1 fails over to node 2. WLM detects that SAP is the most mission critical application in Node 2 and allocates the greater percentage of system resources to run SAP and accordingly adjust the resources for the other applications, keeping them all up and running.

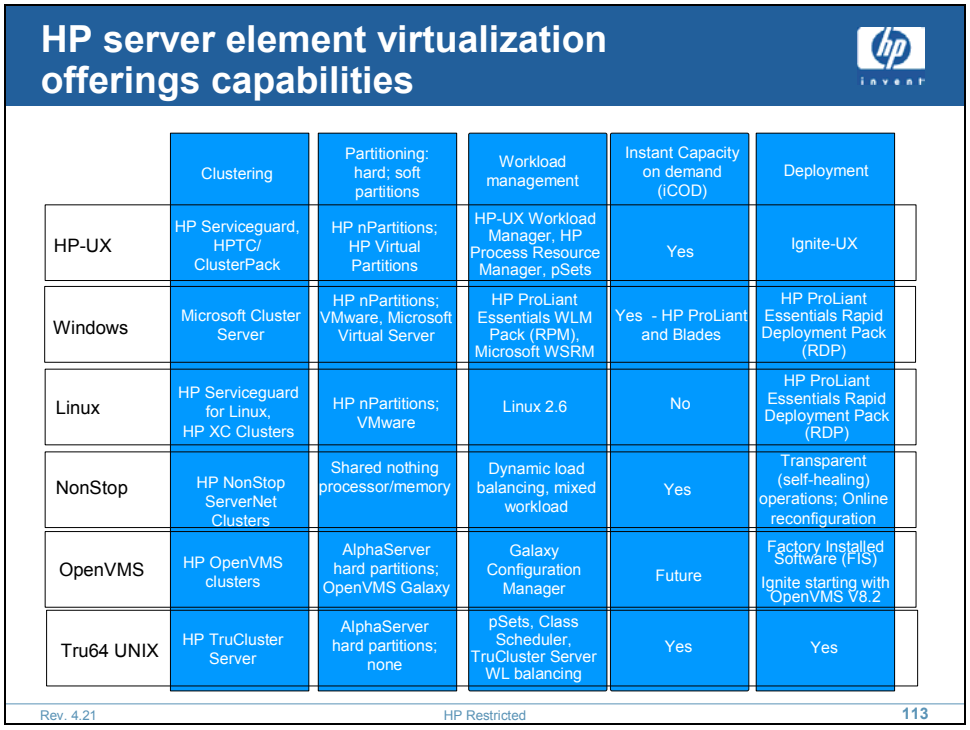
If WLM requires additional resources to maintain service levels, it communicates the need to iCOD monitoring software, which instantly activates additional server CPUs.

It is important to note that the percentages of CPU resources that are assigned to each workload are on outcome of the previously defined goals and priorities

Examples of predefined goals are:

- Fixed policy: for example hard code percentages
- Time-based: for example more resources added after 7am
- Condition-based: for example if a Serviceguard failover has occurred, application ‘A’ gets more resources
- Usage based policy: for example if a workload exceeds a predefined threshold it automatically get more resources

- True goals-based – based on any machine readable metric: for example query response times; number of users; queue length, number of free threads, and so forth.
- Any and all combinations of the above!!



HP server element virtualization offerings capabilities

Virtualization solutions for HP

Key benefits

By taking advantage of virtualization, HP customers are:

- Saving on cost of ownership — Decreased hardware, software, management and environmental costs through server consolidation
- Maximizing performance — Customers have reported higher level of utilization with smaller sets of larger machines
- Optimizing availability — High availability comes from three factors:
  - It is easier to manage a fewer number of machines
  - Larger servers are designed with high availability in mind
  - Availability is increased due to operating system and application isolation
- Enhancing flexibility — Partitioning provides the ability to expand and contract how resources are used based on demands

Competition

None of HP's competitors offer as complete a partitioning story.

- IBM only offers LPars (similar to vPars), which does not offer the hardware/electrical isolation that nPars offer.
- Sun only has a hard partitioning offering. While Sun's offering is dynamic, it does not offer the granularity of HP vPars.

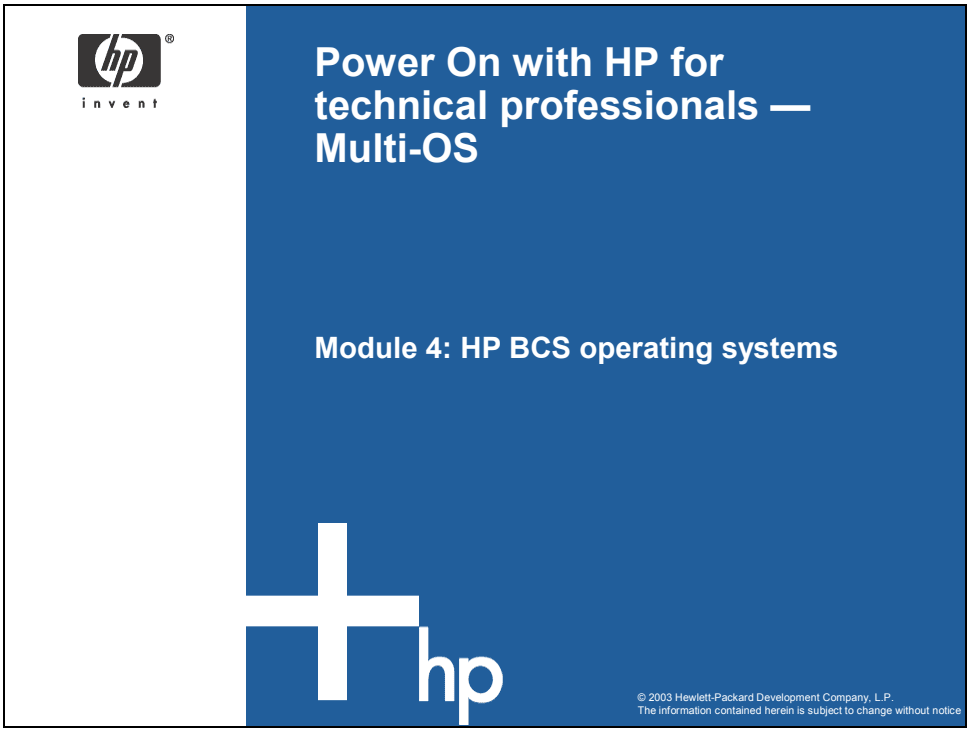
Summary

- HP PA-RISC servers overview and architecture
- HP Itanium servers overview and architecture
- HP NonStop servers overview

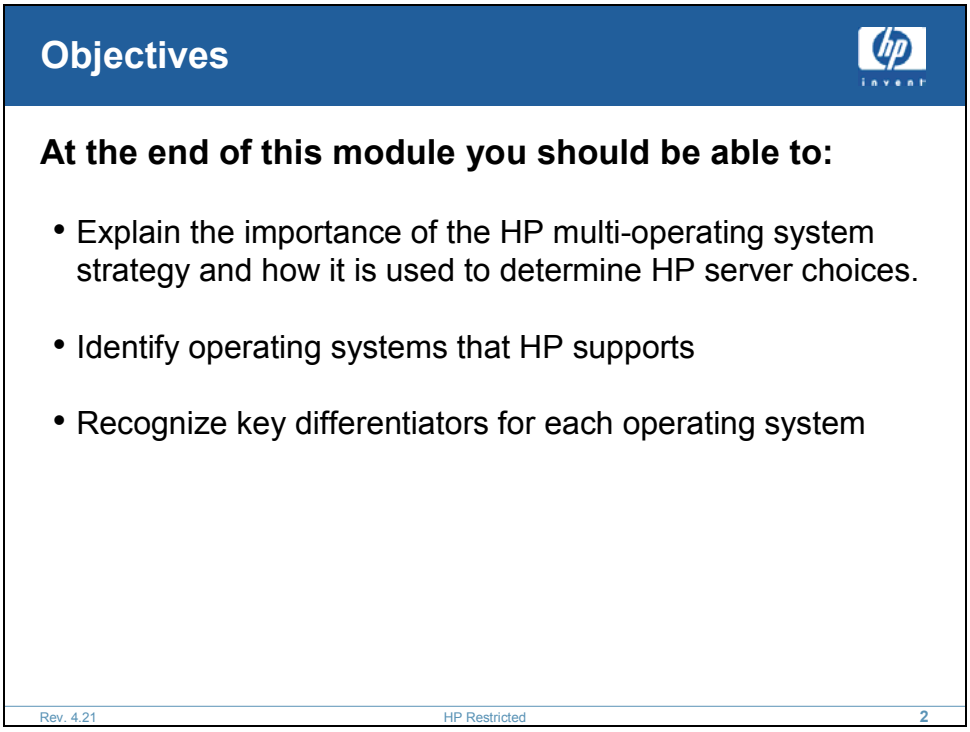
Rev. 4.21 HP Restricted 114

Summary

OPERATING SYSTEMS



HP BCS operating systems



Objectives

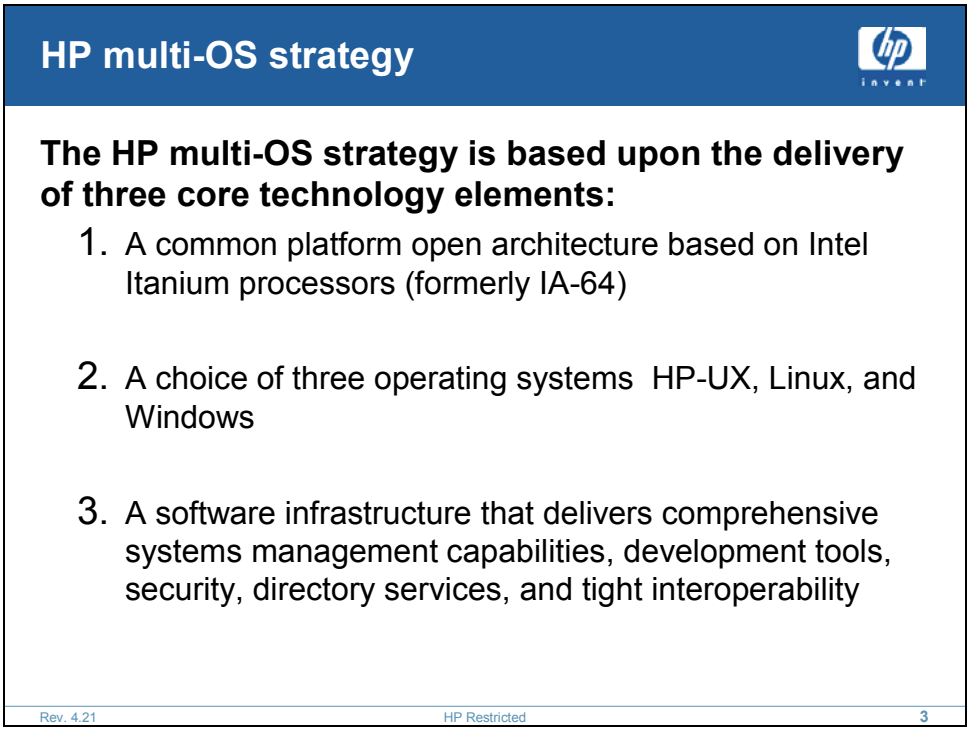
"Internet-enabled businesses are characterized by 1) rapid market changes, 2) quickly evolving customer needs, and 3) increasing demands on information technology (IT) infrastructures. The IT infrastructures of many organizations require the integration of multiple applications and data across a spectrum of server operating system platforms.

For many years now, IT buyers have been challenged with implementing a diverse set of best-of-breed hardware and software components in an effort to build a computing infrastructure that could serve their business needs. Employing a heterogeneous computing infrastructure introduced various complexities that required expert professional services to deploy and to maintain escalating costs even further. HP's multi-OS strategy promises to satisfy today's complex enterprise computing requirements while delivering high value through the tight integration of a software infrastructure designed for a common industry standard architecture."

-HP Multi-Operating System Strategy,
An Executive White Paper,
Aberdeen Group

Agenda

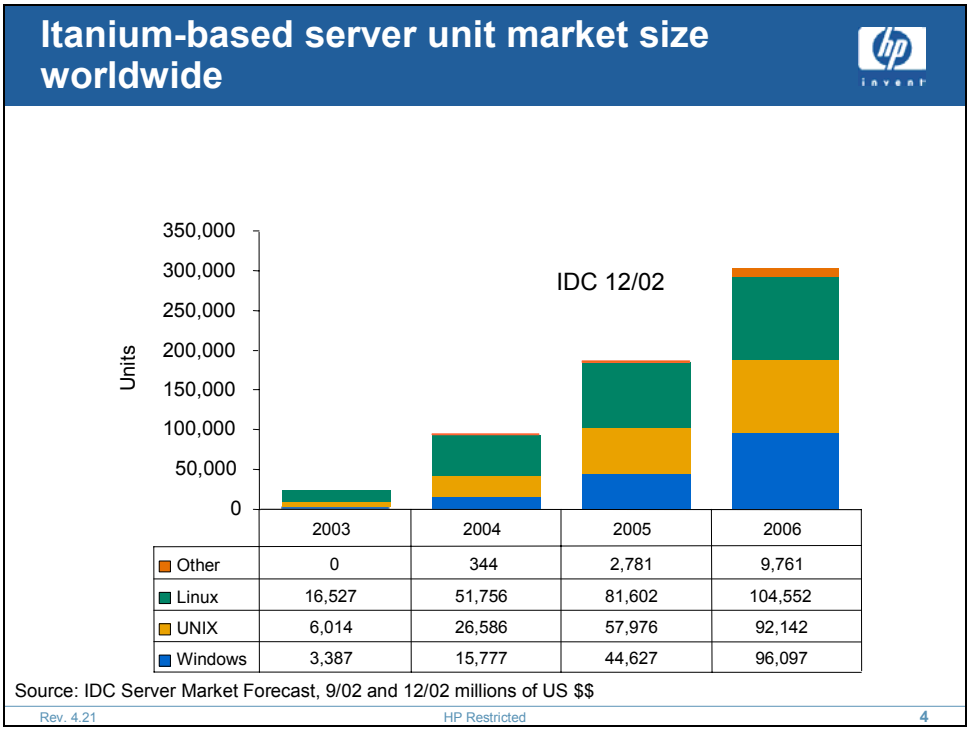
- Strategy
- HP-UX
- Windows
- Linux
- OpenVMS
- NSK



HP multi-OS strategy

"HPs strategy is very simple — buy an Itanium server and run any of three leading industry operating systems: HP-UX, Linux, or Windows. While this is an over-simplification of HPs multi-OS strategy, for the prospective IT buyer, it overcomes many of the past complexities and challenges associated with deploying and maintaining a heterogeneous operating environment HP."

-HP Multi-Operating System Strategy,
Aberdeen Group



Itanium-based server unit market size worldwide

HP — Committed to our customer's success

An enterprise's business needs are significant. They include:

- Headroom to grow without retooling technology infrastructures
- Investment protections for business processes, infrastructure, and skills
- Flexibility to handle rapidly changing application needs and often unpredictable workloads

Robustness to provide continuous availability of increasingly critical business processes

- Risk reduction and economies of scale offered through delivery of standards-based open computing environments
- Ability to incorporate beneficial new technologies with minimal disruption to existing infrastructure

HP has responded to these business requirements with a Multi-OS strategy built around the Intel Processor Family. The HP strategy is designed to enable customers to select the appropriate technologies for their unique businesses without compromising business flexibility and to adapt to technological changes without re-inventing their business processes.

Positioning

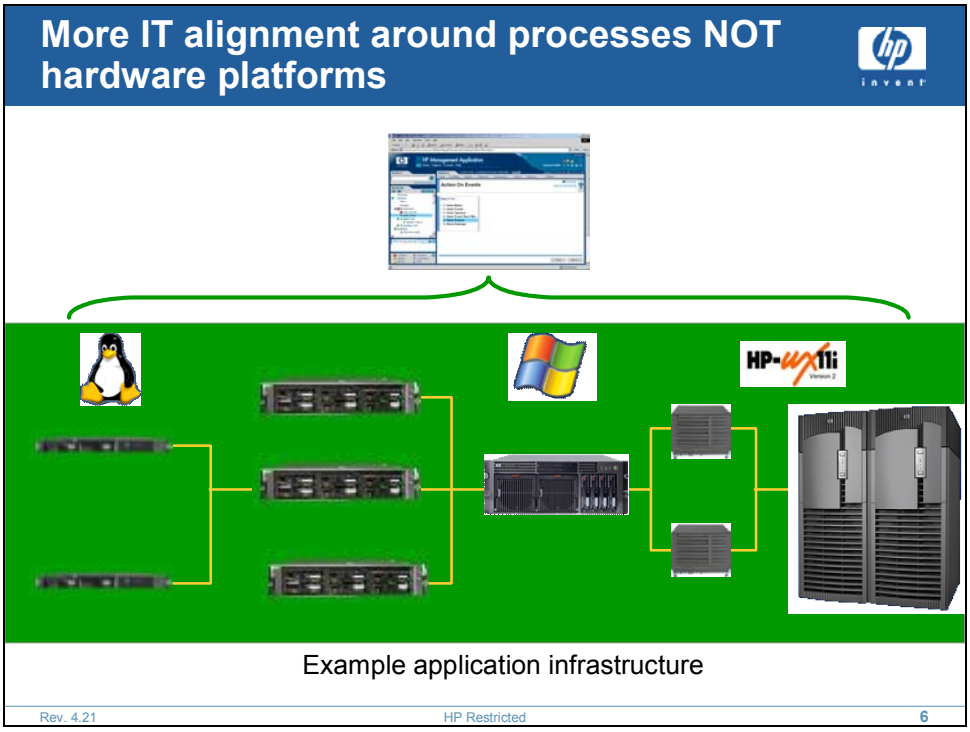
Because HP supports multiple OSs on the Itanium-based servers, how does HP position HP-UX, Windows, and Linux for customers?

In most cases, customers approach HP with a preference for application and operating environment. In cases where a customer seeks guidance from HP, we assess the customer's unique business problem both immediate and future to help them decide which operating environment is the best fit. We find that, in general, Itanium-based servers improve current Windows and Linux solution performance by overcoming IA-32 architecture limitations, enabling growth of these operating environments. For HP-UX environments, Itanium 2 processors allow customers to smoothly evolve to the most future-proof platform in the market by delivering superior performance, fiercely competitive prices that are enabled with industry standard technologies, and the longest life cycle on the market.

What is the value for the customer of the HP multi-OS strategy on Itanium-based servers?

HP enables IT agility by delivering Itanium-based server advantages such as:

- Ability to deploy a single server architecture in the datacenter, regardless of operating environment. Infrastructure consistency on one Intel based standard infrastructure.
- Ability to re-deploy the server hardware to different operating environments. Example: Think about a big retailer who wants to deploy HP-UX now but also would like to be poised for a move to Linux in the future. The last thing that an enterprise like this wants is to travel to potentially thousands of sites to swap hardware as their operating environment migrates.
- Ability to make progressive migrations without being hostage to a complete hardware replacement. Example: Some of the spare capacity can be re-used more easily.



Operating systems for all application environments

Managing the multi-OS environment

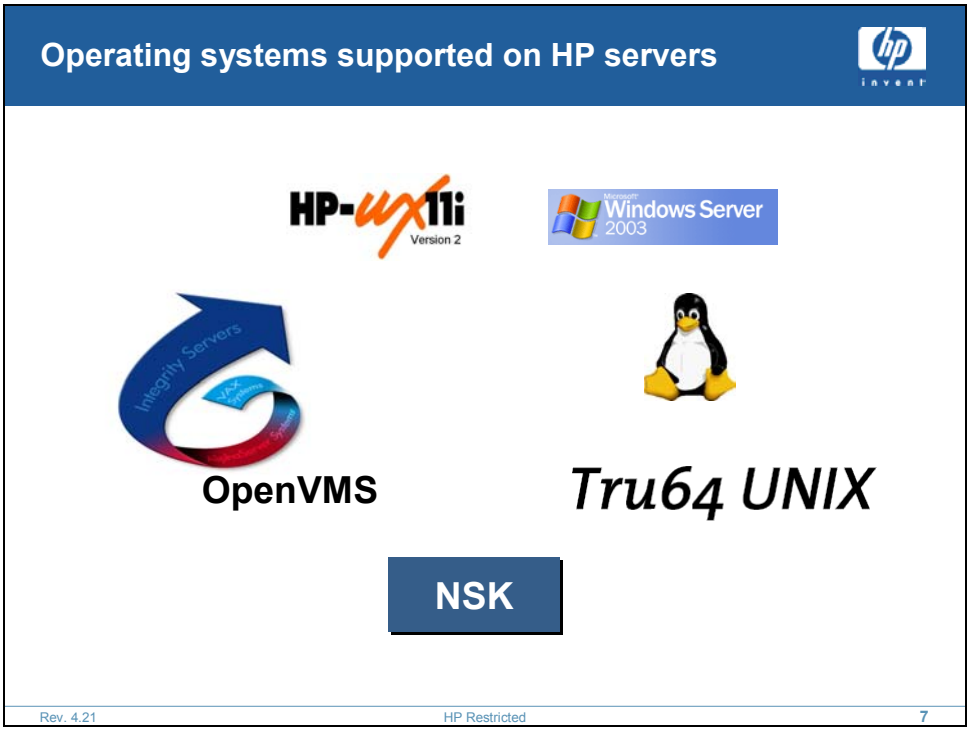
HP assists the IT department by providing a common hardware management application, HP Systems Insight Manager. This software allows IT managers to manage the hardware hosting complex client-server applications, such as SAP, as an integrated environment. This provides more options to better use computing and IT resources, reduce costs associates with separate parallel data center environments and improve communication and coordination. This is a key need for an environment to be defined as “integrated”

Applications such as SAP and PeopleSoft have moved from single operating system solutions to a multi-OS architecture that uses the strength of each to provide a robust and flexible solution.

- On the front end: Web servers running Linux providing access to customers and outside clients via the internet.
- Internal client: Microsoft Windows based client applications for access within the company.
- On the back end: Large databases require robust performance so UNIX
- Servers are deployed to support this segment.

Companies should look at how they manage this environment, as separated datacenters aligned around the operating system or as an integrated application based IT infrastructure.

HP Systems Insight Manager is enabling customers to optimize management for specific processes across platforms.



Operating systems supported on HP servers

HP plans to maintain market leadership with three strategic operating systems:

- HP-UX with the best of Tru64 UNIX (TruCluster and AdvFS)
- Linux
- Windows Server 2003 64-bit editions

Each operating environment enables different levels of availability, scalability, performance, and reliability. Below is a brief summary of the key characteristics of each operating system.

HP-UX 11i

As HP moves forward with the Itanium architecture, four major operating systems—HP-UX, OpenVMS, Windows, and Linux—will be integrated in different ways.

- HP-UX 11i is physically different but functionally equivalent to the PA-RISC and Itanium processor family architectures.
- There are some differences between HP-UX 11i on PA-RISC and HP-UX 11i v2 for the Itanium processor family to take advantage of or compliment the system design and architecture.
  - For example, HP-UX 11i v2 for the Itanium processor family contains the Aries dynamic code translation technology so that it can execute PA-RISC binaries without modification or recompilation. In addition, version 2 has the advanced encryption/decryption engine and libraries for ultra fast security operations.

- The biggest difference is that HP-UX 11i v2 does not yet have the vPar technology that HP-UX 11i for PA-RISC has, although there are plans to add this technology in a 2004/2005 timeframe. However, version 2 does have the nPar, or node partition, technology, and the tools to be able to manage hard partitions. HP Partition Manager can manage HP-UX 11i v2, Linux, and Windows running in separate hard partitions.

OpenVMS

OpenVMS is mature, robust, highly available and disaster tolerant, general-purpose operating environment. It was developed by DEC for the VAX hardware platform in the 1970s and has been continually improved since then. In 1992 it was ported to AlphaServer systems.

OpenVMS is a world-class high-integrity, distributed operating system. It was designed with high-integrity benefits, high availability, data integrity, recoverability, transaction processing, system management, and security features built in.

- OpenVMS is being ported to Itanium, thus providing a stable and long-term path for customers.
  - Release 8.1 is supported directly by engineering for 5-10 preselected strategic ISVs. These partners provide applications to a significant portion of the OpenVMS customer base. We are still evaluating other distribution strategies for 8.0.
  - Release 8.1 is for Itanium-based rx2600 and rx5620 systems and will be released toward the end of the calendar year 2003. This will be a supported early adopters' kit for a larger number of strategic partners and customers to expand the number of applications ported to Itanium.
  - Release 8.2 will be the first production release and is scheduled for 2004.

We are also working very closely with our ISV software partners and our goal is to have 100% of our existing partners port to Itanium.

- We are committed to enabling customers to move on their own schedule and to make the transition as seamless as possible.
  - Existing OpenVMS applications will run on the new servers with little or no modification.
  - To help facilitate this, we will provide source compatibility for OpenVMS applications, and, where sources are not available, binary compatibility as well.

NonStop Kernel (NSK)

Allows for optimized and highly integrated systems that enable an order of magnitude higher availability and scalability that general-purpose servers.

Currently runs on MIPS processors but will evolve to Itanium around 2005.

- Continuous end-to-end availability
- Scalability of multiple dimensions—processors, databases, and software
- ZLE (Zero Latency Enterprise) available for real-time integration of enterprise services and data
- Extreme manageability
- High performance through parallelism
- High reliability—no single point of failure

Linux

Linux is a complete operating system, including a graphical user interface, with components usually found in a comprehensive UNIX system.

Linux is available for Alpha, Itanium, and Intel IA-32 systems.

- Unlike other proprietary systems, Linux is publicly open and extendible by contributors
- It conforms to the POSIX standard user and programming interfaces enabling developers to write programs that can be ported to other operating systems
- It is complimentary to UNIX and has high-availability capabilities with HP's own Serviceguard for Linux product
- HP maintains the Linux kernel for Itanium-based systems

Windows Server 2003

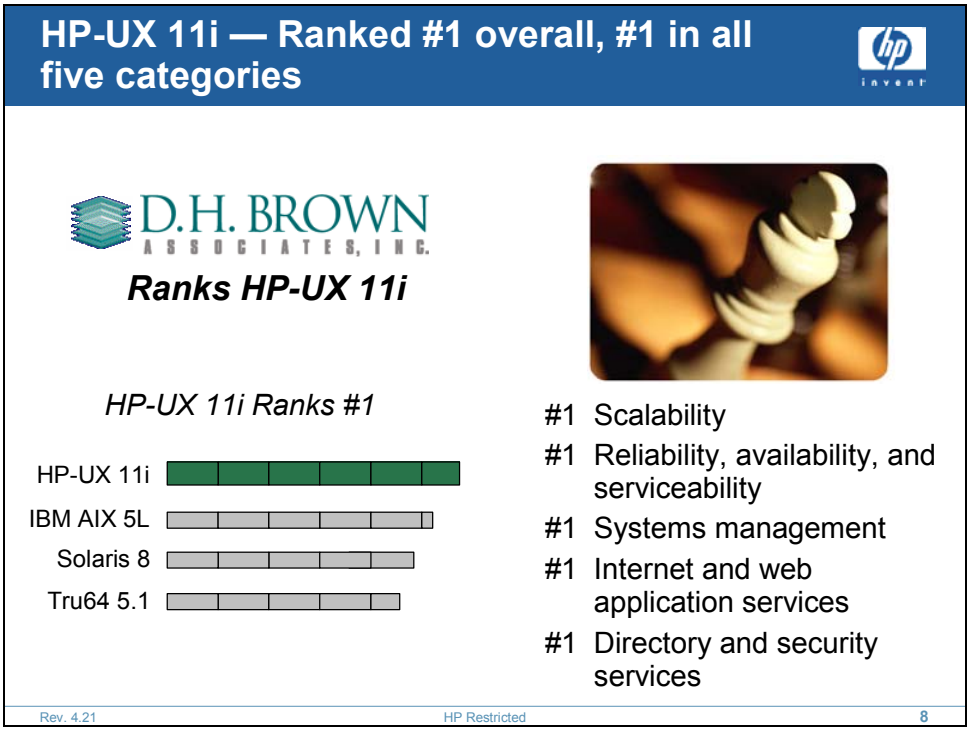
Windows Server 2003 is designed to appeal to small businesses and professional users as well as to the more technical and larger business market.

- It provides up to 64-way SMP and up to 512GB of physical memory
- Advanced functions provide clustering and load balancing
- It promotes high speed computations and large databases using MS SQLServer 2000 Enterprise Edition, 64-bit and Oracle 9i RAC
- It has the capability for virtual private networks to give users access to shared files from any network computer

Tru64 UNIX

Tru64 UNIX is a robust 64-bit production-proven operating system with high availability built in. Tru64 UNIX has:

- High-availability solution
- System, file, and storage management capabilities
- Clustering with TruCluster Server software
- Applications support
- Interoperability with Windows NT
- High performance computing market including e-business technologies



HP-UX11i — Ranked #1 overall, #1 in all five categories

"Clearly reflecting HP's increased investment in its UNIX product line, HP-UX moves to the head of the class for UNIX operating systems functions. HP-UX occupies the top spot in every studied category, with a particularly strong lead in Internet and web application services, and an impressive surge forward in the intensely competitive RAS category."

Quote Attributed to D.H. Brown Associates

Reasoning Inc. announces annual Code Quality winners

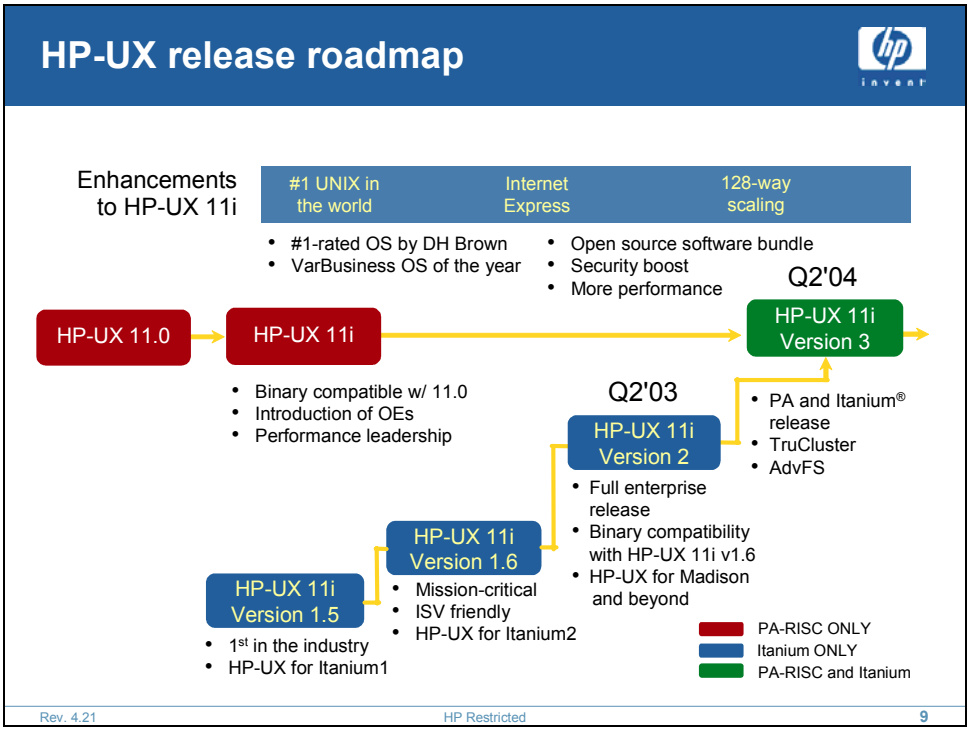
"Reasoning Inc., the leading provider of automated software inspection services, today announced the winners of its 2002 Code Quality Award. The award is given to organizations that have demonstrated a strong dedication and commitment to producing high-quality software, as proven by an extremely low defect rate.

Reasoning singled out companies with a code defect density, or average level of defects per line of code, of .31 defects per thousand. In comparison, the average level of defect density for all the software of companies Reasoning inspected in 2002 was .71 defects per thousand lines of code.

A total of 10 companies received the award, including, in alphabetical order: Baxter International, Gambro AB (a Stockholm-based dialysis and blood bank technology provider); HP; Hitachi, Ltd; IBM Corporation, NASA, and Rockwell Collins. Three other companies, who wished to remain unnamed for competitive reasons, were also given the award."

Quote from Reasoning, Inc., 15 May 2003 Press Release

URL: http://www.reasoning.com/news/pr/05_15_03.html



HP-UX release roadmap

Transition path to Itanium

HP offers the best transition path to Itanium in the industry. HP-UX 11i on Itanium is based on the mature and robust code stream of HP-UX 11i on PA-RISC, a code stream that has been commercially viable for over 4 years. And by using the HP Aries dynamic code translation technology, corporate IT is assured of binary compatibility between 32-bit and 64-bit PA-RISC applications running on HP Integrity systems. With the HP Aries technology, corporate IT can operate a mix of applications based on PA-RISC executables and IPF executables. This means that corporate IT does not need to port the entire application stack to native IPF, but can mix-and-match applications to suite their business needs. Later, applications can be ported over to native IPF executables when it makes business sense to do so.

Application availability

Itanium processor family acceptance in corporate IT requires ISV (independent software vendor) applications availability. In this area, HP-UX 11i v2 offers full binary compatibility with the Aries Technology and full source and data compatibility. Many vendors are available on version 2 with a native version of their applications including Oracle and BEA. This number is growing every day.

For the most up-to-date information on which applications are available on HP Integrity servers see http://www.hp.com/products1/itanium/partners/index.html.

The corporate IT infrastructure consists of five tiers:

1. Front-end access services such as routers
2. Commodity web services such as firewalls and caching applications
3. Applications services such as file and print sharing services
4. Enterprise applications such as ERP (enterprise requirements planning)
5. The enterprise data center with mission-critical databases

The data center is controlled by the availability and performance of the database and the applications that service the database. After Itanium is established at the enterprise data center, the Itanium processor family will be the key component in the e-business infrastructure build-out. Itanium can only get there with HP-UX 11i and the applications that run on it.

Which servers support HP-UX 11i?

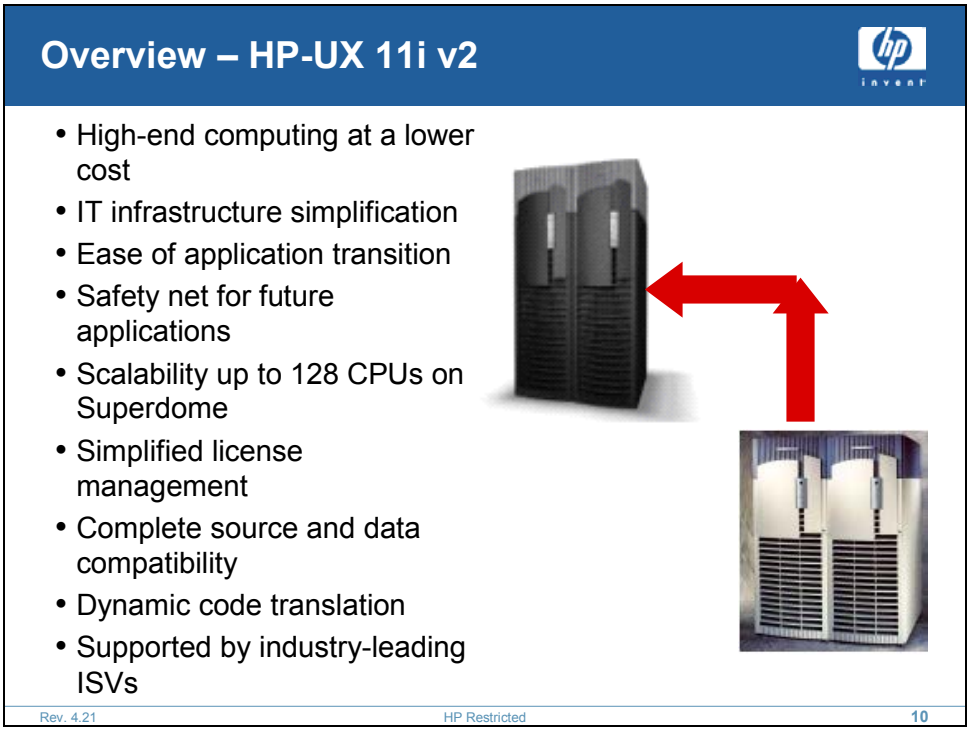
HP-UX 11i supports two industry-leading architectures—PA-RISC and the Intel Itanium architecture.

PA-RISC is a UNIX workhorse that handles heavy mission-critical processing loads. PA-RISC servers are:

- Entry-level servers — HP servers rp3410, rp3440, rp4440, rp5405, rp5430, and rp5470
- Mid-range servers — HP servers rp7420 and rp8420
- High-end server — HP Superdome

The Intel Itanium architecture jointly developed by HP and Intel promises new levels of performance and value. It features explicit parallel execution to derive the best possible performance from the steadily increasing number of components in today’s microprocessors. Itanium-based servers are:

- HP Integrity rx2600
- HP Integrity rx5670
- HP Integrity rx7620
- HP Integrity rx8620
- HP Integrity Superdome



Overview — HP-UX 11i v2

Scalability

HP-UX v2 provides the best Itanium scalability in the industry; HP-UX v2 provides 64-way scalability on the 64-way capable Superdome server and will support 128-way scalability on the future 128-way Superdome (2 processors per socket. HP-UX 11i v2 supports only Itanium processors, and HP-UX 11i 1.0 supports only PA-RISC processors. Also HP-UX 11i includes the industry's best networking solutions on Itanium, with software support of hardware networking link speeds at first shipments. HP-UX 11i v2 includes IP drivers, minimum latencies, and gigabit Ethernet performance.

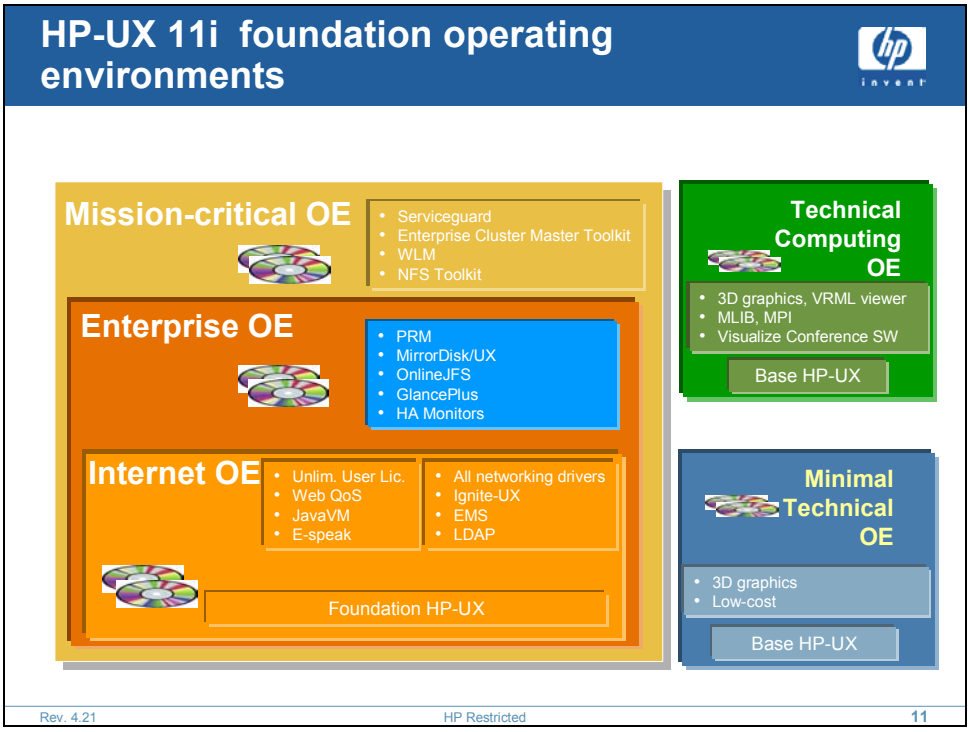
Manageability

The leadership goes beyond performance and scalability. HP-UX 11i v2 offers the industry's best single system HA, as HP-UX 11i v2 supports both memory resiliency and double the number of kernel tunables available on HP-UX 11i for PA-RISC. HP-UX 11i offers the most complete system management capabilities for Itanium, including Ignite-UX (automatic distribution of operating system updates over a network), Software Distributor/UX (automatic distribution of layered software product updates over a network), System Administration Manager (SAM) and On-line JFS (Journaled File System). Finally, HP also offers HP OpenView (enterprise systems management) and Serviceguard (clustered fail-over) on Itanium platforms.

For more information:

HP-UX 11i v2 technical overview white paper:
http://www.hp.com/products1/unix/operating/infolibrary/whitepapers/7207_11i_overview_wp_051403.pdf

ESP Keyword: HPUXINDEX



HP-UX 11i foundation operating environments

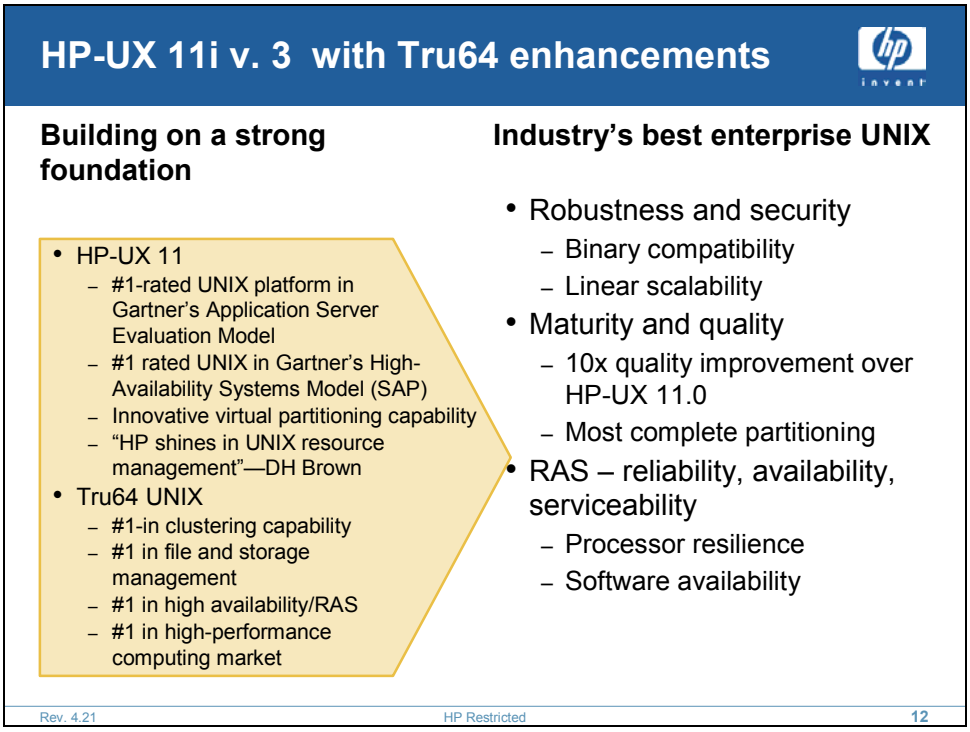
HP created a concept called OEs (operating environments), which extends value to our customers by delivering more than just the operating system. The integration testing, validation, optimization, manageability, security, and availability stack is a fairly complex process for customers to sort through. We have packaged security, manageability, availability, and functionality into a choice of three operating environments. So what it basically gives the customer is a single-point, single-installation, highly optimized environment enabling rapid deployment with all of the capabilities that customers need.

HP-UX 11i is recognized as the most secure commercial UNIX operating system available. The new Install Time Security (ITS) provides the system administrator preconfigured security alternatives and makes HP-UX much more secure out-of-the-box when the administrator selects higher security levels. HP-UX Bastille is now included in the HP-UX 11i v2 operating environments. Customers can use Bastille to create a custom security configuration post-install by running Bastille's interactive "security interview," and then optionally create security-configured golden images using Ignite-UX.

- Scalability is a key feature of HP-UX 11i beyond just SMP (up to 64-way) and performance, which delivers linear or near-linear performance, depending on workload, with increasing numbers of processors.
- In terms of quality, we have done research into defects and patches to our operating system versus Solaris, and we compare very favorably. Obviously, patches and defects are a disruption to a customer's environment, so it is an important indicator of quality.

- We also compared the number of bugs and other issues against ourselves to see if we are getting better. And in this case, we have seen a 10x improvement over HP-UX 11.0, which was very reliable in its own right.

From a Linux perspective, our focus on the development environment has really paid off for customers. We invested heavily to provide customers with all the tools to develop on Linux and deploy on a more production capable HP-UX 11i. This includes both API (Application Programming Interface) and ABI (Application Binary Interface) support allowing customers easier operating system migration and native performance capabilities. Shipments include a complete suite of open source tools for fast, effective Linux/HP-UX 11i development and deployment, and a future migration path to IPF for the future.



HP-UX 11i 3.0 withTru64 enhancements

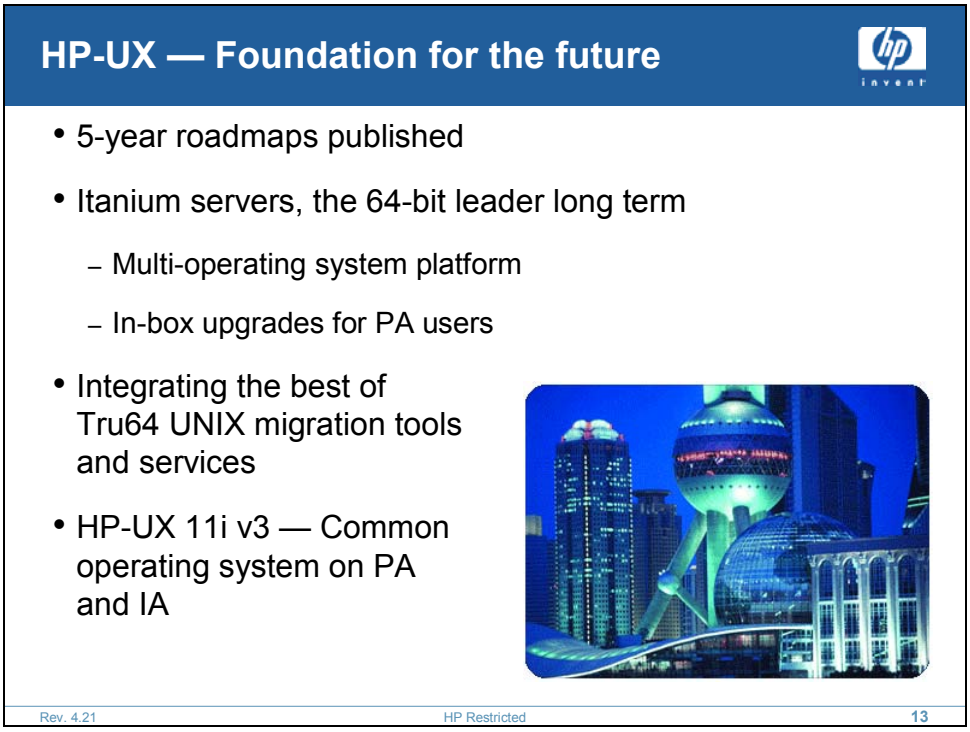
Tru64 UNIX is a robust 64-bit production-proven operating system with high availability built in. Tru64 UNIX has:

- High-availability solution
- System, file and storage management capabilities
- Clustering with TruCluster Server software
- Applications support
- Interoperability with Windows NT
- High performance computing market including e-business technologies

Given our combined strengths in the UNIX market, you can take advantage of leadership functionality, performance, and support by a very large base of market-leading ISVs and applications.

We plan to continue to offer the best UNIX in the industry as we integrate leading features of Tru64 UNIX into HP-UX.

HP-UX has over 16,000 applications available.



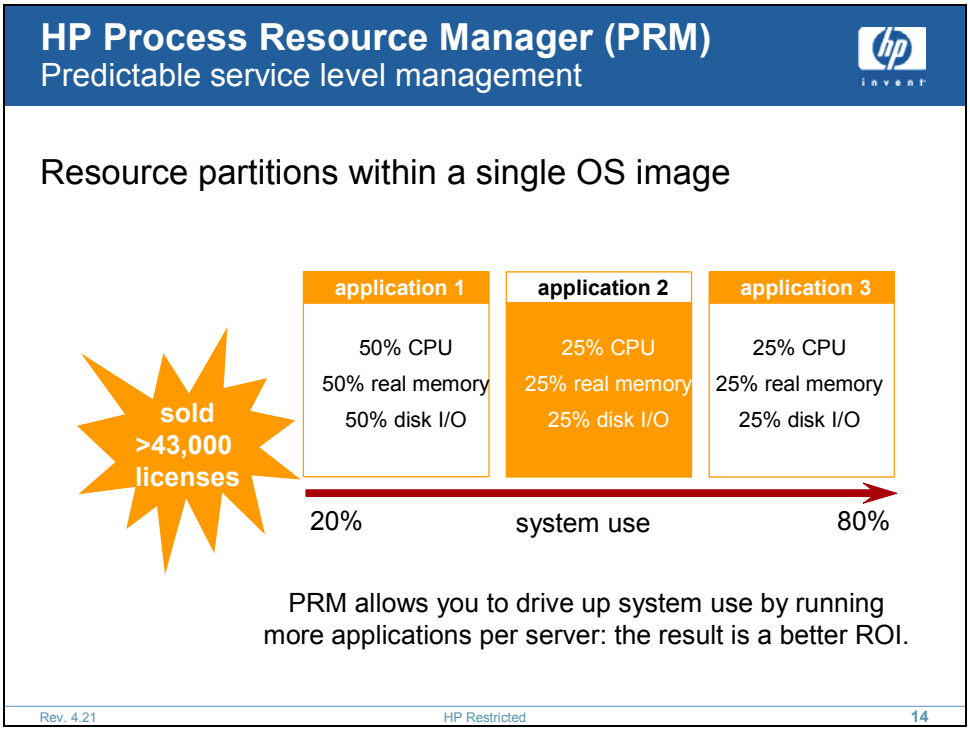
HP-UX — Foundation for the future

- HP-UX 11i v2 provides for Itanium Processor Family (IPF) the scalability, availability, manageability, functionality, robustness, security, and ease of use that the award winning HP-UX 11i 1.0 provides for PA-RISC. HP-UX 11i v2 also provides an easy-to-navigate bridge to the next generation Itanium architecture:
  - Complete data compatibility.
  - Application source code compatibility including build stream compatibility.
  - Patented dynamic code translation technology that allows older applications to run with out modification on the new Itanium architecture.
  - Incorporates enterprise-level HP-UX features and innovative Tru64 functionality—the best of all worlds.
- HP-UX 11i v2 for the HP Integrity servers is physically different but functionally equivalent to HP-UX 11i 1.0 for HP 9000 servers.

- There are some differences between HP-UX 11i on PA-RISC and HP-UX 11i v2 for the Itanium processor family to take advantage of or compliment the system design and architecture
  - For example, HP-UX 11i v2 for the Itanium processor family contains the Aries dynamic code translation technology so that it can execute PA-RISC binaries without modification or recompilation. In addition, version 2 has the advanced encryption/decryption engine and libraries for ultra fast security operations.
  - The biggest difference is that HP-UX 11i v2 does not yet have the vPar technology that HP-UX 11i for PA-RISC has, although there are plans to add this technology in a 2004/2005 timeframe. However, version 2 does have the nPar (hard partitions) technology and the tools to manage hard partitions. The nPar partition manager of version can manage HP-UX 11i v2, Linux, and Windows running in separate hard partitions.

For more information

- HP Itanium home: http://ia-64.hp.com/
- HP technical documentation: http://docs.hp.com/
- HP developer and solution partner portal (DSPP): http://h21007.www2.hp.com/dspp/home/home_HomePage_IDX/1,1292,,00.html



HP Process Resource Manager (PRM) — Predictable service level management

Partitions

	nPars	vPars	Resource Partitions
Description	hardware	software	software
Granularity	cell	CPU	cycles
Controlled by	Partition Manager	PRM	PRM

HP Virtual Partitions allow multiple workloads to run on the same server. An application or a set of users, such as a department, can run in an isolated environment, complete with its own version of the OS. Typically, each will have its own specified memory, CPU and I/O resources. HP Virtual Partitions can be dynamically created, and the core functionality will come free with HP-UX 11i.

Resource Partitions: Within each virtual partition, up to 64 resource partitions can be created and managed using Process Resource Manager (PRM) and Workload Manager (WLM) software.

HP's Process Resource Manager, or PRM, is a policy-based resource management tool that allows system administrators to control the amount of resources that applications, users, or groups may use during peak system load. Resources that can be managed with PRM are CPU, real memory, and disk I/O bandwidth within (1) a server node; (2) a Hyperplex hard partition; (3) a Superdome nPartition; or (4) a vPar. PRM can allocate resources in the following ways:

- Percentage based
- Shares based
- psets

Value proposition

The use of PRM enables the systems administrator to ensure that critical applications and users have access to system resources according to pre-defined policies governing resource consumption. Multiple policies can be defined according to time of day to cater to the required balance between batch and online workloads.

PRM can be used to create one or more PRM groups—a conceptual partition of the system's resources. When PRM is configured on an HP-UX system, each executing process belongs to one of the defined PRM groups. The administrator defines PRM groups by assigning a meaningful name and a share of the CPU cycles, real memory, or disk I/O bandwidth. A resource share is a guaranteed minimum that a PRM group and associated applications has access to, irrespective of total system workload, for example 60% of processor capacity assigned to PRM Group A. PRM can also "cap" or set a limit on the amount of resources that can be used; for example, PRM Group A cannot use more than 80% of system processor capacity. These values can be set either as percentages or shares of the resources. For example, PRM Group A has 40 shares while PRM Group B has 30 shares. If the system resource, such as CPU, real memory, or disk I/O bandwidth is not fully used, groups can use the excess capacity according to need. When system activity consumes all of the available resources, PRM enforces the shares to ensure that the defined policies are met.

Because PRM resource partitioning occurs at the OS level, it is fully dynamic, with addition, modification, and deletion of policies occurring without the necessity for either a reboot or application recycle. Resource shares allow simple additions and removals of groups to a configuration because each group's resource allocation is determined by its number of shares relative to the total number of shares assigned in the configuration for the given resource.

Features of PRM

PRM provides a number of features and benefits, as indicated below:

- Management of the most critical shared server resources: CPU, real memory, and disk I/O bandwidth without hardware duplication
- Support for resource allocation policies for both online and batch applications executing within either an nPartition or a vPar or a single server node

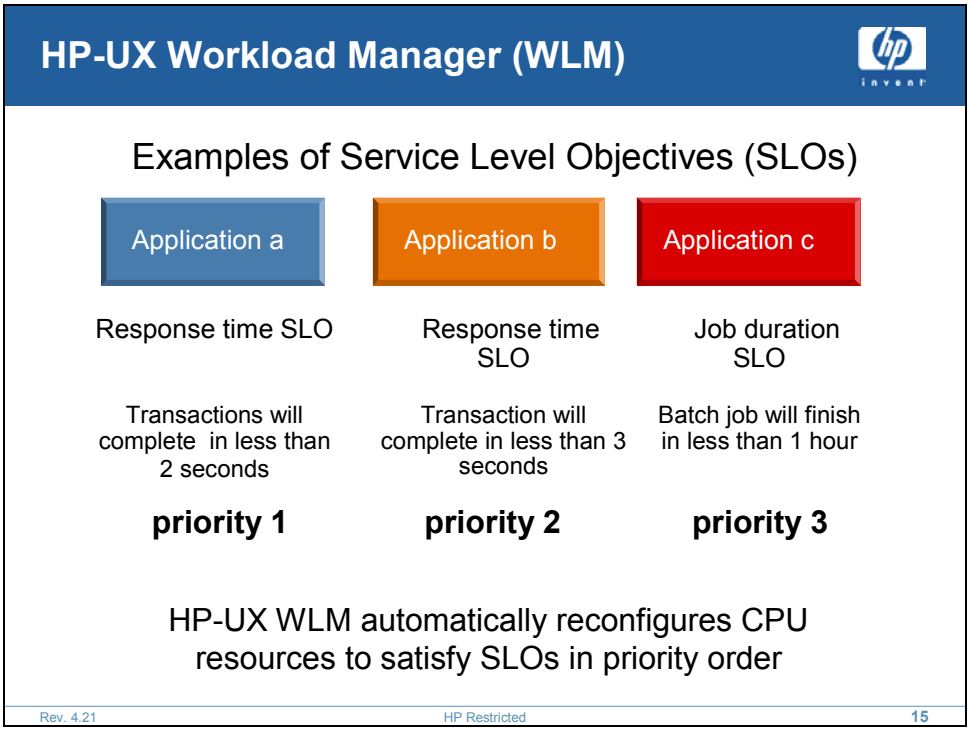
- Fine grain CPU allocation, such as, CPUs can be allocated on a percentage or share basis
- Application independence: Because resource allocation is transparent to the application, applications require no modification to execute on a server whose resources are allocated by PRM
- Dynamic PRM (re)configuration: The configuration of PRM groups does not require a system reboot
- Automated policy changes: Applications do not need to be restarted when resource allocation policies are changed
- Hierarchical resource allocation, where a PRM group's resources are divided among its subgroups
- Integration with psets: Instead of having only percentages or shares of CPUs, a resource group can have dedicated processors in addition to dedicated memory being allocated by associating it with a pset
- Integration with UNIX accounting
- Integration with HP Glanceplus Pak

Why use PRM?

PRM is ideal for consolidating applications that co-exist well within a single HP-UX image yet require guaranteed resources, for example multiple SAP R/3 instances. In addition, PRM can also be used to cap resource consumption, thus preventing runaway processes. The scenario variation within a single partition, such as being online during the day and doing backup and batch windows at night, often requires changes in resource allocation to adhere to defined SLOs. For example, between 7 a.m. and 7 p.m., backup applications can be eligible for 0% CPU use, but between 7 p.m. and 7 a.m. the following day, backup processes are eligible for 60% CPU use.

PRM's dynamic configuration features enable the system administrator to create multiple configurations representing resource and time-based policies.

Moreover, PRM is easy-to-use because PRM groups are configured through a Java-based graphical user interface, which executes either as a stand-alone Java application or within a browser. System administration is simplified because multiple servers can be configured with a single GUI session.



HP-UX Workload Manager (WLM)

HP-UX Workload Manager is the control system for HP Partitioning Continuum. WLM provides automatic resource allocation, including the dynamic resizing of psets and vPars, and application performance management through the use of prioritized SLOs.

WLM has the ability to manage resources both within a vPar and across resource partitions and vPars. WLM does not manage resources across nPartitions, although it can be integrated with Serviceguard to re-allocate resources in a failover situation according to the defined priorities.

Value proposition

With HP-UX WLM, the system administrator creates one or more service-level objectives (SLOs) for defined workloads consisting of applications. Each SLO is assigned a priority, in addition to metric or resource usage goals. As the applications execute, HP-UX WLM compares the performance metrics or usage against the defined goals, automatically adjusting the CPU entitlements, or the amounts of CPU that are available to the workloads, to achieve each goal.

WLM allows customers to run the system at 100% use and still guarantee the performance of your mission-critical applications. This is accomplished by putting one or more critical applications that have performance requirements on a system along with many lower priority workloads that have no performance requirements. WLM will allocate the resources to ensure that the critical applications get the resources they need to meet their performance requirements, while allocating spare CPU cycles to the lower priority workloads. WLM literally maximizes the use of CPU resources while ensuring that the most critical applications perform according to the defined SLOs.

Thus, using HP-UX WLM enables the following:

- Multiple applications can be consolidated so as to use excess capacity while ensuring that the highest priority applications still have access to the resources they need during peak times
- System resources can be dynamically re-allocated in response to changing priorities, conditions that change over time, resource demand, and application performance

Features of WLM

To facilitate the sharing of excess capacity between applications, HP-UX WLM provides the ability to:

- Prioritize workloads on a single system or across a Serviceguard cluster, adjusting the workloads' CPU resources based on their goals.
- Manage by service-level objectives.
- Adjust resource allocations by automatically enabling or disabling SLOs based on time of day, system events, or application metrics.
- Automatically allocate resources upon Serviceguard package failover or during normal operating conditions.
- Ensure critical workloads have sufficient resources to perform at desired levels.
- Set and manage user expectations for performance.
- Run multiple workloads on a single system and maintain performance of each workload
- Monitor resource consumption by applications or users through HP Glanceplus or PRM tools. Set the minimum and maximum amounts of CPU available to a workload. Automatically allocate CPU resources to achieve the desired SLOs.
- Set real memory and disk bandwidth entitlements (guaranteed minimums) to fixed levels.
    - SLOs can be entitlement-based or goal-based. With an entitlement-based SLO, HP-UX WLM simply tries to grant the associated workload a certain amount of the CPU.

- With goal-based SLOs, HP-UX WLM actively changes the associated workload's CPU to best meet the SLO. These SLOs are based on one of two goal types:
  - Metric goals: Goals based on a metric, such as having at least x transactions per minute or a response time under y seconds.
  - Usage goals: Goals based on how efficiently workloads use their CPU allocations. If a workload is not using a certain amount of its allocation, its allocation is decreased; similarly, if a workload is using a high percentage of its allocation, the allocation is increased.

Why use WLM?

The major benefit of using HP-UX WLM is its ability to manage service-level objectives. Users who meet one or more of the following conditions will gain the most benefit:

- Run more than one workload concurrently on a server

  The workloads may all run under one instance of HP-UX or in separate virtual partitions, each with its own instance of HP-UX. These workloads could be multiple database servers, a database server and an applications server, or any other combination of workloads, provided that they are on PA-RISC servers running HP-UX 11.0 or later or on Itanium-based servers running HP-UX 11i v2 (B.11.23).
- Have workloads that can be prioritized
- Have an important workload with end-user performance requirements
- Desire consistent performance from applications under varying application and system loads
- Run Serviceguard and need to ensure proper prioritization of workloads after a failover
- Want more control over resource allocation than PRM provides

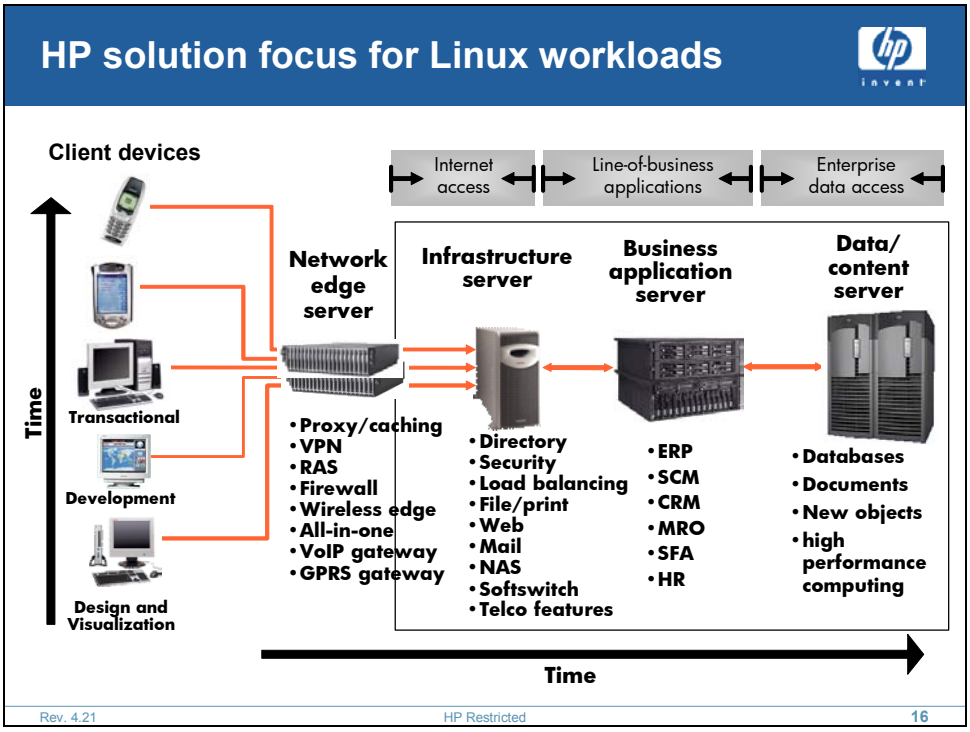
As with PRM, because of the important role that HP-UX WLM plays within HP Partitioning Continuum, integration is a key to its functionality being fully exploited. WLM's integration with Serviceguard, virtual partitions, and utility pricing has now moved WLM into the multi-system workload management space.

HP-UX WLM with iCOD: If HP-UX WLM is implemented on a system with iCOD reserves, it can automatically power on iCOD processors.

HP-UX WLM with Serviceguard: When the WLM configuration is incorporated in the Serviceguard configuration, in the event that an application is failed over to an alternate hard or soft partition, WLM will automatically recognize and reconfigure all applications within the partition according to the predefined rules.

For more information

HP Workload Manager Overview white paper:
http://h30081.www3.hp.com/products/wlm/docs/wlm.overview.pdf



HP solution focus for Linux workloads

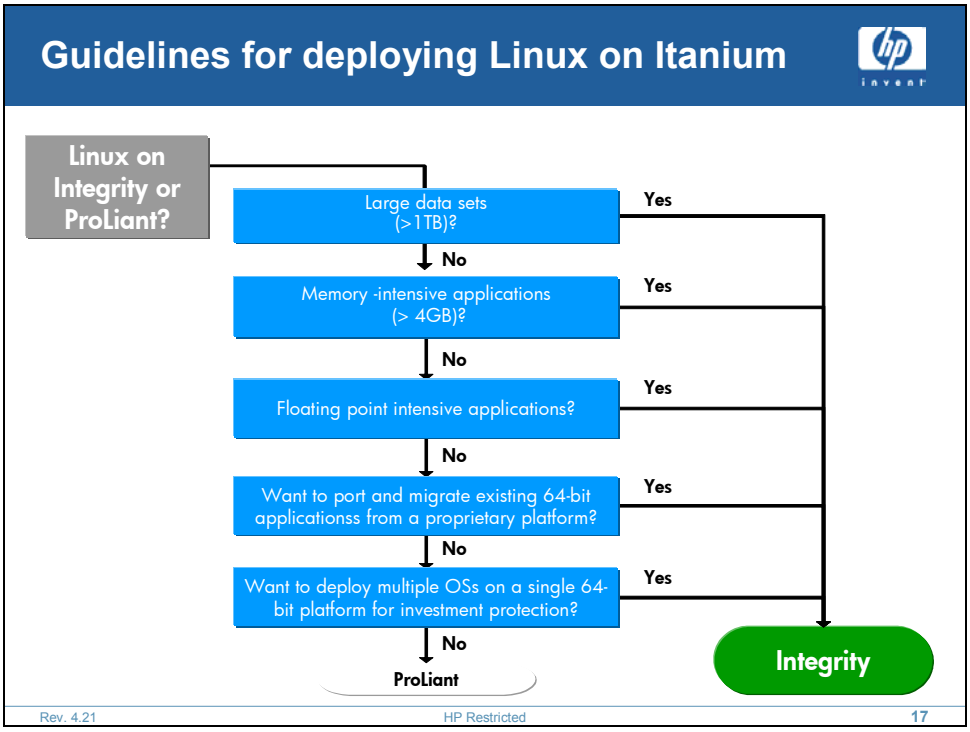
"In 2002, HP generated $2 billion in Linux-based revenue. HP's major investment in its Linux strategy is resulting in advanced industry-standard products, services and support and more choice for customers."

Peter Blackmore, Executive VP,
Enterprise Systems Group

"According to IDC's Quarterly Server Tracker, HP continues to maintain its long-standing No.1 position in the rapidly growing Linux server market across all server platforms with 31.7% customer revenue market share worldwide."

Press release NEW YORK,
LinuxWorld, 21 Jan. 2003

Market opportunities	Needs	Key ISVs committed
High-Performance Technical Computing ■ Scientific research ■ Life & materials sciences ■ Oil & gas ■ Government & defense ■ Computer-aided engineering	■ Heavy use of floating-point operations ■ Large data sets ■ 64-bit computing with high memory bandwidth and low latency means faster calculations, more in-depth data analysis, and more vivid, precise modeling and simulation—all for quicker time-to-breakthroughs	Adina, MSC.Software, Accelrys, Earth Decision Sciences, Metacomp Technologies, Mecalog, Platform Computing, Linux NetworX, Scyld, Scali, Cluster File Systems
Large Database Applications ■ Data warehousing & data mining ■ Online analytical processing (OLAP) ■ Memory-intensive, mid-level DBs	Load entire databases into memory for faster data access, faster throughput, and faster time-to-discovery	Oracle9i, Sybase Adaptive Server Enterprise, IBM DB2 and Informix, TeraText Solutions
Enterprise Resource Planning (*Limited*)	Large data sets can be processed in memory for faster response times and support for more users	SAP mySAP
Application ■ DevelopmentOrganizations porting & migrating their in-house applications ■ ISVs moving to Linux on Itanium	Developers need a complete 64-bit computing and data environment to move to Linux from proprietary 64-bit UNIX environments, while also providing the opportunity to re-architect source code to optimize performance	Many open source development tools, Intel Compiler 7.0, Rational Software, BEA JRockit, Etnus, Pallas, Tibco Software
Financial ServicesFinancial and economic modeling	Floating-point performance for Monte Carlo simulations means faster time-to-solutions and a competitive edge	Primarily in-house applications



Guidelines for deploying Linux on Itanium

The power of HP with Linux and Itanium 2

The power of HP is in the breadth of hardware support and the integration of support services for Linux. HP offers a base level of support bundled with the purchase of an HP Integrity server running Linux. HP also offers a range of services for Linux on HP Integrity servers. HP has received awards for our support on Linux. In particular, Network Computing magazine gave HP the “Best Value” award for Linux services.

As proof of HP leadership, HP is building the world's fastest supercomputer for the Department of Defense at the Pacific Northwest National Labs (PNNL) in Washington state. In April 2002, HP was awarded the contract for an 8.3 Terraflop systems as the prime contractor. HP is a single point of contract for the support and the system will be fully integrated by HP and our partners before it is delivered to PNNL. HP has developed key partnerships to deliver this type of tightly integrated supercomputer as well as more loosely coupled compute clusters. Key partners include MSC Software and Quadrics.

HP is working with other key ISVs for Itanium including MSC Software, Gausian, Alian Wavefront, Zues and many others.

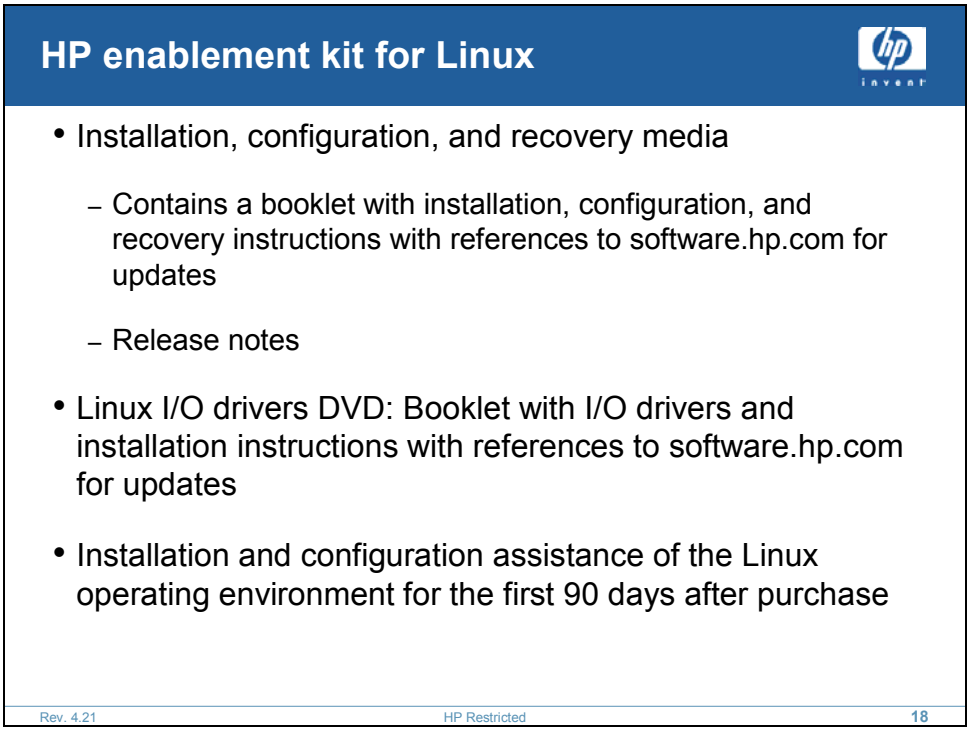
HP is a leader in the open source community for Itanium 2 drives innovation and support.

HP believes that leadership in the open source community is important, because it accelerates innovation for Linux and improves the support that customers can obtain from Linux and from the community. Specifically, HP led the way in bringing the Linux kernel to IPF. HP started a port in 1998, which merged into the Trillian project that included members of the community plus Intel, SGI, and IBM. However, HP through David Mosberger at HP Labs, is the primary architect of the IPF Linux kernel and is the maintainer of the Linux kernel on IPF. David has a book out on Linux and IPF under the HP Press label.

HP has offered an SDK for customers since 2000 to enable development for Linux Itanium systems without the need for Itanium hardware. This is available at www.software.hp.com/ia64Linux and has been distributed to over 10,000 developers.

HP also established the Gelato foundation which is a worldwide consortium focused on enabling open source Linux-based Intel Itanium processor family computing solutions for academic, government and industrial research. For more information, see www.gelato.org.

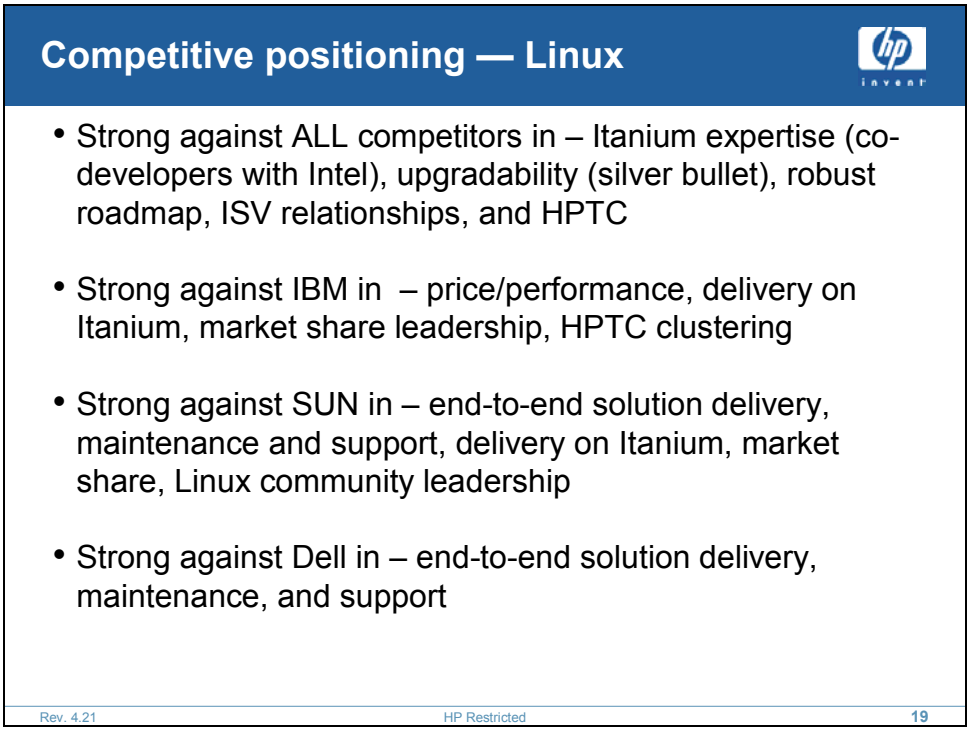
HP is also on the Board of Directors for the Open Source Development Lab through Martin Fink, GM of HP Linux Systems Division. HP is a founding member of OSDL, a Linux open source development testing lab in Oregon and Japan. HP is a sponsoring member of the OSDL. Martin Fink is the Vice President on the board of directors for OSDL. The OSDL is focused on enhancing Linux for Data Center and Telco applications and hosts working groups focused on these market segments.



HP enablement kit for Linux

Linux development tools for easy deployment on HP-UX

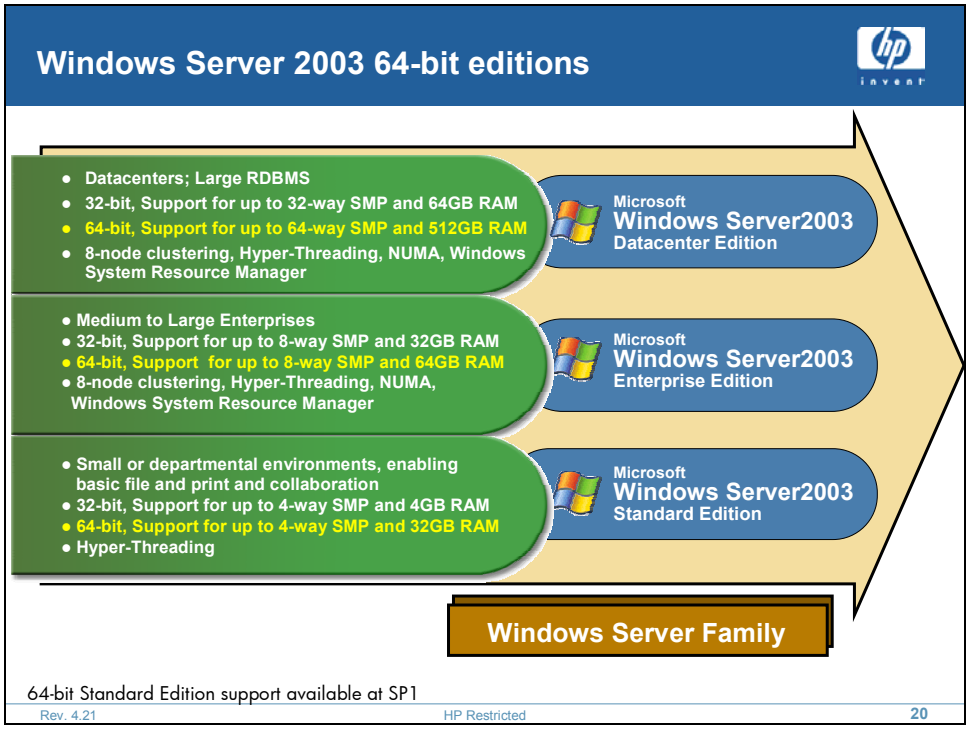
- Linux runtime kit for Itanium
  - Seamless execution of Itanium Linux applications on HP-UX Itanium
  - Reduced support costs, support one binary on multiple operating systems
- Enhanced Open Source developer's toolkit 11.0, 11i
  - Easier port to HP-UX with GNU compiler toolchain
  - Easy installation of popular open source tools
  - Supported tools for HP-UX 11i, IA-64 (Apache, Perl)
- HP-UX Linux compatible APIs 11.0, 11i: Easier migration to HP-UX with Linux-compatible APIs
- Linux software transition kit 11.0, 11i



Competitive positioning — Linux

For more information

- Itanium-based product and technical information:
  - http://itanium.hp.com
  - http://devresource.hp.com
- HP Linux product information
  - http://Linux.hp.com
  - http://www.hp-Linux.org
- Linux/IA-64 website and mailing list:
  - http://www.Linuxia64.org
  - Linux-ia64@Linuxia64.org
- Linux/IA-64 developer's kit: http://software.hp.com/ia64Linux



Windows Server 2003 64-bit editions

Editions

The four editions of Windows Server 2003 each provide additional scalability over previous Windows 2000 counterparts.

- Data center Edition also provides additional scalability and availability over the Windows 2000 equivalent and adds support for 64-bit Itanium-based Servers. Key features include:
  - 32-bit Edition — 32-way SMP, 64GB memory, 8-node clustering
  - 64-bit Edition — 64-way SMP and 512GB memory
- Enterprise Edition replaces Advanced Server and adds increased scalability and availability over Windows 2000. Also adds support for 64-bit Itanium-based servers. Key features are:
  - 32-bit Edition — 8-way SMP, 32GB memory, 8-node clustering
  - 64-bit Edition — 8-way SMP, 64GB memory, 8-node clustering
- Standard Edition — Supports 1-4P and 4GB of memory and can handle a wide range of applications in SMB and at the departmental level in enterprises.
- Web Edition — A new addition to the Windows server family aimed at web serving and web hosting front-end servers. It supports up to two processors and 2MB of memory making it ideal for blade servers and 1U and 2U servers in web front-end solutions. Its price point is expected to be substantially less than Standard Server. Web Edition is 32-bit only.

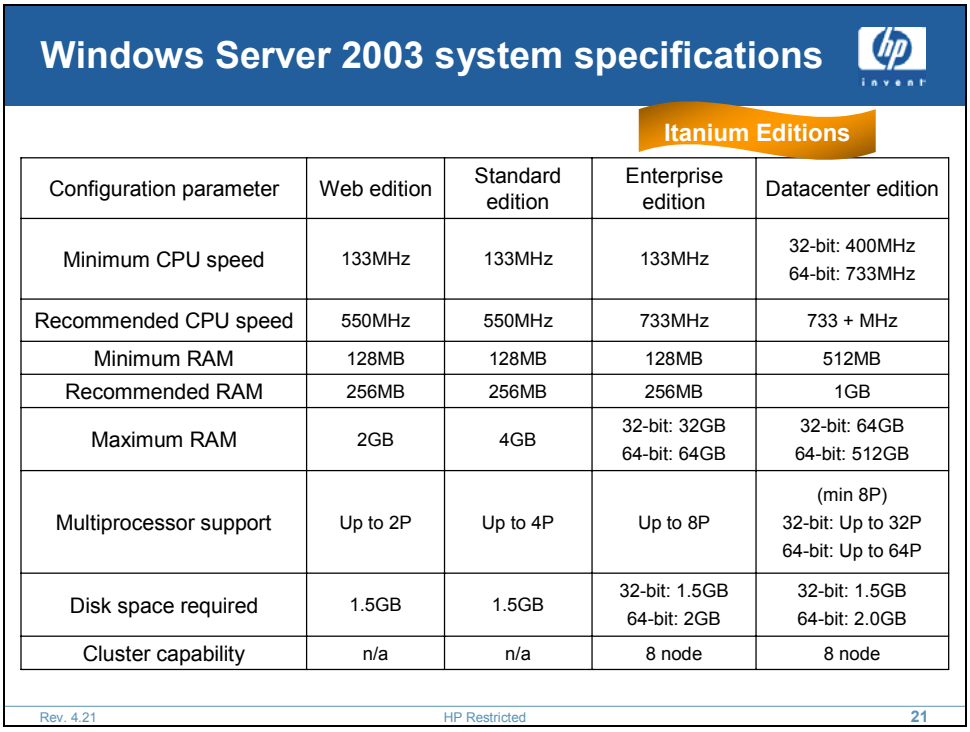
Why HP for Windows Server 2003

Trust — For over 20 years HP and Microsoft have jointly engineered information technology business solutions to be dependable, powerful and adaptable. We work together to help customers realize the most ROI from all their IT investments.

Product Leadership — HP has the most complete and capable 32-bit and 64-bit industry standard servers available for the Windows Server 2003 operating system— from low power blades to clusters of powerful SMP 64-bit servers.

Adaptive and Agile — HP systems and Windows Server 2003 can help your business infrastructure achieve the highest levels of productivity by effectively connecting your people to critical information, suppliers and customers so they can act quickly to respond to opportunities and changing demands.

Confidence — HP has the largest and most highly trained group of professionals capable of delivering unmatched services and support for Windows Server 2003 and Windows .NET Solutions. In fact, HP is the only Microsoft-designated worldwide prime integrator for Microsoft technologies.

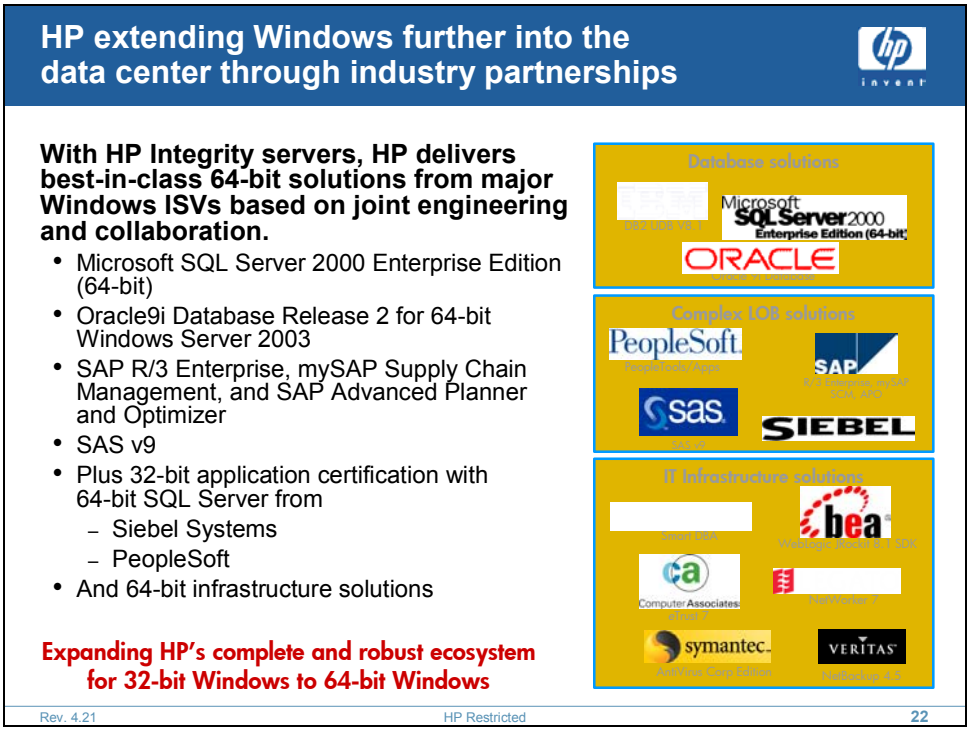


Configuration parameter	Web edition	Standard edition	Enterprise edition	Datacenter edition
Minimum CPU speed	133MHz	133MHz	133MHz	32-bit: 400MHz 64-bit: 733MHz
Recommended CPU speed	550MHz	550MHz	733MHz	733 + MHz
Minimum RAM	128MB	128MB	128MB	512MB
Recommended RAM	256MB	256MB	256MB	1GB
Maximum RAM	2GB	4GB	32-bit: 32GB 64-bit: 64GB	32-bit: 64GB 64-bit: 512GB
Multiprocessor support	Up to 2P	Up to 4P	Up to 8P	(min 8P) 32-bit: Up to 32P 64-bit: Up to 64P
Disk space required	1.5GB	1.5GB	32-bit: 1.5GB 64-bit: 2GB	32-bit: 1.5GB 64-bit: 2.0GB
Cluster capability	n/a	n/a	8 node	8 node

Windows Server 2003 system specifications

For more information

- A simple but useful query from MSDN search engine: http://search.microsoft.com/us/dev/default.asp?qu=win64&boolean=ALL&nq=NEW&so=RECCNT
- Windows driver development kits: http://www.microsoft.com/ddk

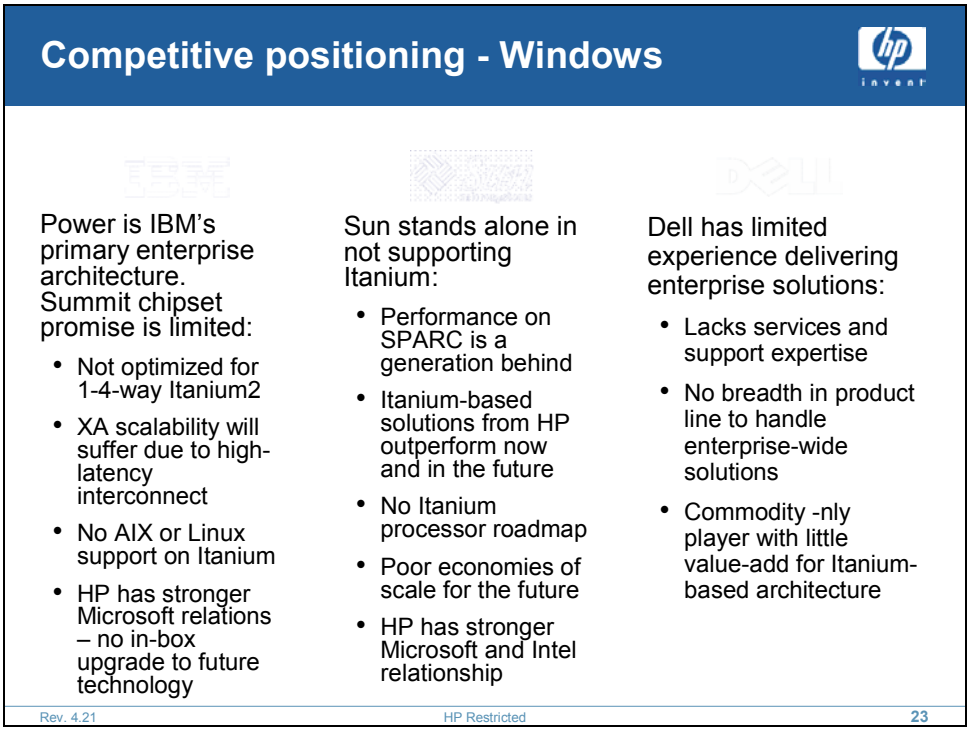


HP extending Windows further into the data center through industry partnerships

What ISVs are available on Windows Server 2003 64bit for Itanium-2 systems and HP?

HP anticipates with the release of production Windows Server 2003 (64-bit), major ISVs will be announcing product availability for HP Itanium systems:

- SQL Server 2000 (64-bit) — HP and Microsoft have collaborated on the development and tuning of SQL solutions, and with HP Itanium-based Servers, SQL Server is a premier database-computing platform. Product availability announcement expected Summer 03.
- SAP, HP, Microsoft, and Intel have worked together on bringing SAP solutions to Itanium. The first SAP Itanium customers, and pilots have been on HP platforms. SAP is expected to announce availability of R/3, and BW Summer 03.
- SAS has already announced product availability of their SAS v9 product and Windows Server 2003.
- Oracle 9i for Itanium also announced with HP
- Siebel will be announcing their 32-bit applications and will be certified to run with a 64-bit SQL Server 2000 database. This enables realization of 2 key benefits from Itanium: performance and scalability.



Competitive positioning — Windows

Why choose HP for 64-bit Windows Server 2003 on HP Itanium-based servers?

Performance and scalability: HP is committed to the highest levels of performance and scalability with Windows Itanium-based server solutions. In fact, the HP Itanium-based server family—including the mid-range and the aforementioned high-end Superdome—will support the 64-bit version of Microsoft Windows Server 2003.

Configured with 64 Itanium-based processors and 512GB memory running the Datacenter Edition of Windows Server 2003, HP Superdome provides an unprecedented level of Windows vertical scalability, enabling Windows to handle the enterprise datacenter's largest, most complex and memory intensive workloads and applications.

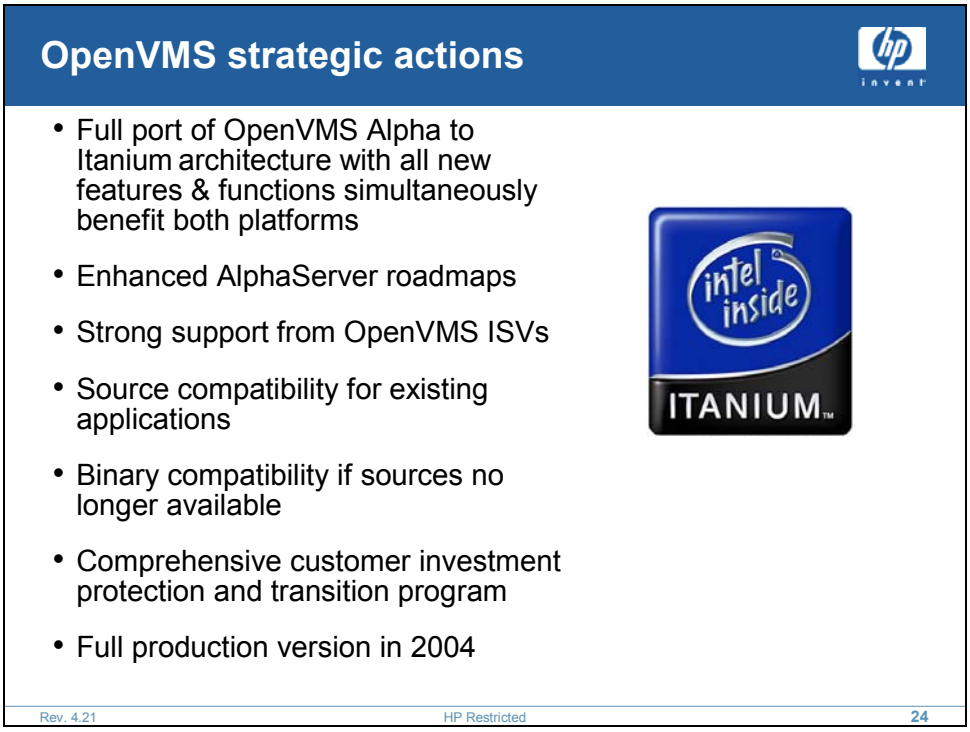
Partnership strength*:* Microsoft and HP share a long history of engineering collaboration and success. For over a decade, HP has worked with Microsoft on the development of the Windows operating system for Intel-based servers including almost 8 years of collaboration on Itanium and 64-bit Windows. HP provided the development platform and key engineering consulting for Microsoft 64-bit applications, including Windows Server 2003 running on the Itanium-based super-scalar HP Superdome Server. In fact, there is a team of HP and Microsoft engineers in Redmond, Ft. Collins, Cupertino and Houston dedicated solely to working on 64-bit Windows for Itanium-based servers—the operating system that truly extends this enterprise-class architecture further into the datacenter.

Worldwide services*:* HP Services has the largest and most experienced Microsoft-trained workforce in the industry focused on building and supporting Windows-based solutions in over 160 countries around the world. And HP capabilities are extended several times over by the services capabilities of the HP channel and integration partners.

Best hardware options, for both 32-bit and 64-bit Windows Server 2003: HP provides the most complete line of industry-standard servers for Windows-based solutions—from uni-processor 32-bit blade servers scaling through 64 processor Itanium-based enterprise servers to meet your full range of computing requirements.

Which Itanium-based servers are currently supported by HP with Windows Server 2003?

All currently shipping HP Itanium-based servers are supported with Windows Server 2003 Itanium 2 including: rx2670 and rx5670. Future Itanium-based servers, including the 64-processor HP Superdome, will be supported.



OpenVMS strategic actions

- OpenVMS is being ported to Itanium, thus providing a stable and long-term path for customers.
  - This port is already well underway, with a target availability for early developers in 2003, and a full production version in 2004.
  - We are also working very closely with our ISV software partners and our goal is to have 100% of our existing partners port to Itanium.
- We are committed to enable customers to move on their own schedule and to make the transition as seamless as possible.
  - Existing OpenVMS applications will run on the new servers with little or no modification.
  - To help facilitate this, we will provide source compatibility for OpenVMS applications, and where sources are not available, binary compatibility as well.

OpenVMS porting methodology

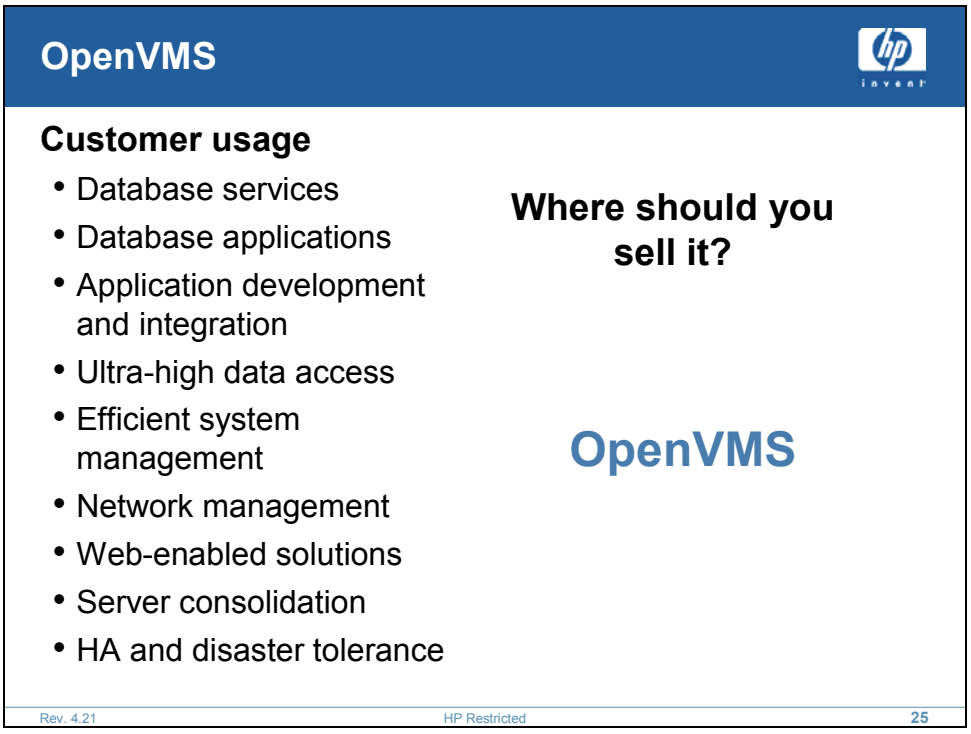
There is a real significance to the HP approach to porting OpenVMS on Itanium Family Processors that needs to be fully appreciated. HP will not be developing separate releases of OpenVMS for Alpha and Itanium-based systems. HP is developing a single source code base so that HP can release OpenVMS on both platforms simultaneously. For customers who prefer to remain on AlphaServer systems through 2006 and beyond, they can continue to take advantage of new versions of OpenVMS. For customers who prefer to deploy Itanium- based systems, they can also enjoy the benefits and advantages of OpenVMS as their underlying infrastructure.

The single source code approach is intended to allow all non-hardware dependent and performance related improvements to be incorporated on both platforms and to minimize the time required for qualification testing on each.

For HP business partners and end users, the advantage is that application development efforts or production system environments can continue using their current or future Alpha systems while enabling them to port their OpenVMS applications to Itanium systems as well.

Summary

- Single source code base to produce the Alpha and Intel Itanium architecture variants
- Intended to allow all non-hardware dependent and performance improvements to be incorporated into both versions without multiple changes to the source code and to minimize the time required to perform qualification testing
- Allows ISVs and end-user developers to continue using their current and future Alpha systems while migrating to the future Itanium platforms
- Cost effective for customers and HP



OpenVMS

OpenVMS mission-critical computing

Technology investments may be driven by a customer's need to deploy industry-focused applications. If so, OpenVMS and our business partners can provide customers with the core IT infrastructure and application solutions needed for businesses. Some examples are:

- OpenVMS provides the core IT infrastructure for thousands of hospitals where availability is a life and death matter.
- In CPU chip manufacturing, OpenVMS provides reliability and dependability required for the process manufacturing lines.
- In OpenVMS cell phone billing environments, high availability and scalability to meet traffic demands translate directly into revenue.
- As one of our customers (ISE) put it, "An electronic exchange is viable only while it is up and running." They depend on OpenVMS.
- Automated lottery systems are also deployed on OpenVMS because you do not get a second chance to sell in that market.
- As the Internet-enabled world continues to expand, OpenVMS system and data security become increasingly important to everyone.

Where should you sell it?

OpenVMS development efforts and our strategic partnerships are focused on five key markets that represent the major part of our installed base revenues:

Healthcare, government/public sector, financial services, telecommunications, and manufacturing.

Our focus on these markets and the core capabilities built into the OpenVMS operating system allow us to provide a computing environment that meets the needs of any industry.

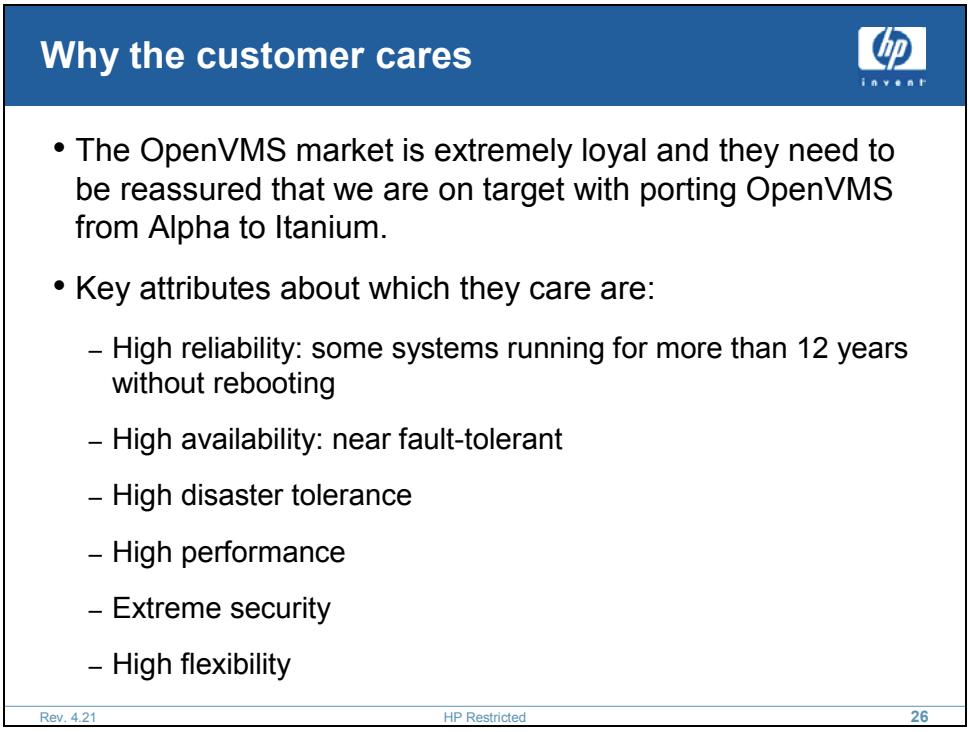
This focus has earned us the reputation as an industry leader in providing the reliability, availability, scalability, and security that businesses require.

Building on the functionality of the OpenVMS operating system, we are working with key application providers to ensure that complete and robust solutions are available for our customers, including e-business solutions.

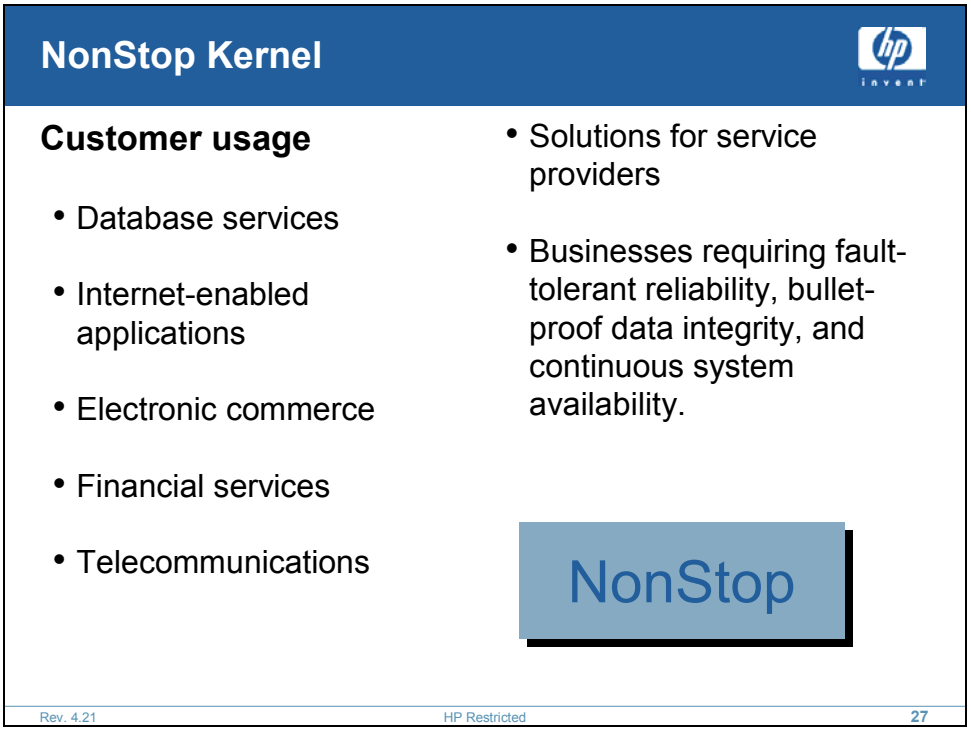
In studies conducted by TechWise Research Inc., OpenVMS was found to have the lowest total cost of ownership over IBM and Sun.

Typical Opportunities

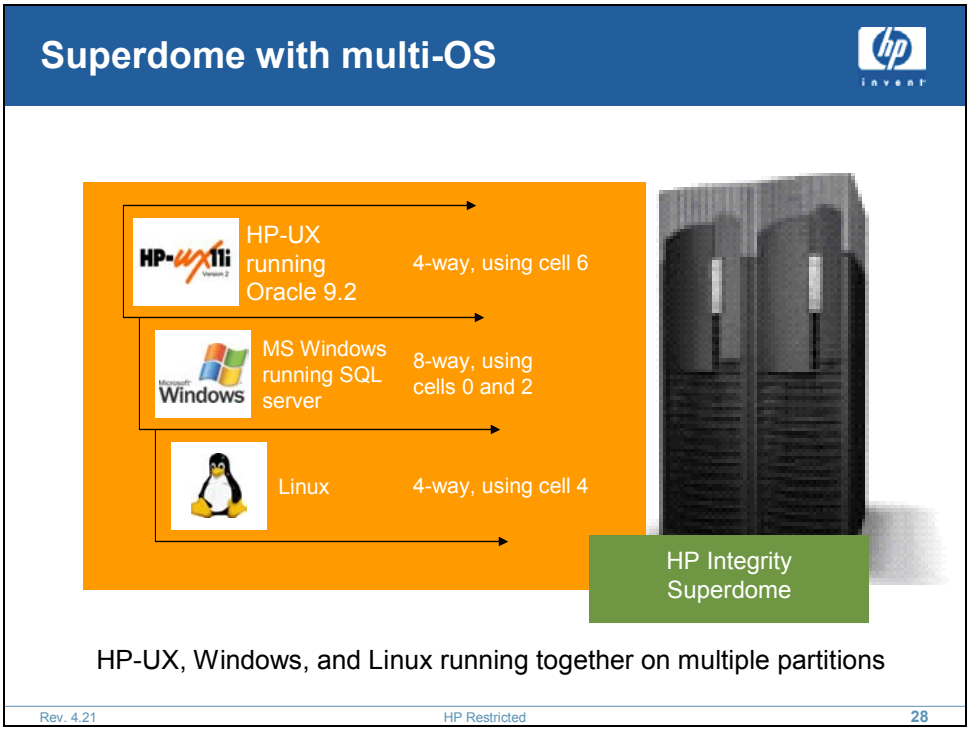
- Existing projects
  - Technical expansion
  - Scale up and scale outNew projects in existing accounts
  - Expands account share
- Greenfield accounts
  - Led by ISVs and VARs
  - Solution sale, for example:
    - Schlumberger-Sema in telco
    - Cerner in Healthcare
    - Brooks-PRI Automation in Manufacturing
    - OM in Financial Services
    - Primes in Government



Why the customer cares



NonStop Kernel (NSK)



Superdome with multi-OS

HP Integrity Superdome

The HP Integrity Superdome runs on Intel Itanium 2 6M processors and offers customers the ability to run multiple operating systems simultaneously. Superdome is the only high-end server in the IT industry that can simultaneously run Windows, UNIX, and Linux in the same box, and provide this capability to an existing installed server through an in-box upgrade. Benefits include:

- Improved system resource use
- Cost savings and improved ROI

  As of 7/30/03 HP and Oracle Corp announced the world-record benchmark result of 824,164 transactions per minute (tpmC) on the Transaction Processing Council's TPC-C benchmark (1) achieved by the first ever system, clustered or non-clustered, to eclipse the 800K tpmC barrier at a price/performance ratio of $8.28/tpmC. (HP-UX 11i v2 operating system)

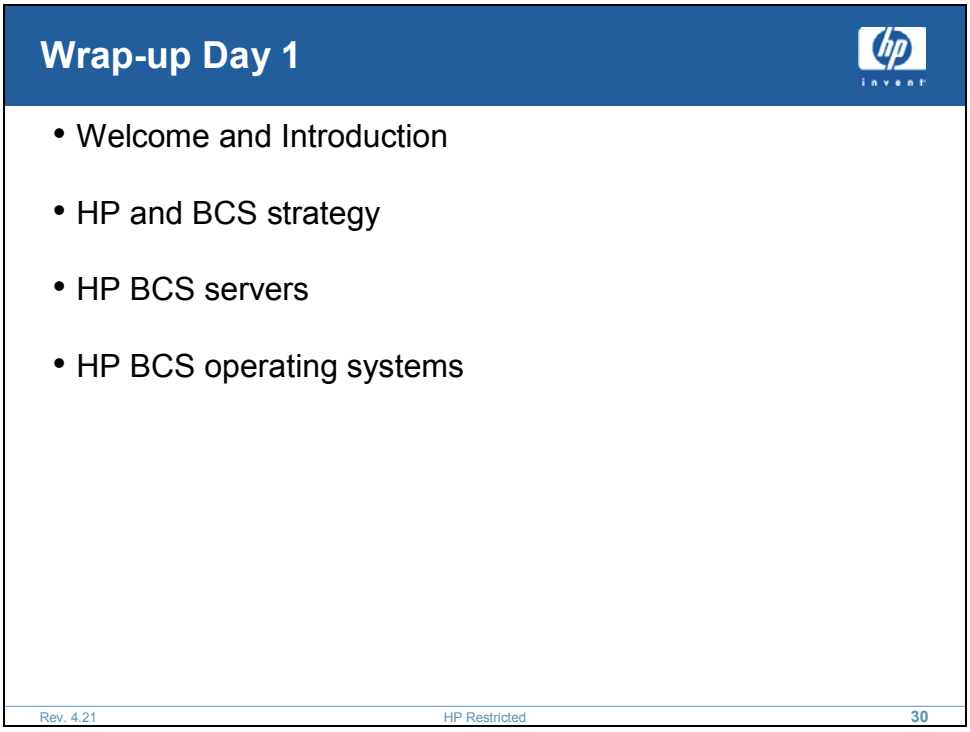
  The HP Integrity Superdome also holds the record for Windows with 786,646 tpmC and a price/performance ratio of $6.49/tpmC.

Summary

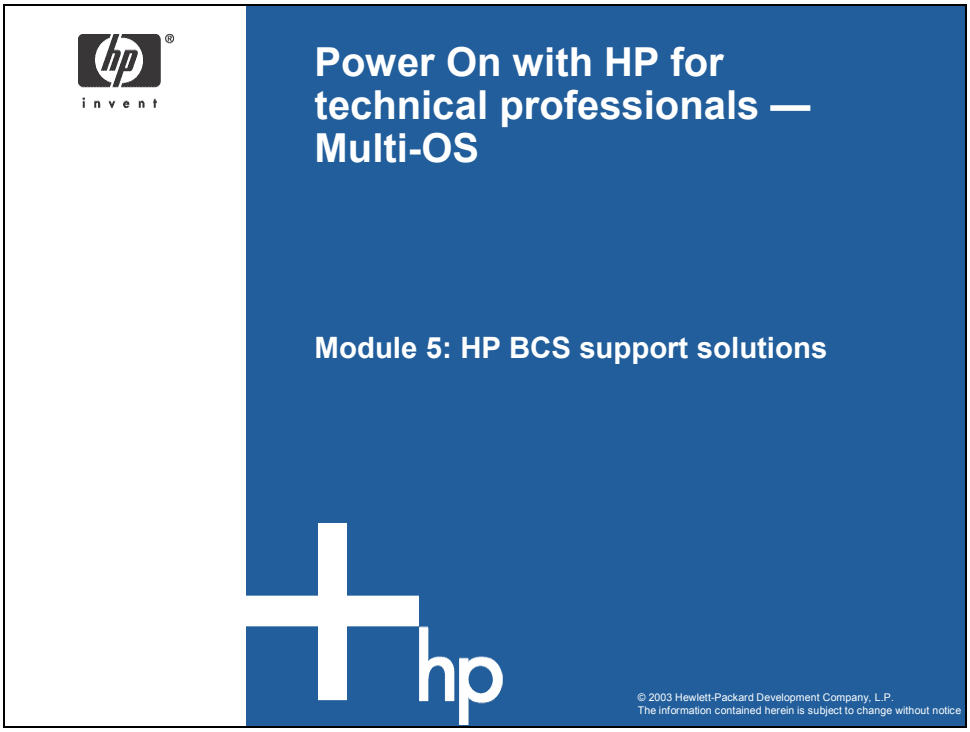
- Multi-OS strategy
- HP-UX
- Linux
- Windows
- OpenVMS
- NSK

Rev. 4.21 HP Restricted 29

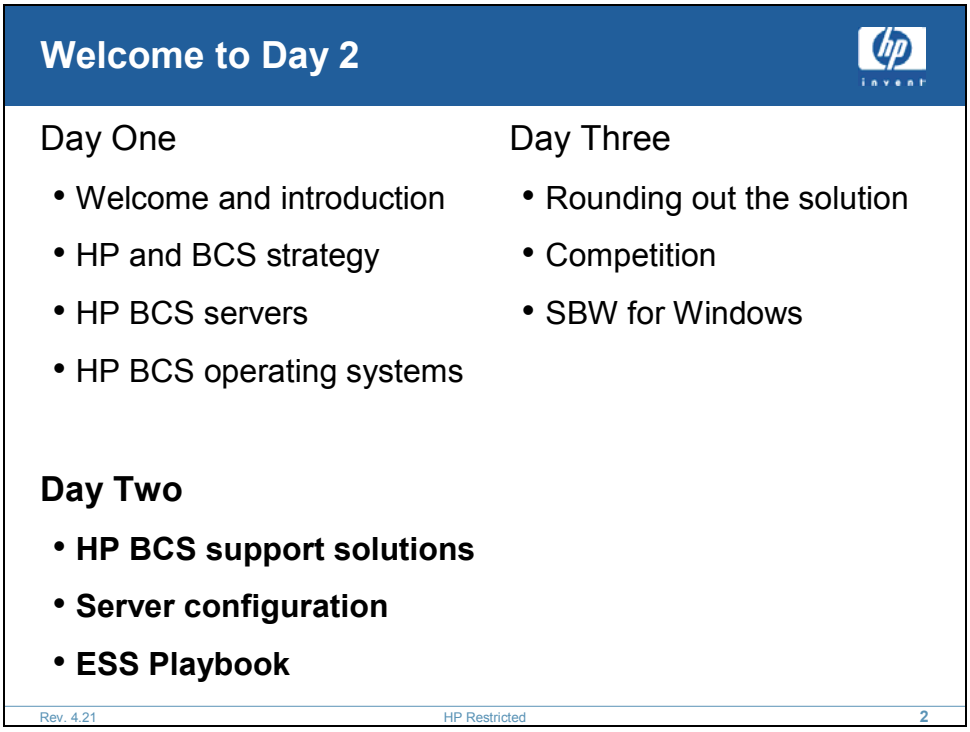
Summary


Wrap-up Day 1
• Welcome and Introduction
• HP and BCS strategy
• HP BCS servers
• HP BCS operating systems
Rev. 4.21
HP Restricted
30

Wrap-up day 1



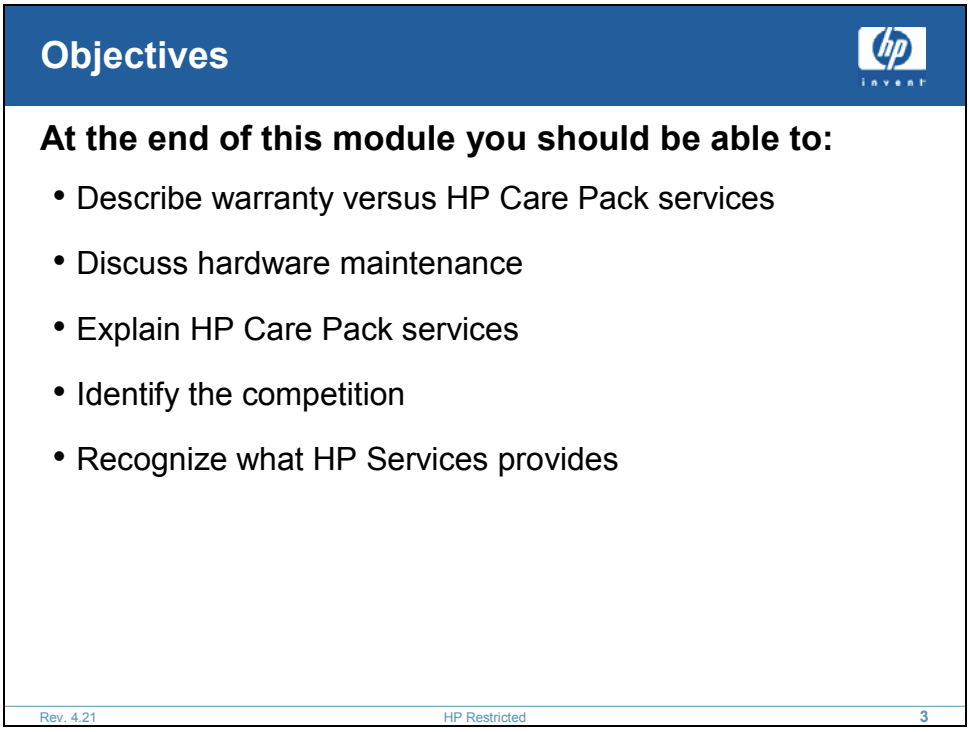
HP BCS support solutions



Welcome to Day 2

Agenda

- HP BCS support solutions
- Server configuration
- ESS Playbook

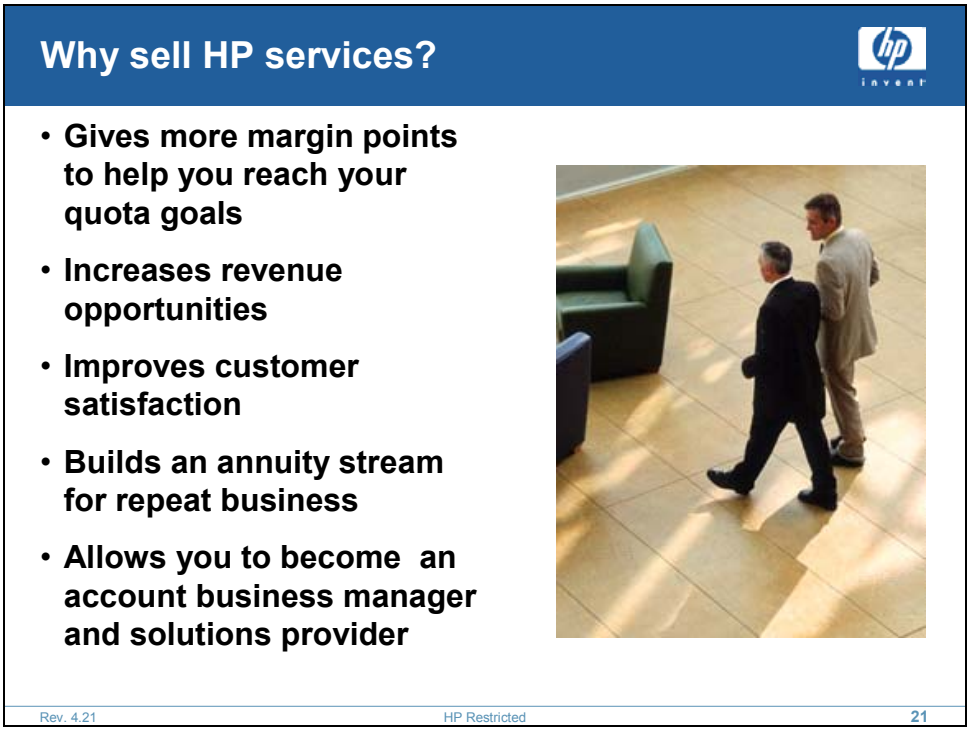


Objectives

Agenda

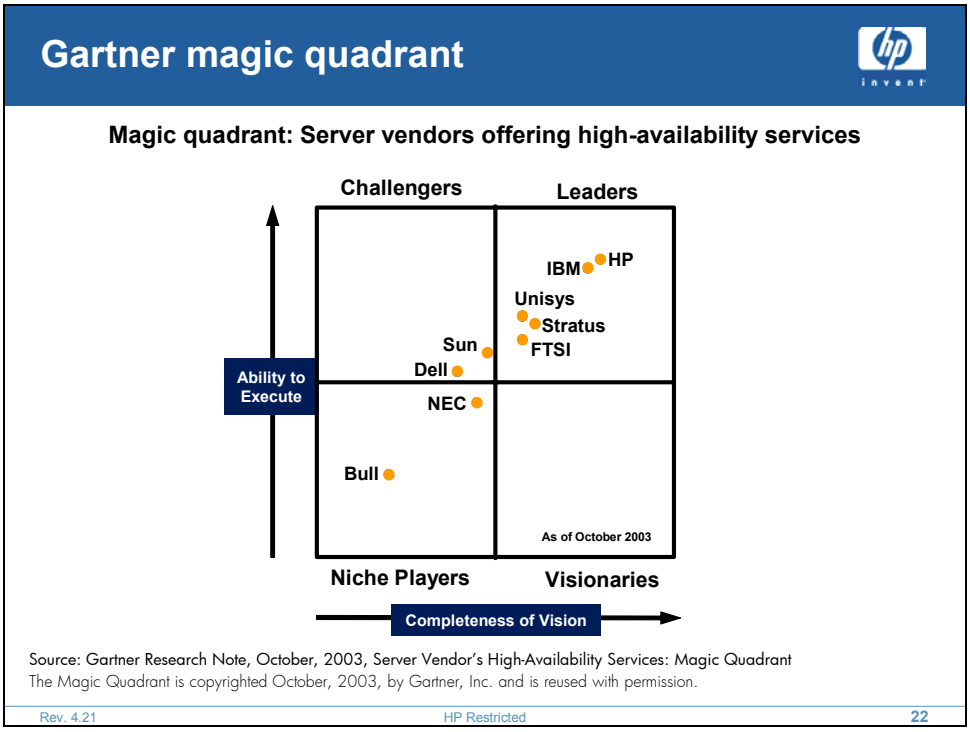
- Warranty versus HP Care Pack services
- Hardware maintenance
- HP Care Pack services
- The competition
- HP Services

Gartner Group quote



Why sell HP services?

- Customer satisfaction — 60% of customers who buy hardware also buy services. Customers are willing to buy services and expect to buy services. If you are not selling it then someone else is!
- Services build an annuity stream for repeat business, which is an excellent opportunity for repeat business in upgrades and renewing services along the way.
- Selling services also allows you to become an account manager and solutions provider, providing your customers with a complete solution and being viewed by customers as more knowledgeable about the business.



Gartner magic quadrant

HP was placed in the leader/visionary quadrant of the diagram

The report also states that HP's position in the leader/visionary quadrant reflects the following HP strengths:

- Global coverage
- Broad base of high-availability offerings
- Strong high-availability management
- High Availability Observatory concept
- Return on investment in IT initiative

Completeness of vision and ability to execute are the two key areas that Gartner evaluates. These include the following:

- Long-term vision and strategic plan for high-availability services
- High-availability services for the full IT life cycle
- HA support escalation process
- Escalation process for high-availability support
- Reimbursement of customers for lost revenue resulting from IT outages
- Customer skills training and education offerings
- Processes and mechanisms for ensuring service quality

Gartner's determination of HP's ability to execute is based on an evaluation of the following:

- Specialists in high-availability services
- Remote-site recovery capability
- Comprehensive global service and support
- Relationship management
- Alliances and partnerships
- An uptime guarantee
- Guaranteed restoration time for hardware
- Guaranteed restoration time for software

Gartner disclaimer

The Magic Quadrant is copyrighted October, 2003, by Gartner, Inc. and is reused with permission, which permission should not be deemed to be an endorsement of any company or product depicted in the quadrant. The Magic Quadrant is Gartner, Inc.'s opinion and is an analytical representation of a marketplace at and for a specific time period. It measures vendors against Gartner defined criteria for a marketplace. The positioning of vendors within a Magic Quadrant is based on the complex interplay of many factors. Gartner does not advise enterprises to select only those firms in the "Leaders" quadrant. In some situations, firms in the Visionary, Challenger, or Niche Player quadrants may be the right matches for an enterprise's requirements. Well-informed vendor selection decisions should rely on more than a Magic Quadrant. Gartner research is intended to be one of many information sources including other published information and direct analyst interaction.

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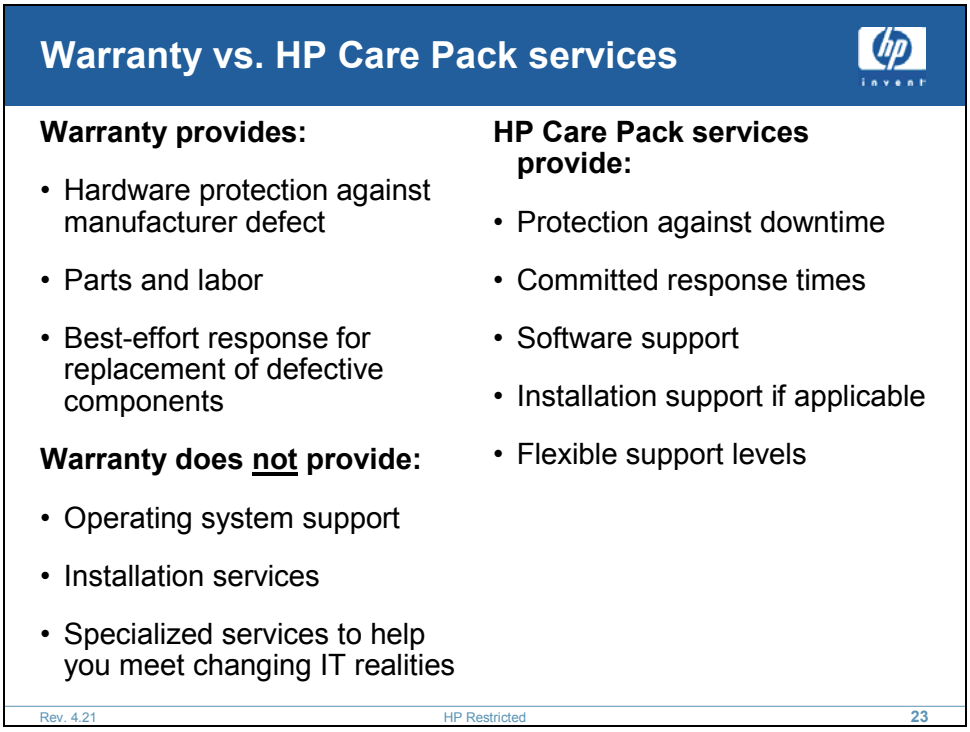


Warranty vs. HP Care Pack services

There is a difference between what a customer receives with a warranty and what the typical customer needs.

Warranty vs. services

Warranty provides protection against manufacturers' defects in the hardware.

Services provide protection from the effects a failure can have on the business solution.

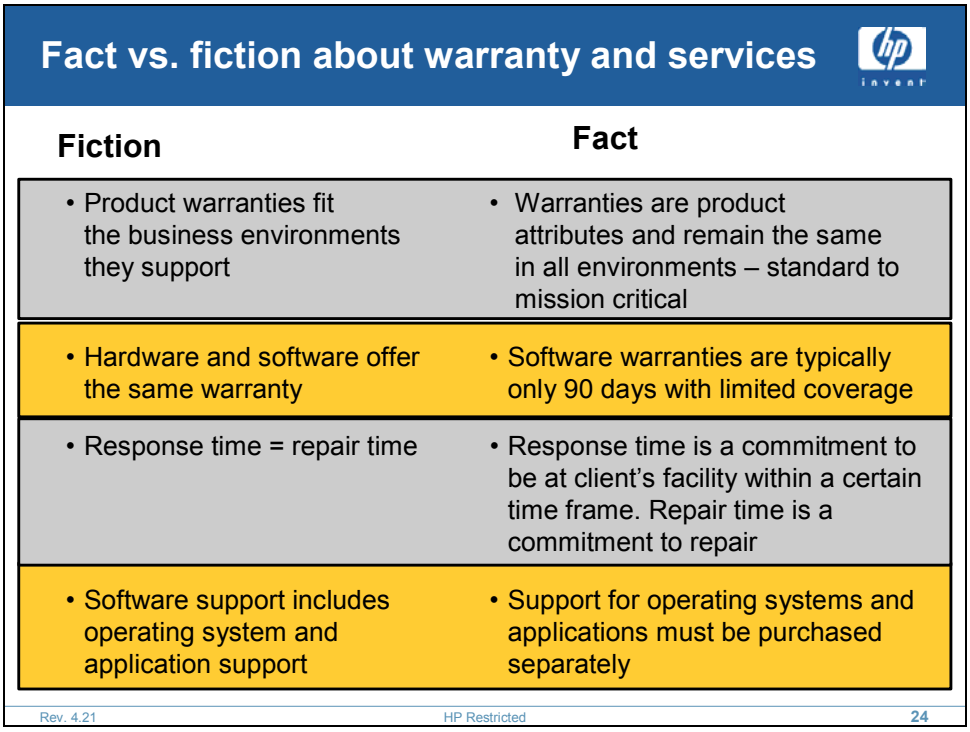
Stress to your customer the importance of understanding the level of service entitlement if no other services are purchased at the time of product sale.

Example

DL360 and DL380 server warranties are 3 years, Next Business Day response, and Best effort.

This means that if a customer has a failure at 11AM on Monday, the soonest someone will be out is 11AM on Tuesday. If the job is not done at 5PM, the engineer goes home and returns Wednesday. If the failure happens on a Friday, or right before a long weekend, it will be Monday before help comes!

How many of your customers implementing new server technology can wait that long?



Fact vs. fiction about warranty and services

Renewal and Post Warranty opportunity

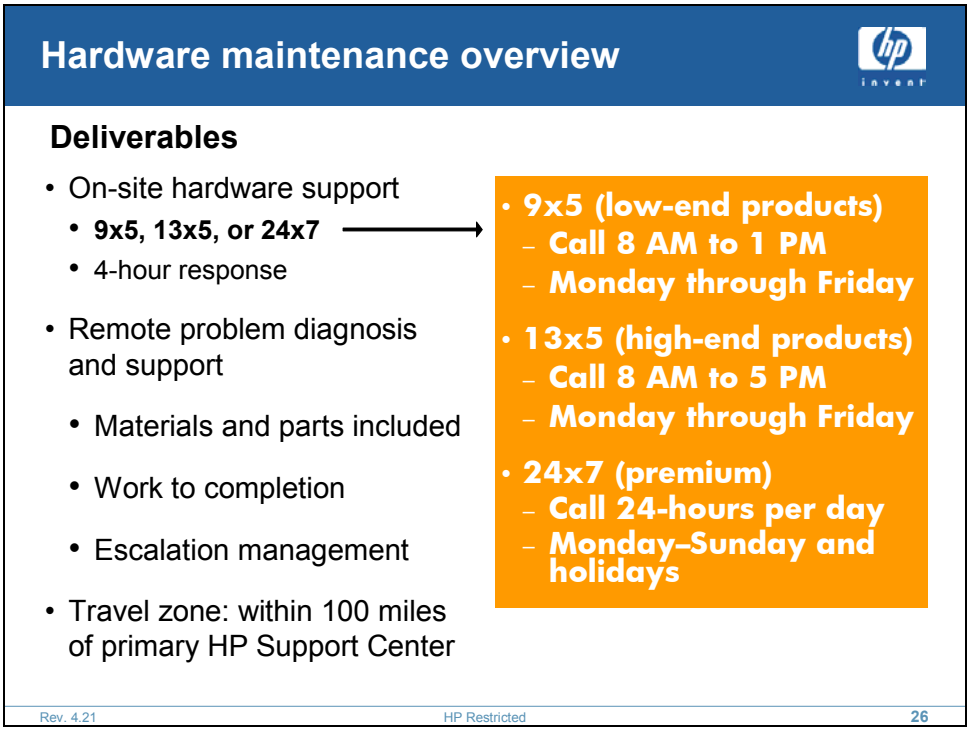
Business Environment

- Due to financial constraints, businesses are keeping their hardware longer and not turning them over every 3 years.
- Within six months of a service expiring, companies are ready to buy services to ensure coverage on older equipment.
- Service renewal sales after the post-warranty period have a higher close rate, in some countries as high as 50%.

Why sell packaged services from HP?

Why sell packaged services from HP? How important is this to your individual business models? How much profit and future value does this business bring to you?

- Leads to repeat business
- With service purchase, 85% buy again from the same manufacturer
- With no service purchase, only 62% buy again
- Increases revenue
- Increases profit
- Fulfills customer need
- Easy to sell
- Huge opportunity: $274B IT services market in North America



Hardware maintenance overview

On-site hardware support

The response time specifies the time from when the customer's service request is received and logged with HP until the HP representative arrives at the customer's site, if this time lies within the specified service window.

Based on your customer's needs, the warranty can be upgraded to three different levels of 4-hour response time:

- **9x5** means a customer must log their call by 1PM for HP to respond onsite by 5PM the same day (9 hours, 5 days), Monday-Friday
- **13x5** means a customer must log their call by 5PM for HP to respond onsite by 9PM the same day (13 hours, 5 days), Monday-Friday
- **24x7** means a customer can call HP any time, 365 days per year, including holidays, and we will respond on-site in 4 hours.

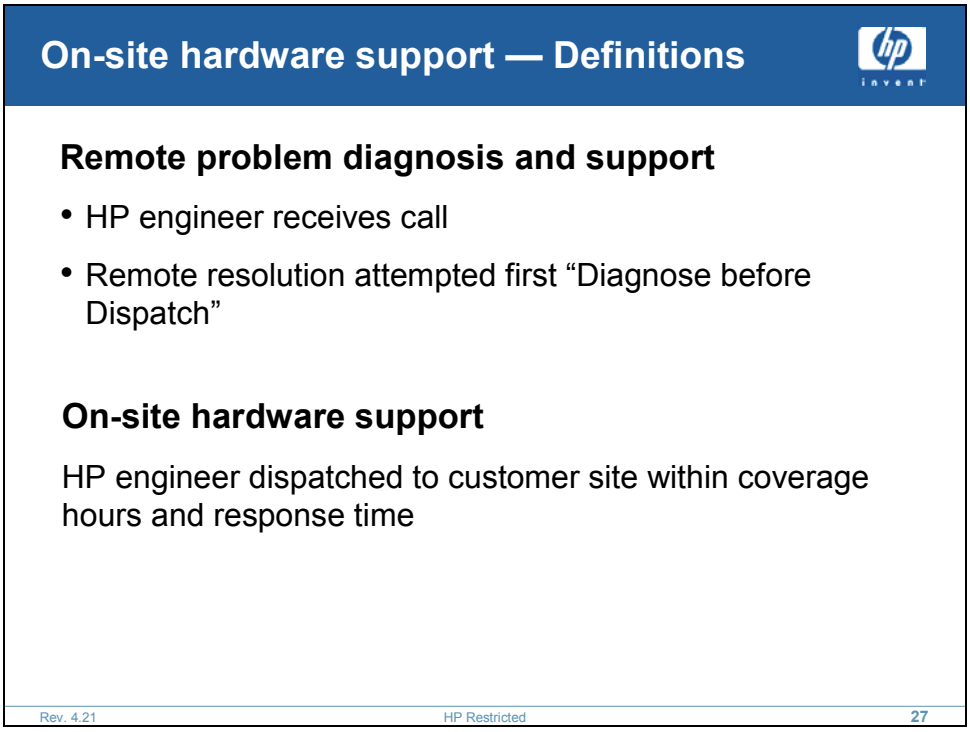
Remote problems diagnosis

Once an HP representative arrives at the customer's site, the engineer continues to deliver the service, either on-site or remotely at HP's discretion, until products are operational or as long as reasonable progress is being made. Work may be temporarily suspended if additional parts or resources are required, but resumes when they become available.

HP has established formal escalation procedures to solve very complex hardware problems. Local HP management coordinates problem escalation, rapidly enlisting the skills of key problem-solving experts throughout HP.

Travel zone

All response times apply only if the repair site is located within 100 miles (160 km) of the primary HP Support Responsible Office.



On-site hardware support — Definitions

Remote problem diagnosis and support

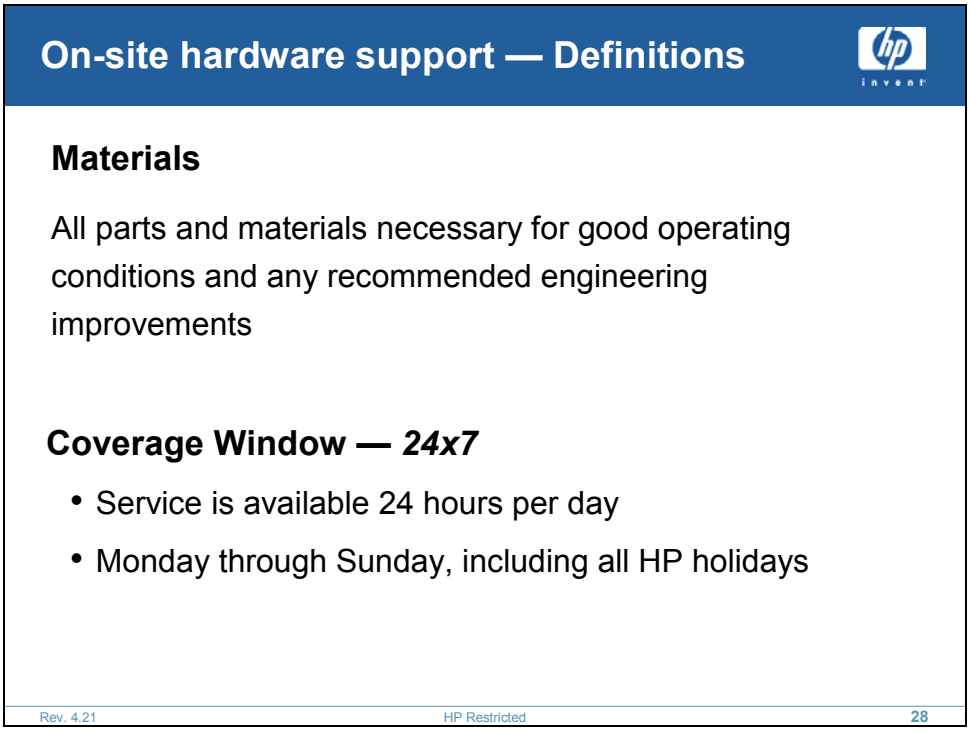
When the customer experiences a system problem, the call is quickly connected to an HP certified resolution engineer. The engineer first attempts to remotely troubleshoot, remedy, and resolve the problem within minutes. Prior to any on-site assistance, an engineer may initiate and perform remote diagnostics to facilitate remote problem resolution.

If necessary, a customer support engineer is quickly dispatched to the customer’s site to manage needed repairs until the covered hardware is operational again.

On-site hardware support

This service is for critical, technical hardware issues, as reasonably determined by HP, that affects business or degrades performance. If it cannot be resolved remotely and quickly, a customer support engineer is engaged and if necessary sent to the customer’s site to begin the on-site repair on the covered hardware to return it to operational condition.

In addition, HP may install available engineering improvements to ensure proper operation of the hardware products and maintain compatibility with HP-supplied hardware replacement parts. HP may install any firmware updates, which are required to ensure supportability of the covered equipment and which are not specified as customer installable. The installation of engineering improvements or firmware updates is not part of the call-to-repair time commitment.



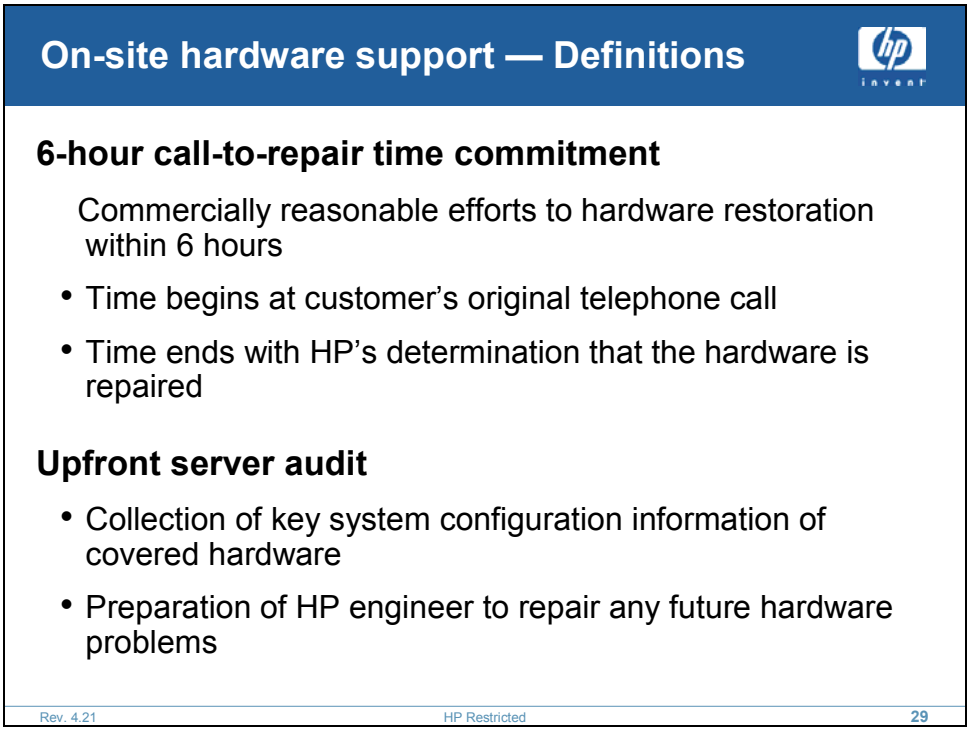
On-site hardware support — Definitions

Materials

HP provides all supported parts and materials necessary to maintain your customer's hardware equipment in operating condition, including parts and materials for available and recommended engineering improvements. Replacement parts are new or equivalent to new in performance. Replaced parts become the property of HP.

Coverage window – 24x7

HP provides complete coverage 24 hours a day, 7 days a week, 365 days a year.



On-site hardware support — Definitions

6 hour call-to-repair time commitment

HP uses commercially reasonable efforts to return the covered hardware to operating condition within six hours of the initial call to the HP Response Center. This means that call-to-repair time includes response time plus repair time.

Repair is complete upon HP verification through the use of diagnostics or other means that determine the malfunction has been corrected. The time it takes for HP to verify that the malfunction has been corrected is not included in the call-to-repair time commitment. At its sole discretion, HP may temporarily or permanently replace the product to meet the repair commitment. Replacement products are new or equivalent to new in performance.

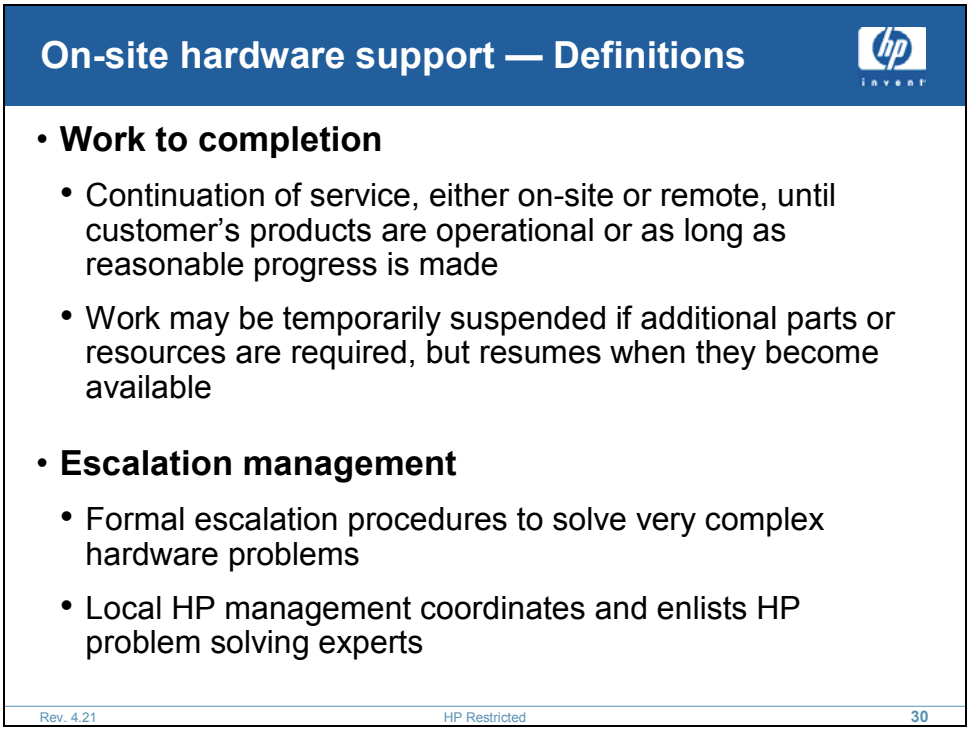
Setting up the HP Care Pack and performing necessary audits and processes before the hardware call-to-repair commitment is in effect takes 30 days from the time of purchasing this service directly from HP, or if purchased through an authorized HP Reseller, takes 30 days from registration of the HP Care Pack.. During this initial 30-day period, HP provides a 4-hour on-site response time and uses commercially reasonable efforts to meet the 6-hour call-to-repair commitment.

Upfront server audit

At its discretion, HP may require a server audit. If such an audit is required, an HP representative contacts the customer to arrange a server audit within the initial 30-day timeframe. During the server audit, key system configuration information is collected and an inventory of the covered equipment is performed. The information gathered in the server audit allows an HP resolution engineer to quickly survey and troubleshoot any future server hardware problems and

complete the repair quickly and efficiently. At HP's sole discretion, the server audit may be performed on-site, via remote system access, via remote audit tools, or over the phone. If an audit is required by HP, the 6-hour hardware call-to-repair commitment does not take effect until the audit is completed.

In addition, HP reserves the right to downgrade service to a response time commitment or cancel the service contract if critical server audit suggestions are not followed or the audit is not performed within the specified timeframe.



On-site hardware support — Definitions

Work to completion

Once an HP representative arrives at the customer's site the engineer continues to deliver the service (either on-site or remotely at HP's discretion), until customer's products are operational or as long as reasonable progress is being made.

Work may be temporarily suspended if additional parts or resources are required, but resumes when they become available.

Escalation management

HP has established formal escalation procedures to solve very complex hardware problems.

Local HP management coordinates problem escalation, rapidly enlisting the skills of key problem solving experts throughout HP.

HP Care Pack services: Hardware services

Next Business Day hardware support

8 to 5 call window

Customer calls need to be received between 8:00 a.m. and 5:00 p.m. local time, Monday through Friday, excluding HP holidays. Calls received after 5:00 p.m. on Friday will be logged on Monday and serviced on Tuesday.

Next business day response

Hardware maintenance service begins the next day after the customer's call has been logged and for which the customer has a contracted coverage window. An HP authorized representative arrives at the customer's site between 8:00 a.m. and 5:00 p.m. local time to begin hardware maintenance service during the next working day after the call is logged.

Travel zone

- **Within 100 miles (160 km)** — All response times apply only if your site is located within 100 miles of the primary HP Support Responsible Office.
- **Within 200 miles (320 km)** — Response time for sites between 101 and 200 miles away is two business days at no additional charge.

- **More than 200 miles (320 km)** — Travel is charged based on the distance to the location.
  - Response time for sites 201 to 300 miles away is 3 business days.
  - For sites beyond 300 miles, response time is established at time of order and subject to resource availability.

4-hour hardware support

- Four-hour response means an HP authorized representative arrives at the customer's site to begin hardware maintenance service within 4 hours after the customer's call has been logged, if this time falls within the customer's contracted coverage window.
- Once an HP representative arrives at the customer's site, the engineer continues to deliver the service either on-site or remotely at HP's discretion until products are operational or as long as reasonable progress is being made.

Some products available for 4-hour hardware support

- Business Critical Servers
  - HP Integrity rx2600
  - HP Integrity rx5670
  - HP Integrity rx4610
  - HP Integrity rx9610
- Network Products
  - ProCurve
  - MV network devices
- Storage
  - Switches
  - NearLine products
  - SureStore disk systems
  - Mid range arrays
  - Enterprise arrays
  - NAS products
  - SANworks

6-hour Call-to-repair

- HP Hardware Support On-site Call-to-Repair provides an IT manager with a team of support resources to immediately begin troubleshooting the system and ensure the availability of the hardware within a maximum of 6 hours from the time of the call receipt.
- This service is available for sites located within 50 miles (80 km) of a primary HP Support Office.
  - For sites that are located within 51 to 100 miles of a primary HP Support Office, an eight-hour hardware call-to-repair time commitment is provided.
  - Travel zones may vary in some geographic locations.

HP Care Pack services: Software support services

Software support – 9x5

This is basic software support that is available during standard office hours, with a 2-hour call-back time. Also included are 24x7 access to product information via the Web and new versions of covered software released during the contract period.

Software Support – 24x7

This provides everything included in Software Support, but with round-the-clock service availability.

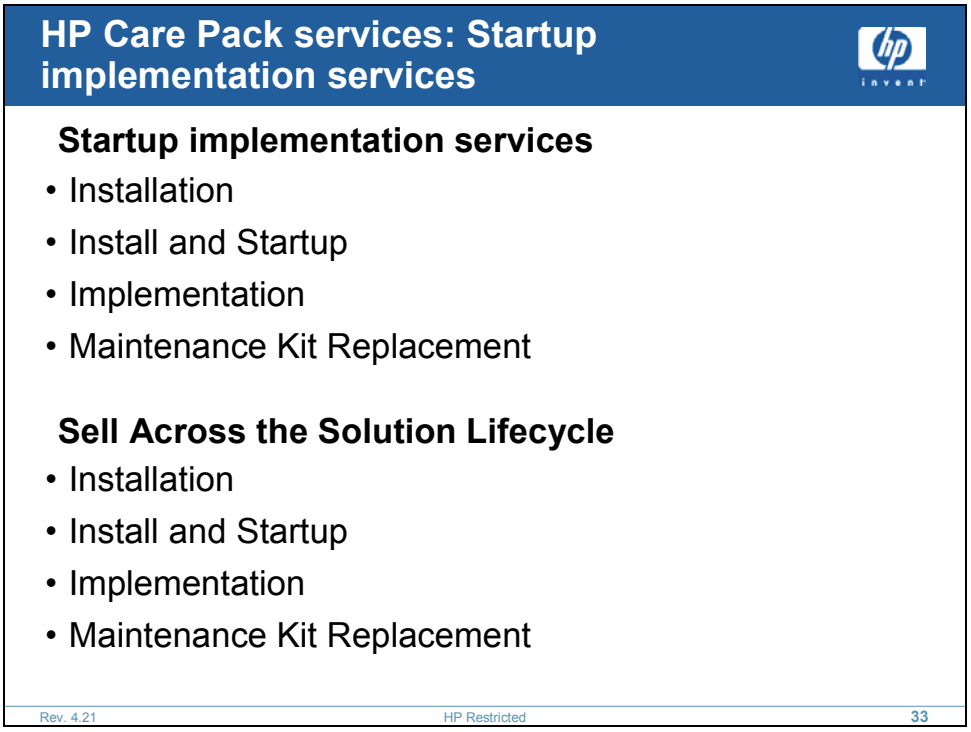
Software product updates

For customers who do not need technical support but do want to keep up with the latest software versions, we offer Software product updates. This service provides new versions of covered software released during the contract period. Also included is 24x7 access to product information via the Web.

Software Support attributes

- Access to Technical Resources: Phone, electronic communication, or fax can connect a customer to HP technical resources for assistance.
- Escalation Management
  - Formal procedures to solve complex software problems
  - Rapid enlistment of HP problem-solving experts and select third parties

- Remote Access tools enable HP to work interactively with the customer and to remotely diagnose an IT problem.
- Latest product features information
  - Known problems and available solutions
  - Operational advice and assistance



HP Care Pack services: Startup implementation services

HP Care Pack services: Combination services

Combination services include:

Support Plus

- 4 hr Hardware 13x5
- Software Technical Assistance
- Software Updates

Support Plus 24

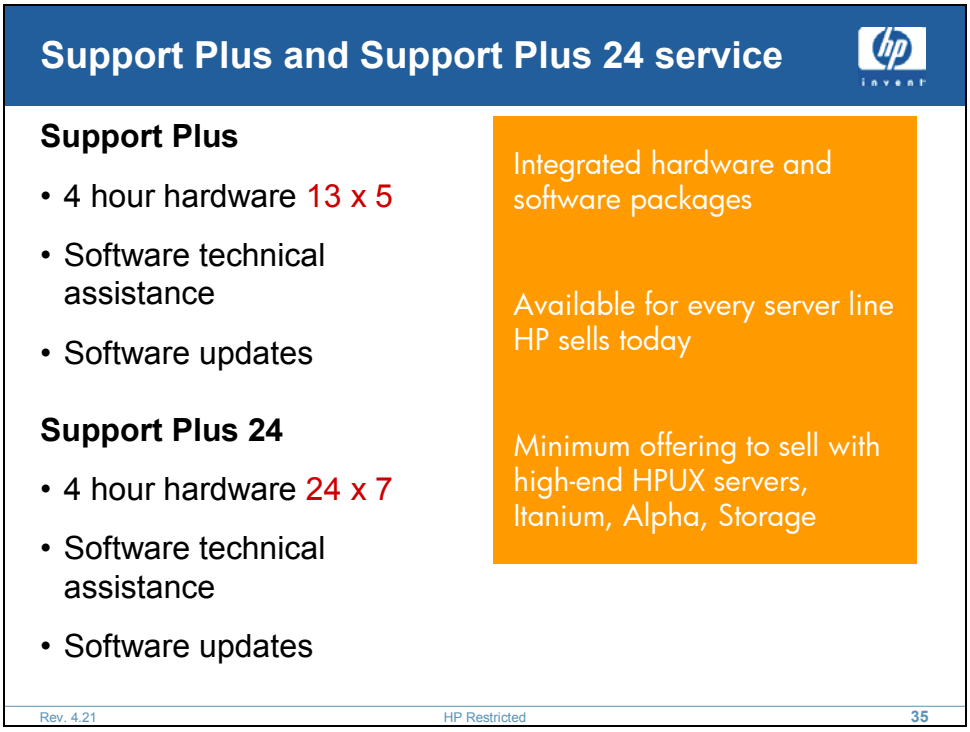
- 4 hr Hardware 24x7
- Software Technical Assistance
- Software Updates

Proactive 24

- Account Management
- 4 hr Hardware 24x7
- Software Technical Assistance
- Software Updates

Critical Service

- Account Management
- Preventive maintenance
- Change Management
- 6 hr call-to-repair
- Software Technical Assistance
- Software Updates



Support Plus and Support Plus 24 service

Support Plus and Support Plus 24 are available for every server and storage line HP sells today

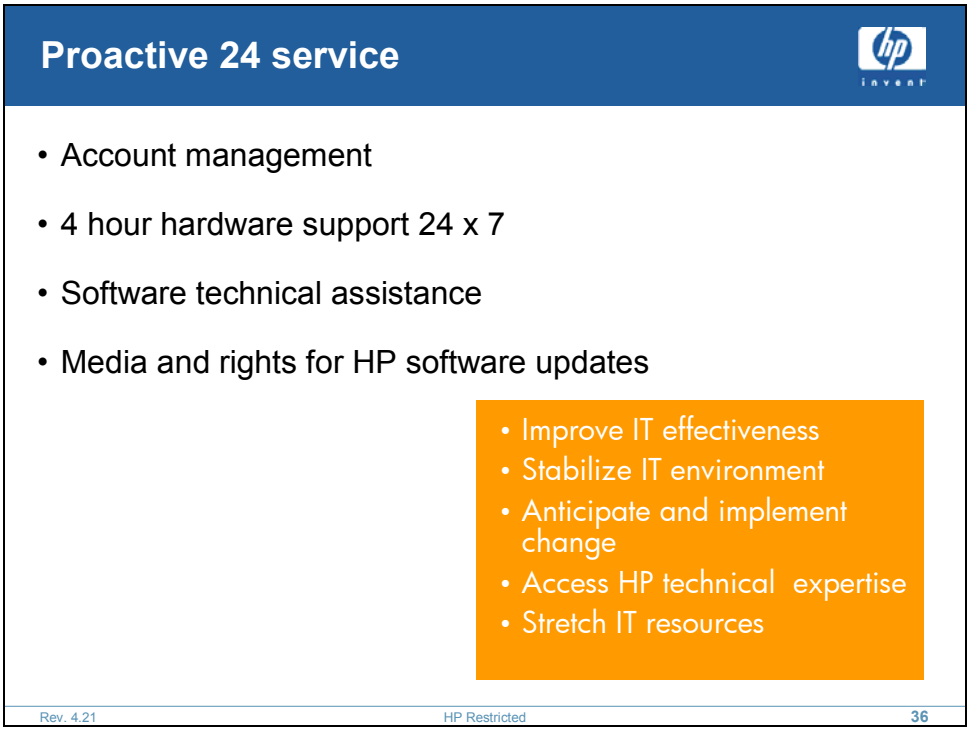
Call to action:

Upsell your services beyond standard support services into these premium packages.

HP Support Plus and HP Support Plus 24 are the minimum service offerings you should sell with high-end HP-UX servers, Integrity servers, AlphaServers, and Storage. It should be of critical importance not to sell an unsupported box for these high-end products, and for the most price-sensitive customers, these service packages should fit the need.

Features:

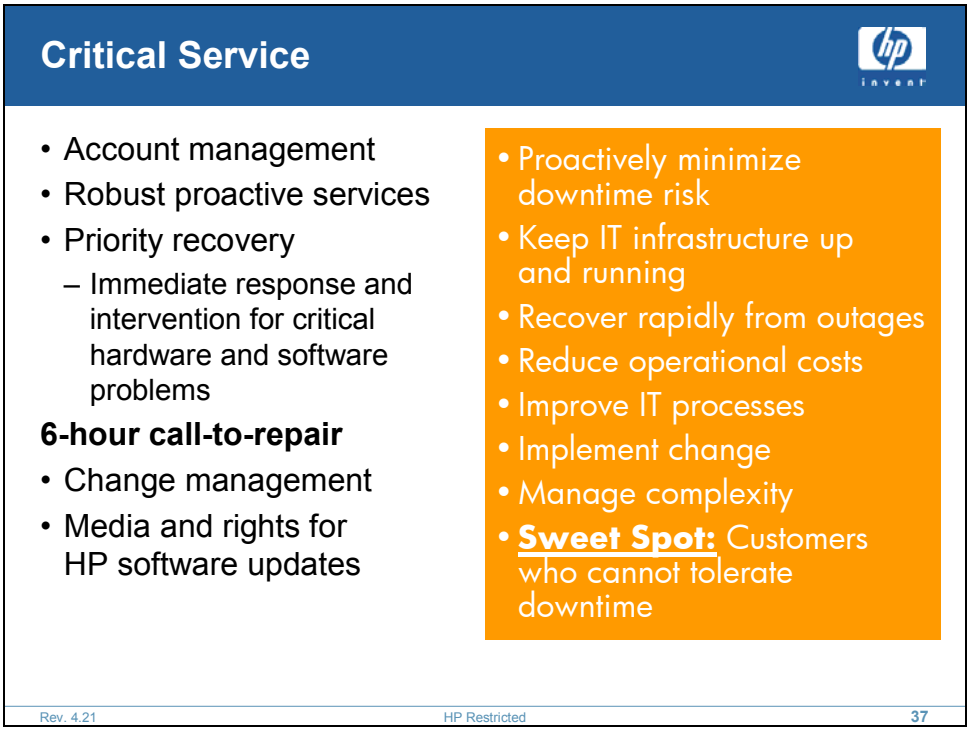
- Semi-annual, on-site support planning
- Remote, quarterly activity review
- Annual system health check
- 1 level B technical service
- Semi-Annual Patch management and recommendation
- Hardware event notification
- Education services (optional)



Proactive 24 Service

- Combining hardware and software support with HP's expertise in preventing problems before they occur, Proactive 24 Service improves the effectiveness of all technologies in the customer's IT infrastructure and establishes a relationship with HP that strengthens the customer's IT team.
- In addition to software product updates, 24x7 coverage for hardware with a 4-hour on-site response time, and 2-hour call-back for software questions, this service includes a designated HP account manager. The account management team includes [fix commas to clarify how many people are on the team] an ASE, regional, on-site and a Response Center Account Advocate who do proactive work for the customer only! They work with the customer's IT team to improve performance and stability, and proactively monitor operations via HP's suite of remote tools on an ongoing basis.

To help the customer help themselves, HP also includes education planning assistance and education credits from HP Education Services.



Critical Service

Features:

- Quarterly on-site support planning
- Accelerated escalation management
- Remote quarterly activity review
- Environmental response 24 x 7
- Availability checkup
- 2 level B technical services
- Quarterly customized patch analysis and management
- Firmware updates, micro-code upgrade
- Remote monitoring, analysis, and management

6-hour Call-to-Repair

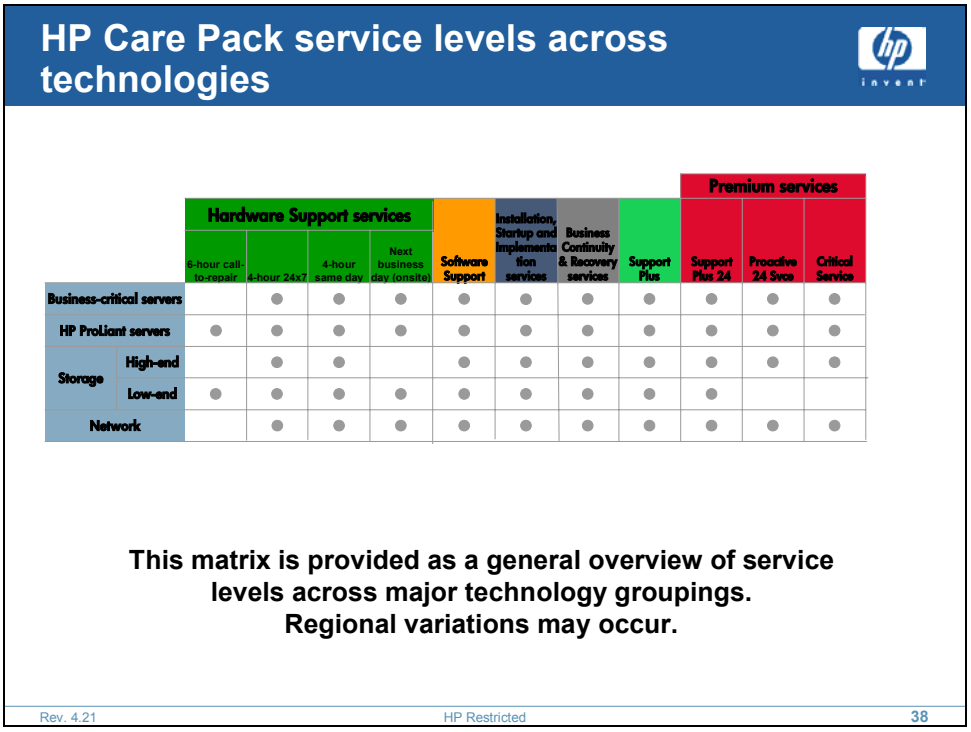
The goal is avoiding downtime, of course, but should a system failure occur, the Critical Service level includes a 6-hour Call-to-Repair commitment.

Remember, that is a capability our competitors cannot match, and most of them cannot match the quality of our proactive service capability, either.

HP's Critical service also includes education planning assistance and education credits from HP Education Services.

Supported Operating Systems

- HP-UX
- MPE/iX
- Tru64
- UNIX
- OpenVMS
- Windows
- Linux



HP Care Pack service levels across technologies

For more detailed information regarding these services, specific product models, or additional HP Care Pack services, please refer to
www.hp.com/services/carepack
or contact your local sales representative.

HP Care Pack service levels for business critical servers

HP Care Pack software support services:

- Software Support
- Software Product Updates

HP Care Pack onsite hardware support services:

- Hardware Support 9x5, 13x5, or 24x7, with 4-hour onsite response
- 6-hour Call-to-Repair, 24x7

HP Care Pack combination services:

- Support Plus
- Support Plus 24
- Proactive 24
- Critical Service

HP Care Pack startup implementation services:

- Installation
- Installation and Startup
- Education

HP Care Pack service levels for storage products

HP Care Pack software support services:

- Software Support and Software Support 24x7
- Software Product Updates

HP Care Pack onsite hardware support services:

- Hardware Support 9x5,13x5, or 24 x7 with 4-hour onsite response
- 6-hour Call-to-Repair

HP Care Pack combination services:

- Support Plus– Proactive 24
- Support Plus 24– Critical Service

HP Care Pack startup implementation services:

- Installation and Education
- Installation and Startup

Networking products

HP Care Pack software support services:

- Software Support and Software Support 24x7
- Software Product Updates

HP Care Pack onsite hardware support services:

- Hardware Support 9x5,13x5, or 24 x7 with 4-hour onsite response
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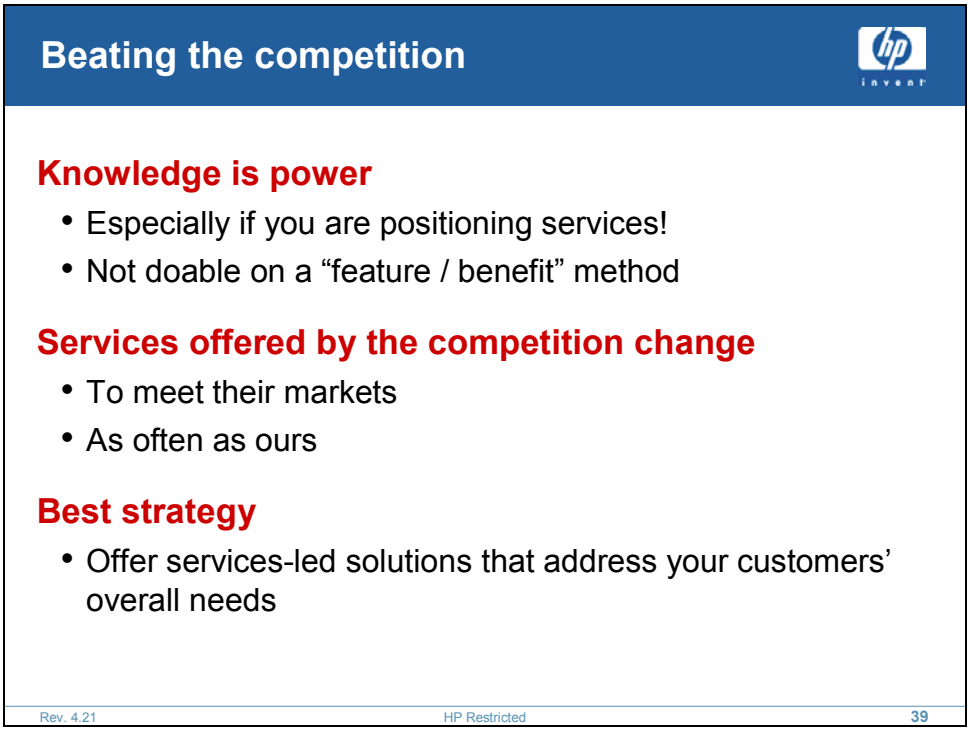
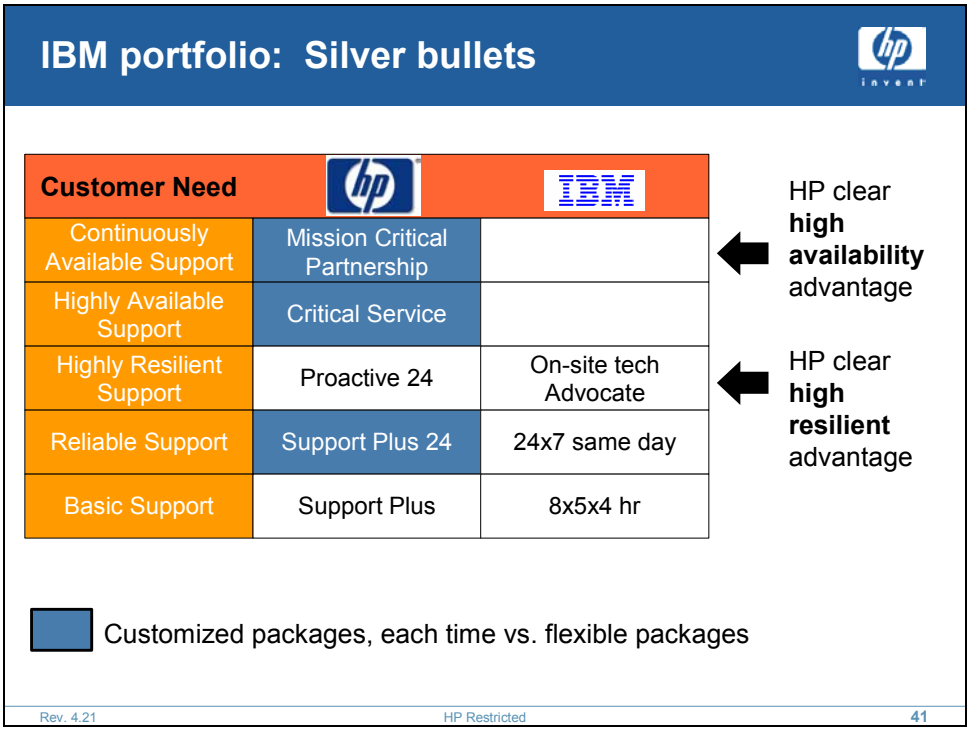


Beating the competition

Competitively selling services

Effective qualifying techniques give you the specific value points your competitors may not have.



IBM portfolio: Silver bullets

In the highly resilient world, IBM offers their "On-Site Technical Advocate." This resource helps deal with change and problem management without the cost of hiring and training additional staff.

With the HP Onsite Technical Advocate, an assigned advocate works with a company as a business-wide computing problem manager and customer advocate.

Companies can choose IBM coverage for ES/9000, AS/400, RS/6000, Windows NT, or OS/2 platforms. Based on the platform, a skilled, IBM-trained technical advocate is assigned to the customer's account. This is a software-only service.

IBM strengths

- IGS is the world's largest IT services and consulting provider, with more than 90,000 business partners worldwide
- IBM's portfolio of Express solutions was developed for medium-sized businesses.
- IBM's philosophy of teaming for mutual success rather than passing the opportunity off to its partners gives them a competitive edge.
- IBM leads with services, so salespeople are trained to discuss the value of the solution before talking price.

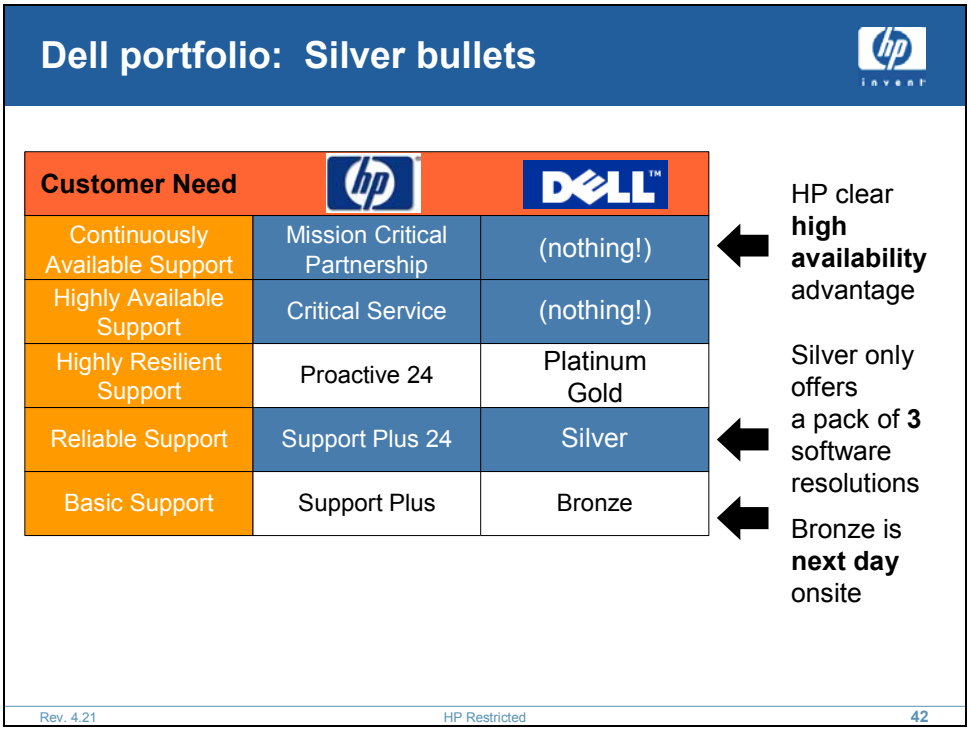
- Strong brand recognition
- Single point of contact and responsibility
- Outsourcing strength

IBM weaknesses

- After the small business market formula in the 1990s–2002, IBM is focusing on mid-market, but there is some question whether they will shift gears to the enterprise segment when the economy improves.
- IBM has a tough sell in the small-medium business (SMB) space, as it is not known for its easy-to-use software.
- Uneven delivery across services
- Perceived as biased toward IBM solutions
- Customers fear IGS for loss of control when outsourcing
- All-or-nothing IGS outsourcing approach promotes aggressive upfront pricing with lots of "change orders" on back end

Positioning HP services against IBM

- #1 in IT sales to SMB market: $21B revenue annually
- HP investing $750M in Smart Office, a set of new services and products designed for SMBs
- HP expertise includes live, interactive, on-line resources and tools, SMB expertise centers, technology adoption programs
- 34,000 U.S. partners with SMB training
- SMBs have an affinity for a Microsoft environment, and HP is #1 in Windows expertise
- HP partners better with selective outsourcing versus IGS all-or-nothing approach
- In an InfoWorld survey, HP Services finished #1 overall whereas IGS was rated last in cost and value



Dell portfolio: Silver bullets

Dell Platinum

Dell's Platinum is a good comparison with Proactive 24. If Dell tries to sell Gold against HP Proactive 24, make sure the customer recognizes that Gold is nowhere near comparable.

Dell Gold

Dell Gold is inferior to HP Proactive 24 because Gold uses a "team of TAMs (technical account managers)" which, jointly, are responsible for servicing the customer.
Note that this is not an entire team working for the customer. In fact, it is a team of six engineers who are collectively responsible for many different customer accounts.

With HP, the customer can depend on a single point of contact through their assigned HP Account Support Engineer as well as a remote Response Center Advocate who is assigned to the customer's account.

Dell Gold offers no change management services, whereas HP Proactive 24 offers a technical service of the customer's choosing based on the careful recommendation of the assigned account manager.

Dell Gold has no custom support plan. With HP Proactive 24's semi-annual plan review, tracking, and updating, the customer knows that they are being offered the best customer service available.

Dell Silver

Dell Silver is the only software support provided in what they call a “resolution pack of 3” software problem resolutions.

In contrast, HP Support Plus 24 provides essentially unlimited software resolutions, so HP is there for the customer no matter what their software support needs might be.

With Dell, they greatly limit their software support. In fact, this same “resolution pack of 3” is true for Dell Gold as well.

Dell Bronze

Dell Bronze is far weaker than HP Support Plus because it only offers next business day response for on-site hardware support.

In contrast, HP Support Plus offers same-day, on-site hardware support with 4-hour response during the most critical 13 hours of the day. HP Support Plus is clearly superior to Dell Bronze.

Dell strengths

- Greatest weapons are its ultra-efficient supply chain and its enormously popular brand
- Willingness to sacrifice price and margin to gain market share
- Lean infrastructure and low operating costs
- A track record of being successful in every market they go after
- Successful alliance with EMC and Cisco
- Easy to do business with in order placement, order status, and returns
- Solutions-oriented ads targeting SMBs featuring services, customization and price effectiveness. Unique business need = unique solution.

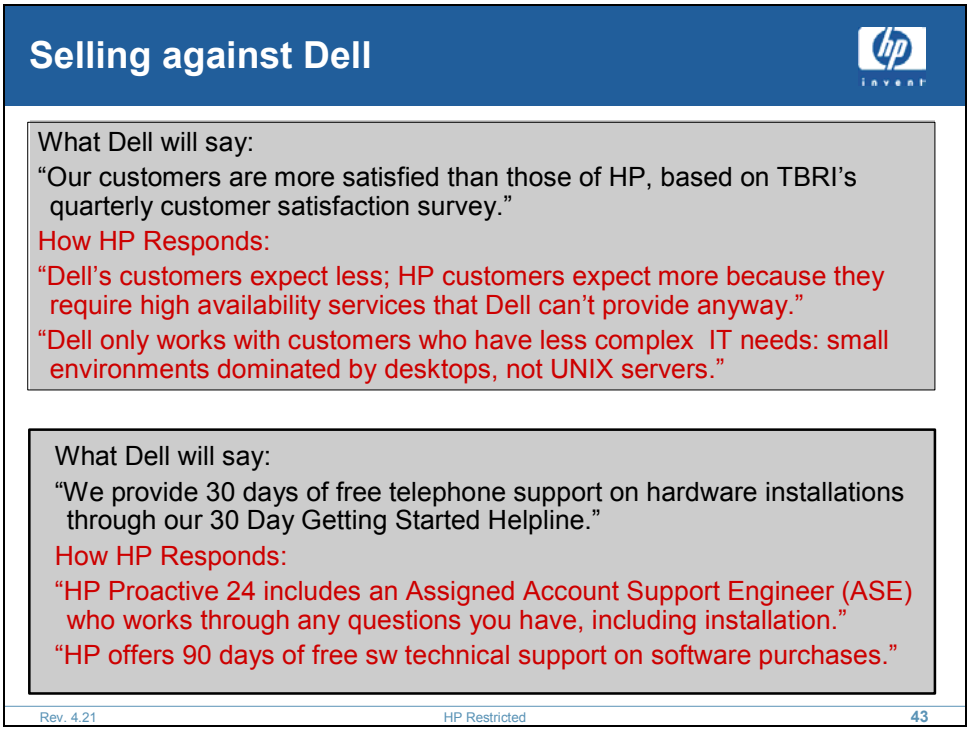
Dell weaknesses

- Would rather solve problems via phone or online to avoid going onsite
- Home Depot Model: Customers go to them for product, not because they want help
- 85% of computer problems are software-related, but Dell offers hardware services—what about software support?
- Trying to engage select service providers to help capture the SMB market without jeopardizing its direct sales strategy
- Professional Services have lack of experience

VARBusiness 2003 Annual Report Card: VARs say Dell cannot hold a candle to its rivals.

Positioning HP services against Dell

- #1 in IT sales to SMB market: $21B revenue annually
- HP investing $750M in Smart Office, which is a set of new services and products designed for SMBs
- HP xpertise includes live, interactive, on-line resources and tools, SMB expertise centers, technology adoption programs
- 34,000 U.S. partners with SMB training
- Dell users value HP, so use value and relevance to appeal to them
- Dell's high customer satisfaction is due to large customer base with low-end systems instead of complex, high-end systems
- SMBs have an affinity for a Microsoft environment, and HP is #1 in Windows expertise



Selling against Dell

Satisfaction survey (TBRI=Technology Business Research Inc.)

Dell will say that their customers are more satisfied than those of HP, based on TBRI's quarterly customer satisfaction survey. Dell may even go so far as to present the customer with a glossy slide reproducing TBRI's bar chart, which they have up on their website.

Responding to Dell's claims:

1. Dell's customers expect less because they are only getting basic maintenance. HP customers expect more because they require high-availability services that Dell cannot provide anyway.
   As we have seen in earlier slides, HP is a high availability leader. Dell barely knows the definition of high availability. So, of course, Dell's customers will rate them higher—their customers don't expect Dell to do anything but basic maintenance services!
2. Dell only works with customers who have simple IT needs: smaller environments dominated by desktops, not servers. How do we know this? In the VERY SAME TBRI STUDY that Dell quotes, the following is also true: Dell averages 350 units per site while HP averages 750.
   - The same report also states that Dell supports primarily desktops and notebooks, while HP is skewed toward servers. Again, Dell customer support requirements are far simpler than HP's.
   - No wonder Dell's satisfaction ratings are higher.

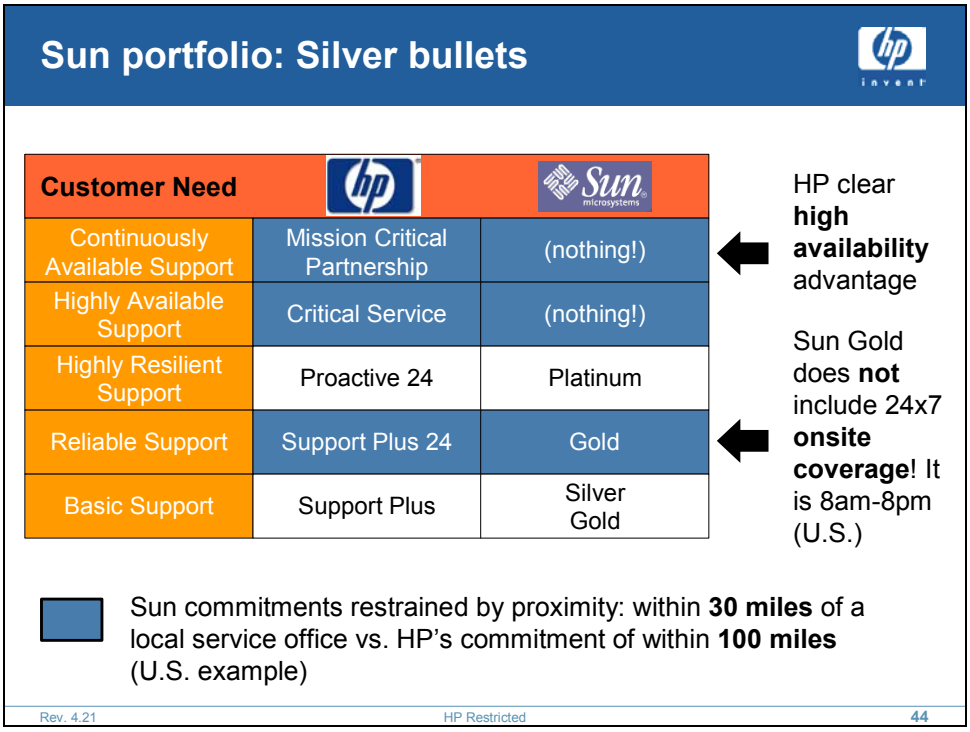
Another claim from Dell:

"We provide 30 days of free telephone support on hardware installations through our 30 Day Getting Started Helpline."

Responding to this claim:

It is true we do not have a line item in our data sheet that says "installation support for hardware," but that is because we do not need to say it. It is included in the collaborative work that HP's Personal Account Team provides to each HP Proactive 24 customer.

- HP Proactive 24 includes an assigned Account Support Engineer (ASE) who works through any questions the customer may have.
- The engineer is the focal point for any customer needs that arise from the account. HP Proactive 24 features also include a Response Center Advocate who remotely assists the client with such activities as proactive patch management and quarterly account reviews.
- In addition, for all software purchases, HP offers 90 days of free software technical support via telephone. This includes installation, software configuration and setup, interpretation of system error messages, and support pack update information.



Sun portfolio: Silver bullets

Make sure when dealing with Sun that you compare this same type of product.

- For the HPCS portfolio, this chart is the comparison that the customer needs to make.
- Do not let Sun confuse the customer into thinking that Sun's Gold, for example, is comparable to HP Proactive 24.
- Do not let Sun trick your customer into believing that Sun Platinum is equivalent to HP's Critical Service, because it is not.

Starting at the top of this chart:

- Sun has nothing comparable at the Continuously Available Support level or the Highly Available Support level, where HP has its Mission-Critical Partnership and Critical Service.
- Sun's Platinum is inferior to HP Proactive 24 because Sun does not have the level of expertise that HP brings to the table. Sun also cannot offer 6-hour call to repair to its customers. Sun has weaker global coverage.
- Sun Gold is comparable to HP's Support Plus 24, yet even here, Sun is weaker. Sun does not include 24x7 onsite coverage with their Gold solution—it is only optional, for an estimated 20%–30% uplift.
- Do not let them fool your customer into thinking that their standard Gold package is equivalent to HP Support Plus 24. When HP says 24 x 7 support, we mean we cover you 24x7. When Sun says it in their Gold data sheet, what they really mean is 24x7 TELEPHONE support, with 8 a.m.—8 p.m. ONSITE COVERAGE.

- Be careful not to let Sun Silver be thought of as 24x7 support. In its marketing material, Sun says that Silver gets you 24x7 access, but this can be misleading because it is simply 24x7 access to a web-based knowledge database. It is not reactive support.
- HP actually offers the same 24x7 on-line access feature for no additional charge as part of the ITRC (HP Information Technology Resource Center) that is available to all of HP's support customers.

  Note: for additional information on ITRC, please see: www.itresourcecenter.com

Also note that Sun "on-site response" commitments are restrained by proximity they offer for customers who are within 30 miles of a local service office in the U.S. By contrast, HP's commitment is for customers within 100 miles of an HP support office in the U.S. That means Sun has a less robust, less expansive support network.

Sun Strengths

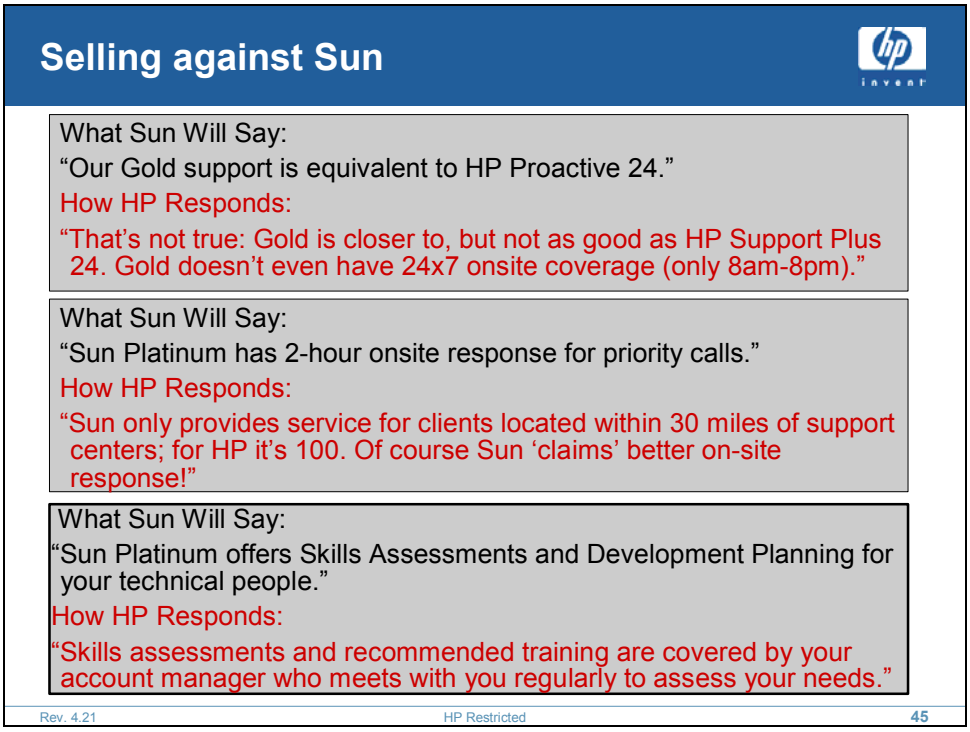
- Strong channel programs and strategy
- Strong IVS relationships
- Large server installed customer base

Sun Weaknesses

- Market share loss
- Proprietary architecture for hardware and software
- Beginning to develop a partner architecture
- Lead with technology vs. total solution, including services
- Focusing more on consulting

Positioning HP against Sun

- Focus on industry standards
- Sell HP adaptive enterprise message
- Leverage HP's ability to provide services beyond the box
- Leverage HP partnerships with Microsoft, SAP, and Oracle
- Emphasize HP's ability to provide mission-critical support in HP-UX and Linux environments
- Take a solution approach to your customers, including lifecycle services, implementation services, software, and hardware



Selling against Sun

Combating Sun's claims

Sun will make lots of empty claims by throwing around statements comparing Sun with HP Customer Support. Here is how to combat the kinds of things Sun will say.

Gold compared with Proactive 24

- Sun claims that Gold support is equivalent to HP Proactive 24, but this is not the case. Not only is Sun Gold more comparable to Support Plus 24 and NOT Proactive 24, it is also not as good as Support Plus 24.
- HP's offering includes 24x7 onsite coverage, whereas Sun Gold only offers 8 a.m. to 8 p.m. coverage for onsite support.

2-hour onsite response

- Sun will claim that Platinum is superior to Proactive 24 because Platinum has 2-hour onsite response for priority 1 calls.
  - But Sun has less comprehensive coverage areas–they only service clients within 30 miles of support centers.
  - HP covers clients within 100 miles (Critical Services 50 miles). So, of course, Sun can make the claim of having 2-hour onsite response because they require their customers to be located much closer to them.

Skills assessment

- At HP, we place great value on working with our customers to solve their needs. The customer's Assigned Account Support Engineer conducts a regular dialogue with the customer that includes the assessment of training needs and recommended courses that are appropriate for the customer, given their IT environment.
- When the customer does decide to take training, we have over 3,000 courses available that can be delivered through our award-winning HP Virtual Classroom for ease of use and time flexibility, or through live instructors to allow for a more personal approach—whichever the customer prefers.

Let us look at one other competitor.

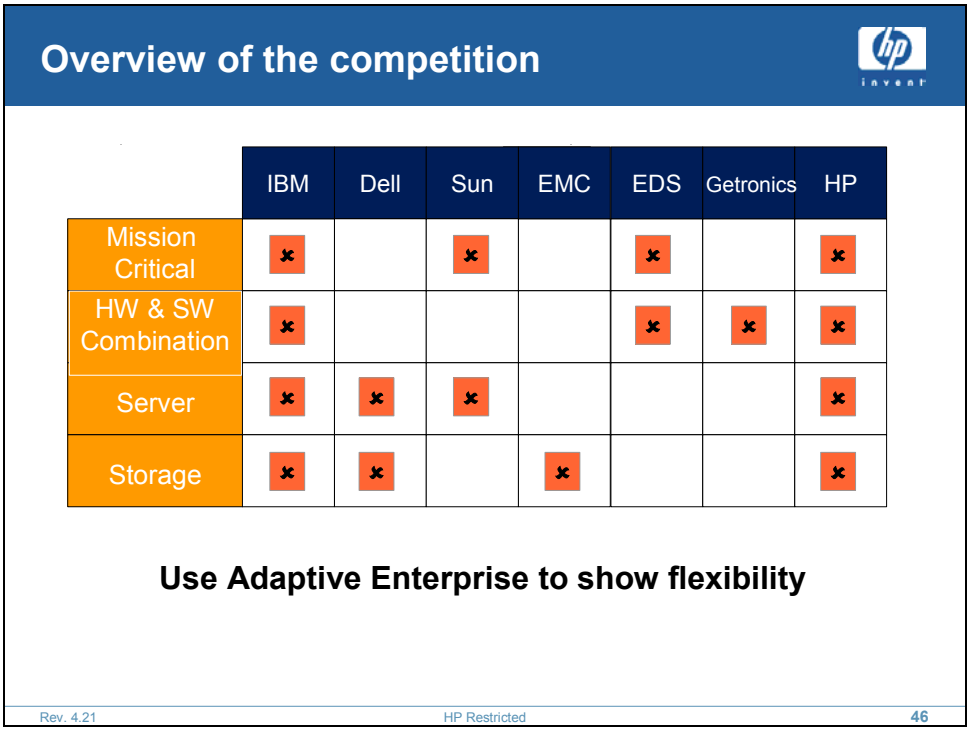
Selling against EMC

Sweet Spots for HP against EMC

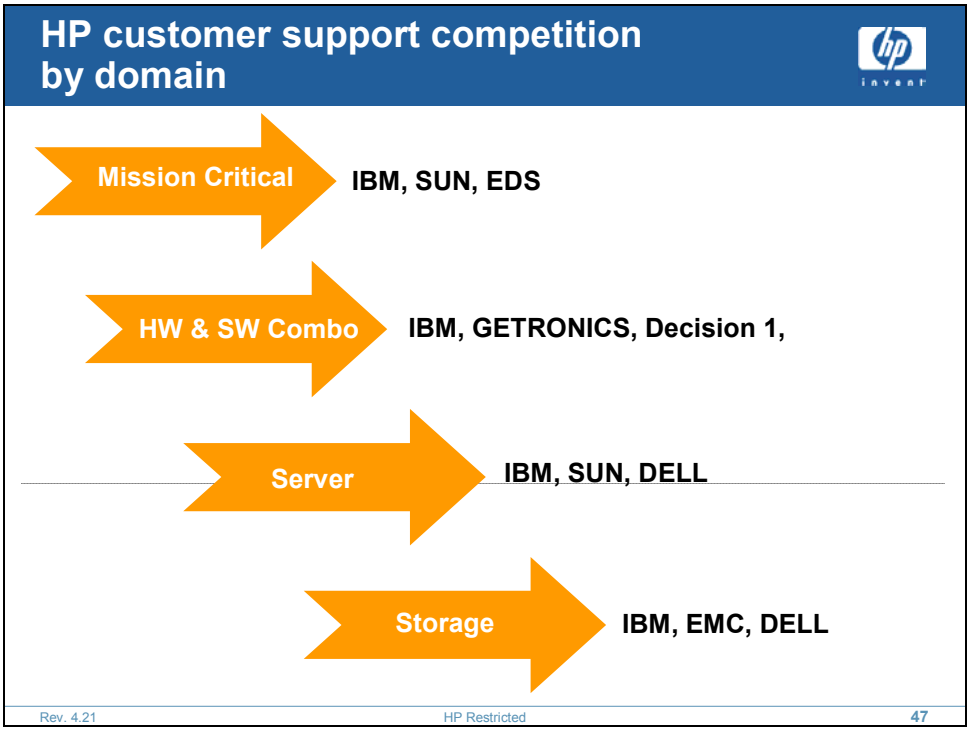
- 'Pay per use' models, because they have no capacity on demand today
- One solution for the entire environment
- Mission-critical support

Parity

- Partner Delivered Implementation Services
- Parity at product support services



Overview of the competition



HP customer support competition by domain

Mission Critical

- IBM: Leads with services, customizes every deal, sells high in the account
- SUN: Focuses on proprietary hardware and software
- EDS: Sell high in the account, offers outsource of total needs

Hardware and software combo

- IBM: Outsourcing strength, single point of contact, one-stop shop
- GETRONICS: Multi-vendor expertise, targeted mainly DITS customers, no software
- Decision 1: Multi-vendor expertise, targets mainly mature technology

Server

- IBM: Full suite of maintenance services, global capabilities
- SUN: Low cost pressure on UNIX servers, hardware focused
- DELL (ISS): Direct model efficiencies, their web interface includes a services strategy

Storage

- IBM: Services and solutions leader
- EMC: Product and awareness leader
- DELL: Brand reputation and recognition, partnership with EMC

Getting more from HP Services — Opportunities for your customer

For your customer

- Ability to focus resources internally
- Reduced Total Cost of Ownership
- Peace of mind

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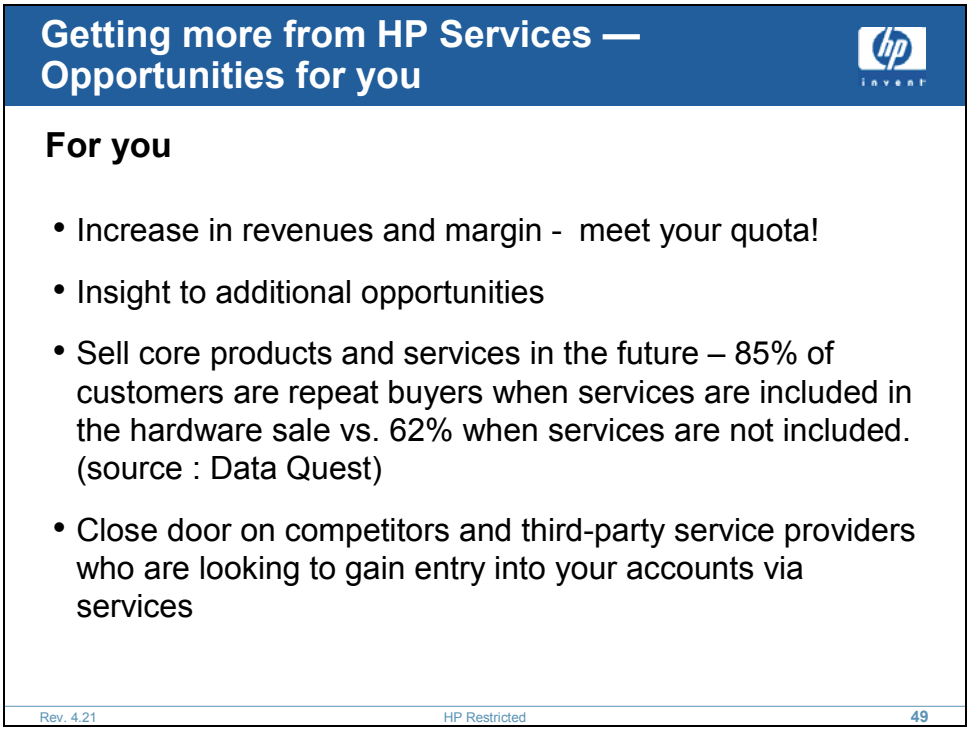
Getting more from HP Services — Opportunities for your customer



Getting more from HP Services — Opportunities for you

HP Services: A global leader

Benefits to Channel Partners

- Aligns your selling model with HP strategic direction
- Consultative sales process results in higher-level, quality relationships
- Allows focus on area of expertise
- Enables simplification, standardization, modularity, and integration
- Provides strategic re-commitment by HP with an extensive and growing industry mindshare
- Provides worldwide presence
- Provides visibility and access to joint sales and marketing activities
- Provides greater opportunities in strategic business solutions
- Once the customer is sold on the Adaptive Enterprise vision and strategy, you can:
  - Realize ongoing, annuity revenue streams
  - Secure higher-revenue projects
  - Reduce cost of sales

How HP and Channel Partners win together

- By enabling customers to:
  - Have control and choice over infrastructure, business applications, and business processes
  - Competitively respond to market changes
- Greater accountability, agility, and business value from IT investments for our customers
- Leadership in platforms and infrastructure services
- Worldwide partnering and solution value chain
- Leading position with partners to drive industry standards
- Collaborative versus competitive approach
- Flexibility and choice
- Innovation
- Best-in-class solutions by integrating industry and domain leading partners

HP and its partners make an unbeatable combination in the HP Adaptive Enterprise strategy and vision.

Additional Resources

Partner Resources

- http://www.hp.com/country/us/eng/solutions/partners.html
- http://www.hp.com/partners/us
- http://www.hp.ca/pweb/

HP Care Pack Services Partner Website/Channel Services Network (CSN)

- http://www.hp.com/partners/csn

HP Care Pack Services Lookup Tool

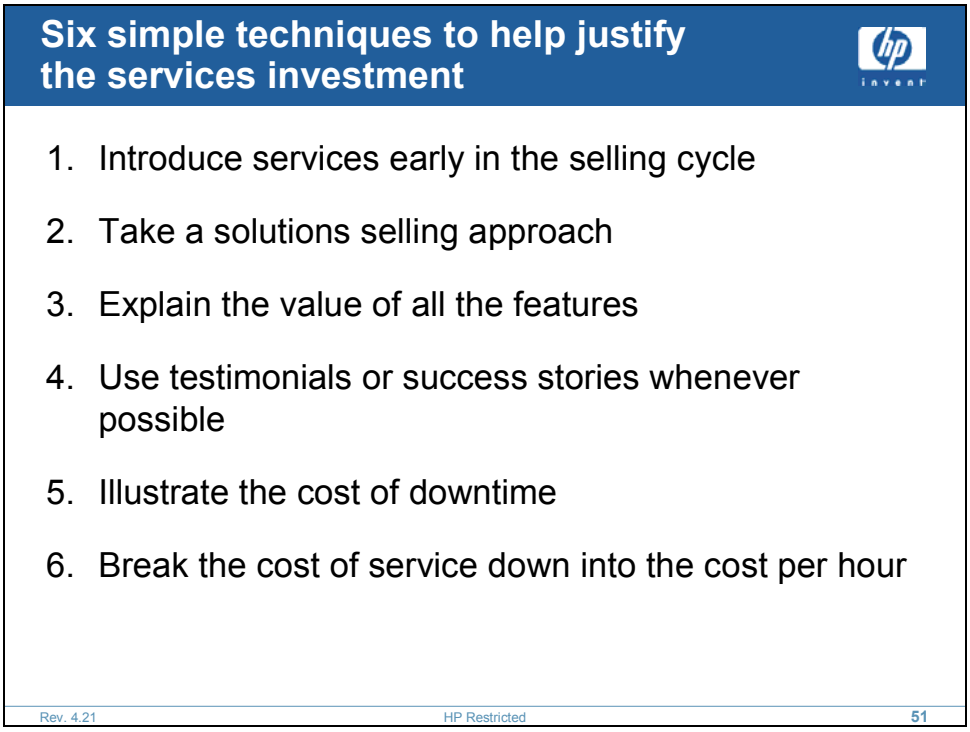
- http://www.hp.com/go/lookuptool

HP Care Pack Services Web-based Training

- http://www.hp.com/partners/csn

Customer information

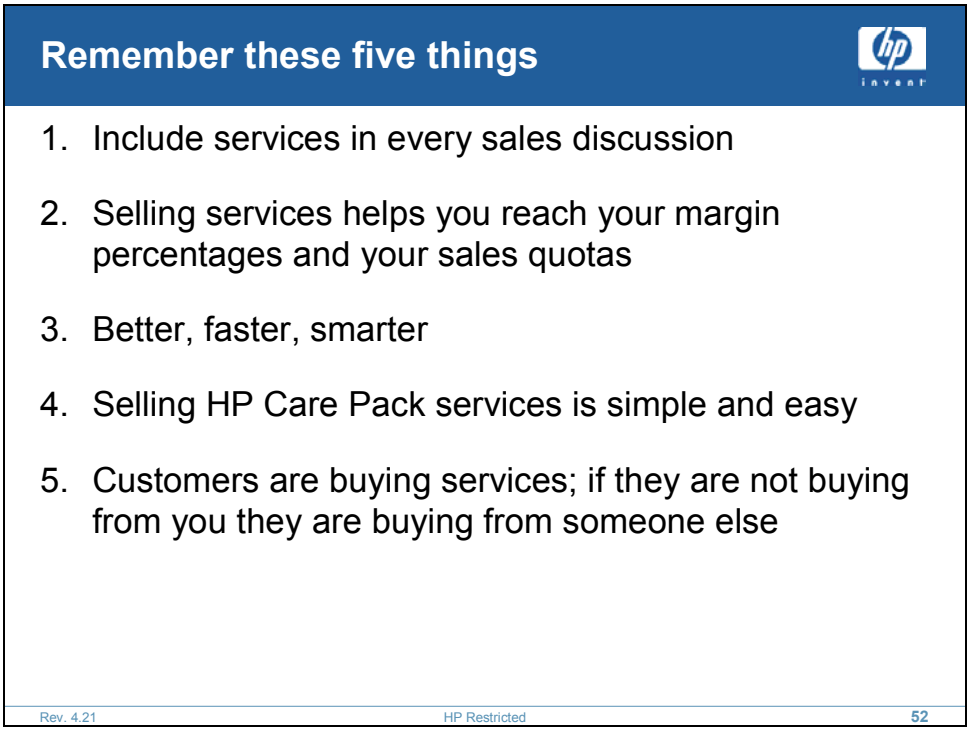
- http://www.hp.com/services/carepack



Six simple techniques to help justify the services investment

1. Introduce services early in the selling cycle.
   - Treating services as an afterthought is a sure way to get a negative response from your customer.
   - Make them a key part of your solution and a must to achieve business goals.
   - Warranty DOES NOT do that.
   - Warranty is a product attribute, not a solution component.
2. Take a solutions selling approach.[use less slang in the following list and be more literal]
   - LISTEN to the customer's business goals
   - Pay attention to details"
   - Deal with all aspects of the solution
   - Ask "Impact Oriented" questions to do this
3. Explain the value of all the features.
   - What does response time mean to the customer?
   - Equate response times to business objectives
   - Installation means speed of deployment!
   - Make it personal!

4. Use testimonials or success stories whenever possible.
   - Industry or business specific
   - Talk to your peers
   - Show them the bottom line—this increases your value to the customer!
5. Illustrate the cost of downtime.
   - Break down the cost of downtime vs. actual cost of services per hour
   - Compare results
   - Break down the services investment by the hour and minute
   -
6. Break the cost of service down into the cost per hour, then compare with the cost of downtime



Remember these five things

Summary

- Warranty versus HP Care Pack services
- Hardware maintenance
- HP Care Pack services
- The competition
- HP Services

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Summary

Student Guide

Power On With HP for technical professionals – Multi-OS

Book I

Course Number: 10227

March 2004

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