



Accelerate deployment of mission-critical virtualization on Integrity Superdome 2 servers

HP VirtualSystem for Superdome 2/HP-UX

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Executive summary

Accelerate deployment of mission-critical virtualization with the HP VirtualSystem for Superdome 2/HP-UX, built on HP Mission-Critical Converged Infrastructure. Achieve rapid deployment, dynamic optimization, and advanced management of your most critical virtualized environments with this virtualization-focused solution, integrating hardware, software, storage and services for mission-critical environments.

Reduce the complexity of data center management, and address key needs in mission-critical IT environments:

- Consolidate legacy and new HP-UX computing environments
- Improve resource utilization
- Save on energy costs
- Ensure mission-critical application availability

As part of this solution, you can order these specific solution components:

- HP Integrity Superdome 2
- HP-UX 11i v3 Virtual Server Operating Environment (VSE-OE)
- HP 3PAR F400 Storage System (including HP 3PAR Inform Software)
- HP Installation Services and 3 year HP Critical Service

Enjoy multiple virtualization elements with HP VirtualSystem for Superdome 2/HP-UX. For flexibility, electrically isolate a multi-tiered application environment, within the same server. Utilize different HP-UX virtualization technologies that address specific, differing requirements for the sub-environments. Speed virtualization deployment with a system configuration that is simplified and tuned for mission-critical virtualization. Refer to this paper for: a configuration example, recommended best practices and pointers to additional technical information. Leverage this configuration as needed to create a solution best suited for your unique mission-critical virtualization requirements.

Target audience: IT professionals who are responsible for implementing a mission-critical environment with HP-UX and HP Superdome 2, and are looking for test-validated recommendations on how to deploy a complete, fully integrated, cost-effective, and easy to maintain virtualization infrastructure.

Testing performed in August 2011 is described.

Figure 1. VirtualSystem including Superdome 2 and HP 3PAR F400

HP Integrity Superdome 2 Server



HP 3PAR F400 Storage System



Meet your mission-critical virtualization requirements

To increase agility and speed innovation, you need your IT to instantly adjust to meet the changing needs of users, customers, and citizens. Yet IT sprawl is causing enterprise complexity and slowing down your organization's ability to keep pace with enterprise demands. The resulting IT sprawl causes an underutilization of server assets, and increases server and management costs associated with dedicated physical hardware.

With HP VirtualSystem for Superdome 2/HP-UX, break through the IT sprawl, and turn technology assets into interoperable, shared pools of resources with a common management platform. With this integrated solution, reduce the complexity of data center management, accelerate deployments, increase server utilization, and provide higher levels of service.

Enable your organization to have your virtualization solution up and running in days instead of weeks¹ with HP VirtualSystem for Superdome 2/HP-UX, a virtualization-optimized solution based on HP Converged Infrastructure, that integrates HP Superdome 2 servers running HP-UX 11i v3 Virtual Server Environment OE with HP 3PAR F400 Storage Systems and HP factory integration and onsite installation services.

Focus on managing your business and not on the details of your IT environment. Provide a streamlined environment to deploy mission-critical virtualization—with HP VirtualSystem for Superdome 2/HP-UX, which offers: fault-tolerant resiliency, scalability and dynamic optimization.

¹Based on internal HP testing in August 2011.

Why virtualization is valued by mission-critical environments

Implementing virtualization and consolidation within an HP Superdome infrastructure enables you to reduce the complexity and expense of data center management with a wide range of benefits:

- Contain server sprawl and consolidate on a scalable platform
- Better manage the environment with fewer resources
- Enhance the utilization of current and future resources
- Increase reliability, availability, and flexibility
- Improve business agility and IT responsiveness

Virtualization techniques for Superdome 2 include hard partitions, virtual partitions, virtual machines, and HP-UX Containers, which may be used alone or in combination.

- **Electrically isolate your most critical workloads:** Isolate workloads into separate hard partitions (nPartitions), that act as separate physical servers, each running its own operating system and hosting its own applications. Electrically separate hard partitions from each other, so hard failures are confined to the nPartition in which they occur. For reboots, and most hardware upgrades, require only the affected nPar(s) to be brought down. For resourcing flexibility, dynamically migrate processor core and memory usage rights between nPartitions. Utilize hard partitions to provide the highest degree of isolation within a server. Keep IT processes running to support your business—the key to a mission-critical converged infrastructure.
- **Virtualize with high performance and scalability:** With HP-UX Virtual Partitions (vPars), a soft partitioning technology within HP-UX 11i v3 Virtual Server Operating Environment (OE), add finer, core granularity to nPartitions, as well as the flexibility of dynamic resource migration. Run multiple workloads within an nPartition or server. Isolate an operating system, and its applications and resources, within a virtual partition. Assign processor core and memory resources to different vPars, and starting with vPars v6, share I/O resources. Deploy this simple methodology for high performance, high scalability, and predictable resourcing. For flexibility, dynamically move physical cores or instant-capacity (iCAP) processor core usage rights between vPars.
- **Virtualize with shared resourcing and mobility:** Utilize Integrity VM, a software virtualization technology, to create multiple virtual servers with shared resourcing and mobility, on HP Integrity servers or nPartitions. Isolate workloads within a VM, each with its own: operating system, applications, virtual resources and users. With Integrity VM, enjoy additional flexibility with built-in, dynamic, shared resourcing between virtual machines. Utilize dynamic memory reallocation, to easily increase VM memory, particularly useful in the case of disaster recovery. With the virtual network switch, connect multiple virtual machines through a single physical network connection. Provide a high level of software and security isolation between the VM Host and the VMs, by placing them in different Integrity privilege levels. For flexibility, move a running Integrity VM, its guest OS, and applications to a different VM Host, without an OS reboot or application restart, with Online VM Migration.

Note: since HP-UX Containers is not included in HP VirtualSystem for Superdome 2/HP-UX, it is described in the Appendix as an alternative option.

To easily accommodate future growth, use HP Instant Capacity (iCAP) as a two-step purchase model for HP Integrity server hardware. Enable reserve processing and memory capabilities to be installed on the server, ready for activation when needed.

What are the core components of the VirtualSystem solution?

Server

Extend Superdome 2 reliability and availability to new levels with its innovative sx3000 enterprise systems chipset. You can safely choose Superdome 2 for the next decade, with its innovative mission-critical features.

To provide a lower cost of entry than the first generation of Superdome, and to leverage standards-based components throughout, utilize the modular design of Superdome 2 and the Mission-Critical Converged Infrastructure. Superdome 2 uses a 19" standard rack and includes a bladed design, with the basic building block of the Superdome 2-16 sockets (16s) compute enclosure. To give you common, easy-to-service spares, the enclosure leverages the HP c7000 enclosure and shares a common midplane, fans and power supplies. It is 18U, and supports up to 8 Superdome 2 blades that contain compute, memory, and I/O resources. The architecture supports up to four compute enclosures cabled together to provide a 64 socket symmetric multiprocessing (SMP) system with 1024 DIMM slots and 256 I/O adapters. If you need more I/O capability, a Superdome 2 I/O expansion enclosure provides 12 PCI Express (PCIe) slots in a 4U space. You can use up to 8 I/O expansion enclosures in the Superdome 2-16s, and Superdome 2-32s, for an additional 96 PCIe I/O slots.

Software

Work with HP, a vendor that understands that critical environments endure, and see how our HP-UX roadmap extends longer into the future than any other UNIX® in the market. With HP-UX 11i v3, simplify and unify IT, and deliver the always-on resiliency, dynamic optimization of resources, and investment protection and stability that you need for mission-critical computing. Drive up flexibility, reduce risk, and deliver compelling value with proven UNIX functionality that integrates with advances in high availability, security, virtualization, workload management, and instant capacity, delivered within a mission-critical Converged Infrastructure.

With the HP-UX 11i Virtual Server Environment OE (VSE-OE), take advantage of:

- The entire UNIX operating system plus comprehensive, integrated security for systems, data, and identity, as well as virtualization such as: hard partitions, virtual partitions, virtual machines and containers.
- Full HP Insight Control functionality with power management, health check, and deployment tools, as well as full performance analysis tools for kernel processes
- Advanced file system software and volume management with system-level performance analysis, plus the full complement of HP-UX virtualization software, provided through the HP Matrix OE² components, with capabilities for
 - Soft or sub-core virtualization
 - Capacity planning
 - Goal-based workload management
 - Automated infrastructure provisioning
 - Advanced physical and virtual infrastructure management

Storage

Utilize HP 3PAR Utility Storage as the virtualized storage platform that delivers the simplicity, efficiency, and agility demanded by today's virtual and cloud data centers. Exceed the economic and operational requirements of today's most demanding IT environments with HP 3PAR Utility Storage. It delivers the performance, scalability, and availability required of tier 1 storage along with unique technology benefits not available with traditional platforms.

The HP 3PAR Storage System family is the hardware foundation of HP 3PAR Utility Storage. Unlike modular and monolithic (or cache-centric) storage arrays, HP 3PAR Storage Systems use a cluster-based approach and feature fourth-generation HP 3PAR Thin Built-in ASICs in each clustered controller node. Scale continuously from the small to the very large, and gain complete fault tolerance of both hardware and software, with the modularity of the single HP Converged Storage platform.

² formerly Insight Dynamics-VSE suite.

Utilize HP 3PAR Software, with the HP 3PAR InForm Operating System (InForm OS) as its foundation, as the intelligence behind HP 3PAR Utility Storage. With HP 3PAR InForm OS, enjoy these advanced capabilities:

- Massively parallel performance levels, and the flexibility to configure various levels of service, with fine-grained virtualization and “wide striping” capabilities
- Efficiency and reduced capacity, with industry-leading, pioneering thin technologies.
- Protection against hardware, software and site failures, with sophisticated resiliency features.
- Seamless migration of data and workloads between arrays, without impact to applications, users, or services, and with storage federation capability.
- Uncompromising security, including secure workload segregation to enable multitenancy.
- The elimination of manual, repetitive, and error-prone administrative tasks, and automatically load-balanced storage, with autonomic management

Support services

Solve your most complex infrastructure problems with HP Technology Services consultants and support experts. We help keep your business running, no matter what. Boost availability and avoid downtime, and trust our expertise to help optimize your HP solution. Tap into the HP support services advantage, backed by the strategic and technical know-how of our consulting experts—for a single source solution that makes the most of your investments. We recommend that the level of Support Service for VirtualSystem for Superdome 2 be Optimized Care.

Optimized Care: Maintain products at optimal performance and availability

When your business cannot tolerate any downtime, choose comprehensive, proactive and reactive support. Assure improved stability, availability and operational effectiveness with integrated hardware and software support service that combines industry-leading, reactive, technical assistance with proactive account services, giving your IT team support from a team of service specialists. As part of this level of support, we suggest:

- **3 year HP Critical Service:** When your business runs essential mission-critical applications, and cannot tolerate downtime without a significant business impact, choose HP Critical Service (CS) for a complete support solution. This 3-year, comprehensive service provides the right combination of proactive and reactive support designed to improve availability and performance across your IT infrastructure. With fewer interruptions and less downtime, you can lower costs and gain competitive advantages in the marketplace. HP Critical Service provides highly trained professionals with world-class skills and a commitment to understand both your enterprise technology requirements and your business objectives. In today’s new era of business technology, technology must produce thousands of business outcomes. Ensure that your technology and business “works” and is managed with today’s HP Technology Services portfolio.
 - Boost business productivity through increased availability, and decrease business losses caused by IT downtime
 - Reduce risk, and improve efficiency, by proactively managing changes across the environment with no interoperability gaps
 - Resolve complex problems quickly through direct access to HP Services expertise, and support from a team familiar with business and technology infrastructure
 - Free IT staff to focus on strategic business issues and increase customer satisfaction moving to final location; plug-in, power up and test basic connectivity, and if boot disks were enabled in the factory boot the OS.
 - Manage the implementation of the service engagement with a deployment manager
 - Verify that all service prerequisites are met, prior to installation, to expedite the process
 - Have the solution installed and started up by an HP technical service specialist who can answer basic questions during service delivery
 - More effectively utilize the HP products, by knowledge gained from HP service specialists during onsite service delivery

Utilize Factory Express, Installation and Startup Services, and included and Insight Remote Support

- **HP Factory Express Package 5 Service:** For help in designing your solution, utilize all of the configuration, racking, and installation services of Factory Express Packages 3 and 4, along with advice and technical assistance, by choosing HP Factory Express Package 5 Service. Leverage the HP factory capabilities, along with those of an HP services consultant and field delivery specialist, to deliver a solution that addresses your unique needs and requirements. This service is recommended if you want to benefit from HP design and configuration skills by having an

HP consultant work directly with you to recommend and develop technical specifications for the solution, that help address your performance and availability goals.

Service benefits

- A solution that is designed and configured by HP, based on accurate data that you provide about your requirements
 - Dedicated team engagement, in collaboration with you, from planning through implementation
 - Enhanced IT resources and operations
 - A solution designed by a team of HP engineering specialists, to your specifications in accordance with ISO 9000:2000 quality standards, and then built, tested, shipped and deployed with skilled onsite deployment assistance
 - Dedicated team engagement, and collaboration with you, from planning through implementation
 - Enhanced IT resources and operations
- **HP Installation and Startup Services for HP Superdome 2:** Receive: comprehensive site evaluation, preparation, and verification; installation planning and management; consolidated shipment, detrashing, moving to final location, and plug-in; power up, testing of basic connectivity, and, if boot disks are enabled in the factory, booting the OS.
 - A deployment manager to manage the implementation of the service engagement
 - Verification prior to installation that all service prerequisites are met
 - Installation and startup by an HP technical specialist
 - Availability of an HP service specialist to answer basic questions during the delivery of this service
 - Expedited installation, provided all service prerequisites are met prior to commencement of service
 - Effective utilization of HP product through knowledge gained from HP service specialist during onsite service delivery
 - **Insight Remote Support—Included in each Package:** Receive secure remote monitoring and support for HP servers and storage 24x7, at no additional cost, as part of: HP Warranty, Care Pack and Service Contract. HP eSupport is a portfolio of technology-based services that assist you with managing your business environment—from the desktop to the data center. The HP support portal provides one-stop access to the information, tools and services you need to manage the daily operations of your IT environment. Features include:
 - Access to self-solve tools (including search technical knowledge base)
 - Efficient logging and tracking of support cases
 - Collaboration with other business and IT professionals
 - Download of patches and drivers
 - Access to diagnostic tools
 - Proactive notification of relevant information

HP Insight Remote Support software delivers secure remote monitoring and support for your HP Servers and Storage, 24x7, so you can spend less time solving problems and more time focused on your business. Remotely monitor your systems for hardware failure using secure technology that's been proven at thousands of companies around the world. In many cases, avoid problems before they occur.

Configuration design of the VirtualSystem

Utilize a Superdome 2 16-socket system as the foundation for HP VirtualSystem for Superdome 2/HP-UX. HP-UX, as well as virtualization software within the HP-UX 11i v3 Virtual Server Environment (VSE-OE). Use HP 3PAR F400 as the VirtualSystem storage solution to best compliment the Superdome 2 16-socket.

Have the system built in the HP factory, with final installation and setup provided at the customer site including: hard partitions, virtual partitions, virtual machines and adjustment of kernel parameters.

Order the same level of support for both server and storage. Note that installation and setup services are automatically included with the system and storage purchase.

The VirtualSystem configuration provides four electronically isolated subenvironments or nPartitions, each illustrating a different HP-UX virtualization technology, each tuned to address specific, differing workloads.

Figure 2. VirtualSystem hard partitions



VirtualSystem hard partitions (or nPartitions):

- nPartition 1:** Native database (4 blades are set up as a single nPartition, sized as needed for database)
- nPartition 2:** Application servers (2 blades are defined as a single nPartition and are sub-divided into virtual partitions or vPars)
- nPartition 3:** Development systems in this nPartition are set up in Integrity VM
- nPartition 4:** Test systems in this nPartition are set up in Integrity VM

Note: Multi-cell nPartitions should have their cells in every other slot. Three HP Instant Capacity (ICAP) processors are included in the VirtualSystem configuration and may be replaced with active processors as required.

Optimization for virtualization is provided as recommended by the HP Integrity Virtual Machine Sizer, a tool used to ensure that the configuration includes appropriate resources for virtualization.

Configuration components

VirtualSystem component tables

Table 1. Component table: System

Superdome 2	Quantity	Description
16-socket Superdome 2 configured into 4 partitions		
Services		3-year Critical Service Factory Express level 5 Implementation and startup for vPars/VM only
Superdome enclosure	1	Power: 4-wire 2 x 60 A PDUs (opt 004) 1 x 2 m cabinet IOX in same rack as SD chassis, shared between 2 nPartitions Peripherals use IOX PDUs LOM connectivity: <ul style="list-style-type: none"> Two HP E-series 6120XG Switches (AT064A) (Note: these switches do not support pass-through and must be configured on the network.) SFPs: 2 x 10GbE-SR, 8 x 1GbE RJ45 or SX DVD media (one copy provided with first partition)
Software		HP-UX 11i v3 VSE-OE (licensed per socket)
Partition one Database (1 nPar, no vPars)	1	4 cell blades each with 24 active cores (6 processors) and 8 iCAP* cores (2 processors) 1.73 GHz/24 MB—9350 (AM253A) 128 GB RAM using 4 GB DIMMs/16 GB modules 2 I/O bays, 6 slots each : 12 x AH403A (2p Emulex 8 Gb FC)3 Factory integration of HP-UX 11i v3 VSE-OE
Partition two: Application (4 vPars)	1	2 cell blades with 12 active cores (3 processors) and 4 iCAP* cores (1 processor) 1.73 GHz/24 MB—9350 (AM253A) 1 iCAP core RTU (4 cores per RTU) 128 GB RAM using 4 GB DIMMs/16 GB modules 2 I/O bays, 6 slots each : 8 x AH403A (2p Emulex 8 Gb FC) Factory integration of HP-UX 11i v3 VSE-OE
Partition three: Development (4 VMs)	1	1 cell blade with 8 active cores 1.73 GHz/24 MB—9350 (AM253A) 96 GB RAM using 4 GB DIMMs/16 GB modules 1 I/O bay, 6 slots: <ul style="list-style-type: none"> 4 x AH403A (2p Emulex 8 Gb FC) 2 x AD337A (2p 1000 BT) Factory integration of VM Host with HP-UX 11i v3 VSE-OE
Partition four: Test (4 VMs)	1	1 cell blade with 8 active cores 1.73 GHz/24 MB—9350 (AM253A) 96 GB RAM using 4 GB DIMMs/16 GB modules 1 I/O bay, 6 slots: <ul style="list-style-type: none"> 4 x AH403A (2p Emulex 8 Gb FC) 2 x AD337A (2p 1000 BT) Factory integration of VM Host with HP-UX 11i v3 VSE-OE
Boot		(for nPartitions only—VM and vPars boot from SAN)
Internal storage	2	2 x P2000 G3 FC arrays: <ul style="list-style-type: none"> 12-drive LFF (AP845A) 12 x 300 GB disks per enclosure RAID5 Shared by all 4 nPartitions—direct connect 8 x 5 m cables (BK840A) from IOX to P2000 (2 from each nPartition)

*Active cores may be substituted for instant capacity cores in any VirtualSystem order

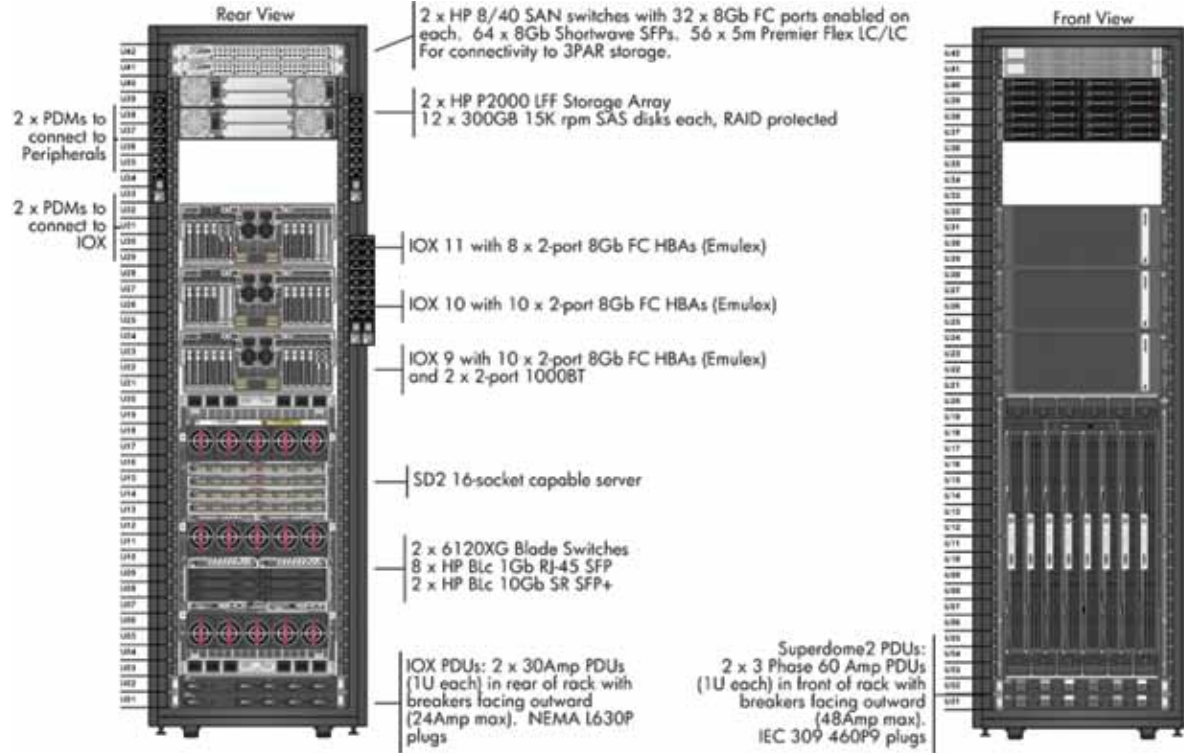
Table 2. Component table: Storage

Components	Quantity	Description
HP 3PAR F400 with four controller nodes, 111.4 TB usable RAID50		
Services		3-year Proactive 24 first system Factory Express level 5 HP SAN Implementation Service (Level 2 Tier 2)
Controller nodes and base	1	Four controller nodes 24 GB Data Cache/16 GB Control Cache Total 16 Fibre Channel Host Ports/16 backend Fibre Channel disk ports Two 2 M cabinet and redundant PDUs One service processor
Drive chassis and magazines	1	Sixteen 16-disk drive chassis Two hundred and fifty six 600 GB 15k 4 GB drives (64x 4-drive magazines) 111.4 TB usable RAID50/74.2.4 TB usable RAID10
HP 3PAR Software		HP Inform OS (bundled with the system) HP 3PAR Host Explorer HP 3PAR System Reporter HP 3PAR Dynamic Optimization HP 3PAR Thin Suite
Connectivity		Two HP 8/40 SAN Switch with 32 8 Gb FC ports enabled on each 64 x 8 GB Shortwave SFPs 56 x 5 m Premier Flex LC/LC

Superdome 2 16-socket diagrams

The following diagrams are generated by the configuration tools.

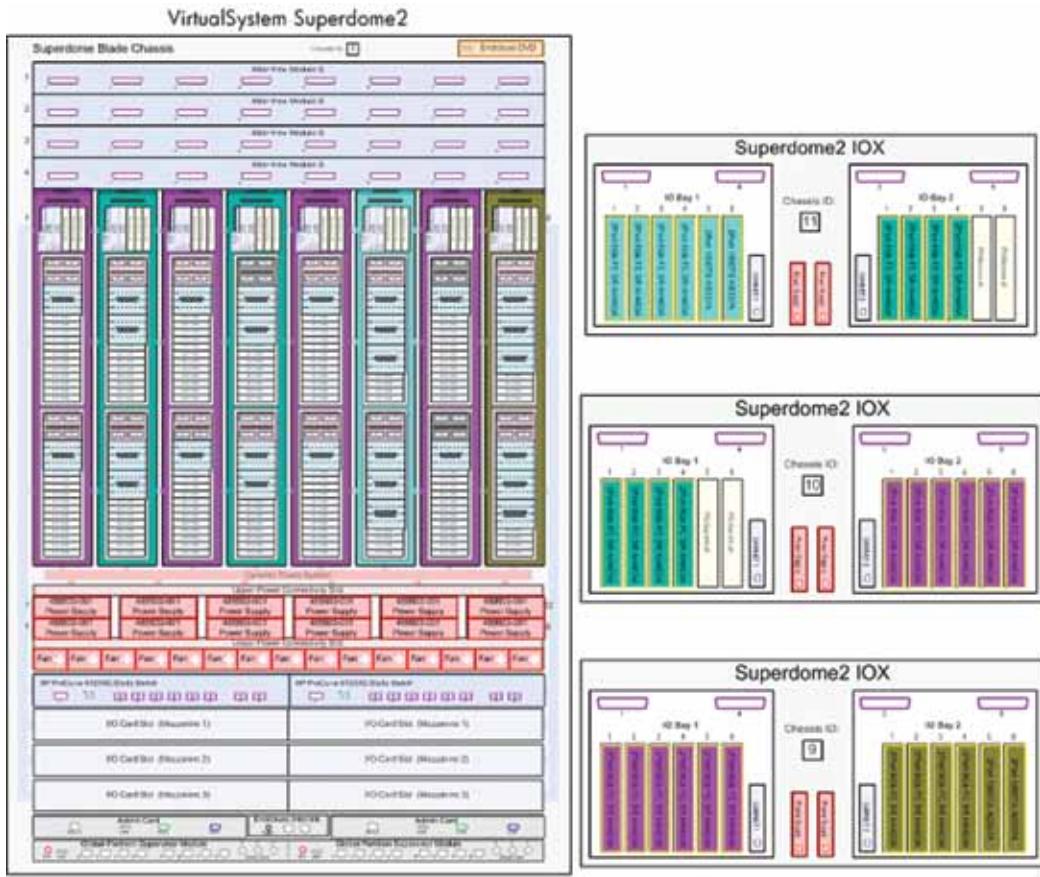
Figure 3. Rear and front views





Note:

HP Instant Capacity (iCAP) software provides the ability to instantly increase or decrease computing capacity. This VirtualSystem has been configured with three iCAP processors. Active processors may be substituted as required.

Figure 4. Logical view—nPartitions



 Active processor
 iCAP processor

Logical view of iCAP processors – actual iCAP assignment will be determined by HP-UX and may vary from what is shown here.

nPar1 - Database:
 4 cell blades
 24 x 1.73GHz/24MB cores
 8 x 1.73GHz/24MB iCAP cores
 128GB Memory using 4GB DIMMs
 16 x 10Gb embedded ports (4 per blade)
 2 IO Bays (6 slots each)
 12 x 2-port 8Gb FC HBAs (AH403A)
Software:
 Virtual Server OE, 11iv3

nPar2 - Application:
 2 cell blades
 12 x 1.73GHz/24MB cores
 4 x 1.73GHz/24MB iCAP cores
 128GB Memory using 4GB DIMMs
 8 x 10Gb embedded ports (4 per blade)
 2 IO Bays (6 slots each)
 8 x 2-port 8Gb FC HBAs (AH403A)
Software:
 Virtual Server OE, 11iv3

nPar3 - Development:
 1 cell blade
 8 x 1.73GHz/24MB cores
 96GB Memory using 4GB DIMMs
 4 x 10Gb embedded ports (4 per blade)
 1 IO Bay (6 slots each)
 4 x 2-port 8Gb FC HBAs (AH403A)
 2 x 2-port 1000BT (AD337A)
Software:
 Virtual Server OE, 11iv3

nPar4 - Test:
 1 cell blade
 8 x 1.73GHz/24MB cores
 96GB Memory using 4GB DIMMs
 4 x 10Gb embedded ports (4 per blade)
 1 IO Bay (6 slots each)
 4 x 2-port 8Gb FC HBAs (AH403A)
 2 x 2-port 1000BT (AD337A)
Software:
 Virtual Server OE, 11iv3

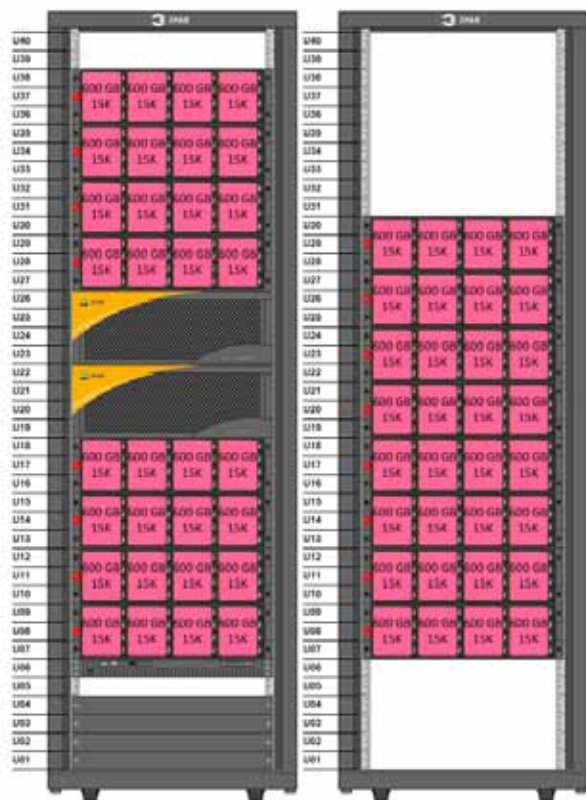
Figure 5. Partition details, cores, and memory

NPAR_VPAR	Partition Name	iCAP Cores	Active Memory	Total Memory	Min Cores	Max Cores	Active Cores	Total Cores
1_0	Database	8	131072	131072	0	0	24	32
2_0	Application	4	131072	131072			12	16
2_1	vpar1		32768		0	12	3	
2_2	vpar2		32768		0	12	3	
2_3	vpar3		32768		0	12	3	
2_4	vpar4		32768		0	12	3	
3_0	Development	0	98304	98304			8	8
3_1	VM1		24576		0	8	2	
3_2	VM2		24576		0	8	2	
3_3	VM3		24576		0	8	2	
3_4	VM4		24576		0	8	2	
4_0	Test	0	98304	98304			8	8
4_1	VM1		24576		0	2	2	
4_2	VM2		24576		0	2	2	
4_3	VM3		24576		0	2	2	
4_4	VM4		24576		0	2	2	

HP 3PAR F400 diagrams

The following diagrams are generated by the configuration tools.

Figure 6. F400 front view

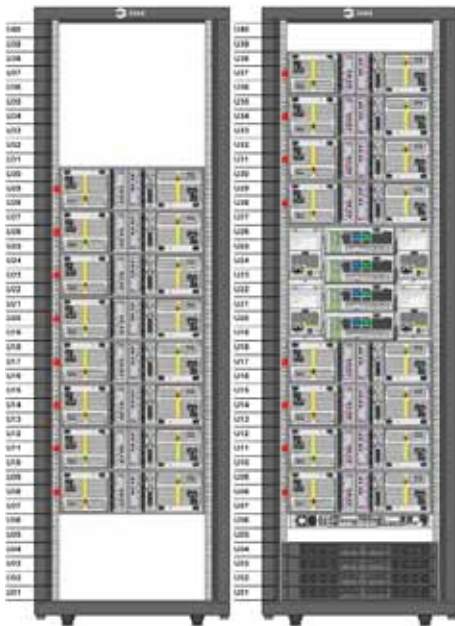


System summary:

- HP 3PAR 2M F-CI w/PDU Pair Exp Cab
- HP 3PAR 2M F400 Base Cabinet
- HP 3PAR North America Regional Kit*
- 1 x HP 3PAR INSERV F400 Config Base
- 1 x HP 3PAR F-Series Node Pair
- 4 x HP 3PAR PDU
- 1 x HP 3PAR Service Processor
- 64 x HP 3PAR 4 x 600 GB 15K 4 Gb Single-Drive Magazine
- 153600 GB Total Disk

*111.4 TB usable RAID50/74.2.4 TB usable RAID10

Figure 7. F400 rear view



Service summary:

- HP Optimized Care with:
 - 3-year Critical Service
 - HP Installation and Startup
 - Simple Onsite Install plus NW Config
- Same services for VirtualSystem server, software, and storage.

Summary

Accelerate your deployment time for mission-critical virtualization with the HP VirtualSystem for Superdome 2/HP-UX, a part of HP's VirtualSystems family. Built on HP's mission-critical Converged Infrastructure, HP VirtualSystem for Superdome 2/HP-UX is customized to help enterprises easily deploy dynamic optimization, and advanced management, of their most critical virtualized environments.

This solution is a virtualization-focused solution, integrating: hardware, software, storage and services for mission-critical environments.

You can order HP VirtualSystem for Superdome 2/HP-UX as shown. Also, check out the example for configuration choices.

The VirtualSystem illustrates virtualization methods to meet a variety of needs. The HP virtualization technology with Superdome 2 is delivered as a complete solution including: hardware, software, storage and services. The system components are tested for interoperability, completely installed and ready for deployment.

Appendix

Options for extending beyond the HP VirtualSystem for Superdome 2/HP-UX

Since we help you plan, configure and automate your physical and virtual resources in response to your requirements, we realize that you have unique requirements for your equipment. The configuration size of Superdome 2 may be based on the database you have deployed and the number of active users for that database. Sizing may also include details of the existing system and considerations for future growth.

Consider the following alternatives for the HP Superdome 2, HP-UX Operating Environments and HP 3PAR Storage components of the HP VirtualSystem for Superdome 2/HP-UX:

- The SD2 32-socket system is specifically advised when an nPartition greater than 8 blades is desired.
- The HP-UX 11i v3 Data Center Operating Environment (DC-OE) adds high availability support.
- The use of HP-UX Containers enables shared OS virtualization, as well as consolidation of HP 9000 environments onto HP Integrity servers.
- Virtualization sizing guidelines help to best size the virtualization required for your workloads.

- The 3PAR P10000 is appropriate for massive scale storage, and complements the Superdome 2, 32-socket system

HP Integrity Superdome 2, 32-Socket

HP Superdome 2, 32-socket is recommended where nPartitions greater than 8 blades are required.

For future growth, you may order the Superdome 2, 32-socket enclosure with empty slots or with iCAP processors. Note that the systems are architected for 64-socket scalability.

HP-UX 11i v3 Operating Environments

To add high availability and disaster tolerance, order HP-UX 11i v3 DC-OE. The DC-OE includes both the VSE-OE and HP Serviceguard.

HP-UX 11i DC-OE

- Includes the VSE-OE
- Adds availability:
 - local clusters
 - stretch clusters
- Toolkits for plug-and-play availability for NFS, Oracle database, IBM DB2, MySQL Server, Sybase ASE, Common Internet File System (CIFS), Tomcat, and Apache

HP-UX 11i DC-OE is also offered in combination with [Serviceguard Storage Management](#) Software and Serviceguard Cluster File System software.

[HP Metrocluster software](#) provides synchronous replication and failover for disaster recovery for remote sites.

NOTE:

The HP-UX 11i v3 Base Operating Environment and HP-UX 11i v3 High Availability Operating Environment do not include the HP virtualization software and are NOT recommended for the VirtualSystem.

HP-UX Containers and HP 9000 Containers

In addition to the virtualization methods illustrated in this paper, you may use HP-UX Containers, included in the HP-UX Operating Environments, to consolidate multiple workloads into one HP-UX 11i v3 Operating System image. HP-UX Containers utilizes a shared OS virtualization model to allow a single instance of the HP-UX operating system to host multiple application workloads in individual operating environments. Efficiently utilize dynamically shared server resources (CPU, memory, and network access). Configure highly granular security properties with this type of shared O/S virtualization. Containers are portable and can be migrated or cloned across servers for high availability and load balancing purposes. Within HP-UX Containers, the [HP 9000 Containers](#) solution significantly simplifies transition from Precision Architecture—Reduced Instruction Set Computing (PA-RISC)-based HP 9000 (with HP-UX 11i v1 and later) servers to HP-UX 11i v3 on HP Integrity servers. Traditionally, HP Automatic Recompilation and Integrated Environment Simulation (ARIES)-based transition requires intensive effort, and sometimes has an error-prone inventory collection of the applications under transition considerations. For complex application environments, identifying application dependencies and components is sometimes tedious.

HP 9000 Containers is a set of tools that enable quick transition and consolidation of application environments from an HP 9000 server to an HP-UX 11i v3 Operating System instance on an HP Integrity server. It provides a mechanism to rehost the complete HP 9000 user space environment, without the need to recompile and reinstall individual applications, and with minimal reconfiguration and application inventory preparation.

The transitioned applications reside in a chroot environment (called the HP 9000 Container) along with the HP 9000 commands and libraries. Each HP 9000 Container has its own IP address and hostname, which can be used to login, start and stop applications, and network. The HP 9000 Container can be started, stopped, exported, imported, and deleted. However, since it is not a virtual machine, it cannot support the HP 9000 HP-UX: kernel, kernel intrusive applications, device drivers, system administration commands and system management-related applications inside it.

See the “[for more information links](#)” at the end of this paper.

Sizing guidelines for virtualization

You can refer to these virtualization optimization guidelines:

- System sizing considerations, described in "[System Sizing Guidelines for Integrity Virtual Machines Deployment](#)", a technical white paper.
- An automated tool to assist with sizing and scope of server environment, provided by the [HP Integrity VM Sizer](#). The sizing information and algorithms have been deployed using testing and performance data on HP servers running HP Integrity VM.

HP 3PAR P10000 Storage Systems

Deliver the agility and efficiency demanded by your enterprise's virtual or cloud data center(s). With HP 3PAR, you can enjoy the unique features of: thin provisioning, persistent cache and mesh-active controller design.

Deliver enterprise IT as a utility service simply, efficiently and flexibly with the: new tier 1 storage for cloud computing, HP 3PAR P10000 Storage Systems. Fuel enterprise-class virtual and cloud data centers with these arrays that feature: a tightly coupled clustered architecture, secure multitenancy and mixed workload support. Reduce acquisition and operational costs up to 50 percent with the use of unique thin technologies, and improve administrative efficiency by up to tenfold with autonomic management features. Increase capacity utilization while delivering high service levels with the HP 3PAR Gen4 ASIC in each of the system's controller nodes, which provides a hyper-efficient, silicon-based engine that drives on-the-fly storage optimization. Enable agile and efficient response to the changing business needs present in your most demanding data centers, since the arrays were designed for these purposes.

Check out the suggested configuration below for HP 3PAR P10000 V400 that will deliver 179 TB usable RAID5.

Table 3: HP 3PAR P10000 V400 with 179 TB usable RAID5

HP 3PAR P10000 V400 Component	Quantity	Description
16-socket Superdome 2 configured into 4 partitions		
Controller nodes and base	1	Four controller nodes 64 GB data cache/32 GB control cache total 16 Fibre Channel host ports/32 Backend Fibre Channel Disk ports Two 2 M cabinet and redundant PDUs One service processor
Drive chassis and magazines	1	Twelve 40-disk drive chassis Three hundred and eighty four 600 GB 15k 4 GB drives (96x 4-drive magazines) 179 TB usable RAID50 6:1/104.4 TB usable RAID10
HP 3PAR Software		HP 3PAR Software Recommended: <ul style="list-style-type: none"> • HP 3PAR Host Explorer • HP 3PAR System Reporter • HP 3PAR Dynamic Optimization • HP 3PAR Thin Suite

HP Support options

Select the same support level for both server and for storage. An alternative support level available for Superdome 2 and HP 3PAR storage, is Standard Care (described below). Both Optimized Care and Standard Care include: Factory Express, Installation and Startup Services and, Insight Remote Support (described above in the Optimized Care section).

Standard Care: Maintain a high level of product availability

When your business can tolerate limited downtime, count on certified HP Services professionals to reduce the cost and complexity of implementing and supporting hardware, software and network environments across the enterprise. To push service beyond just keeping systems up and running, this recommended support maintains a high level of hardware availability: single point of accountability lifecycle support, rapid response coverage and availability of technical expertise and training in the latest technologies. The support recommended here includes:

- **3-year HP Proactive 24**

Enhance operational effectiveness and identify problems

Improve the stability and operational effectiveness of your IT environment with HP Proactive 24 Service (P24), that integrates hardware and software support. Ensure that HP meets your support needs effectively with an HP Account Manager as your primary point of contact.

P24 provides the greater value when multiple technologies in the environment, (for example, servers, storage, SAN, and the network), are all covered. Ensure the stability of your key applications with an environment-wide view and consistent support of all of these components.

Choose P24 when you want to:

- Enhance operational effectiveness with proactive problem identification and recommendations from HP
- Partner with technical experts who help coordinate support, provide hands-on assistance, and share knowledge with your staff
- Rapidly access support and expertise spanning your environment
- Obtain personalized services tailored to your business environment and critical success factors
- Anticipate necessary change—and execute it correctly the first time
- Efficiently manage infrastructure resources to meet your performance objectives

Related services

HP Proactive Select Service

This is a good solution, when you need the flexibility of choosing from a variety of service activities, ranging from: assessments, performance analysis, firmware management, and infrastructure solution support to technical forums. These service activities cover a broad spectrum of IT technology domains including servers, blades, operating systems, storage, SANs, networks, third party software, virtualization, power and cooling, management software, security and ITSM. The end result is a solution that is designed by you to help you meet your IT and business goals. You can buy Proactive Select Service Credits when you purchase your hardware and then use the credits over the next 12 months.

HP Proactive Select services helps you to:

- Access a list of flexible and customizable proactive service activities
- Choose from a variety of service activities addressing both technology and process needs
- Have the ability to change the Plan during the review meeting
- Enhance your in-house IT team with complementary assistance from HP
- Improve the time to solution
- Reduce business risk and project costs by accessing HP specialists
- Simplify IT operational procedures by leveraging HP best practices

For more information

HP VirtualSystem for Superdome 2/HP-UX

Homepage:

<http://h71028.www7.hp.com/enterprise/us/en/os/mission-critical-virtualsystem.html>

HP Superdome 2

Homepage:

hp.com/go/superdome

QuickSpecs:

http://h18004.www1.hp.com/products/quickspecs/13682_div/13682_div.pdf

Data sheet:

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA1-1678ENW.pdf>

Technical white paper:

<http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=4AA1-7762ENW&cc=us&lc=en>

HP-UX 11i v3 Operating Environments

Homepage:

hp.com/go/hpux

Data sheet:

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA1-0428ENW.pdf>

Technical white papers:

HP-UX 11i v3: engineered for critical workloads—An Ideas International white paper:

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA1-9232ENW.pdf>

HP Matrix Operating Environment for HP-UX solution components:

<http://h18004.www1.hp.com/products/solutions/insightdynamics/vse-components.html>

Reference Architectures for Application Deployment in Virtualized Environments:

<http://h71028.www7.hp.com/enterprise/cache/307722-0-0-0-121.html?jumpid=qo/vsera>

Optimization for virtualization

Virtualization homepage:

<http://h18004.www1.hp.com/products/solutions/insightdynamics/vse-overview.html>

System Sizing Guidelines for Integrity Virtual Machines Deployment:

<http://bizsupport2.austin.hp.com/bc/docs/support/SupportManual/c02157777/c02157777.pdf>

HP Integrity VM Sizer Tool:

<http://h71019.www7.hp.com/ActiveAnswers/Secure/595493-0-0-0-121.html>

HP Instant Capacity for HP Integrity Superdome 2 Servers White Paper:

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA1-7100ENW.pdf>

HP Instant Capacity QuickSpecs:

http://h18000.www1.hp.com/products/quickspecs/11723_na/11723_na.HTML

Secure Resource Partitions/HP Containers:

<http://h71028.www7.hp.com/enterprise/us/en/os/hpux11i-virtualization-containers.html>

HP 9000 containers:

<http://h71028.www7.hp.com/enterprise/us/en/os/hpux11i-transition-hp9000-to-integrity-overview.html>

HP 3PAR

Homepage:

hp.com/go/3PAR

Technical white paper:

<http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=4AA3-3516ENW&cc=us&lc=en>

QuickSpecs:

http://h18000.www1.hp.com/products/quickspecs/14103_div/14103_div.PDF

HP Setup Services and Technical Support

HP Technical Services homepage:

hp.com/services/technicalservices

To plan your mission-critical reference configuration, contact a sales expert at,

hp.com/go/hpux-sales.

Get connected

hp.com/go/getconnected

Current HP driver, support, and security alerts
delivered directly to your desktop

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