Overview

HP-UX 11i v3

QuickSpecs for HP-UX 11i v3 describes the features and functionality delivered by the HP-UX 11i v3 operating environments and related software, plus considerations for a successful, optimized HP-UX deployment.

Mission-critical applications are at the core of your company´s ability to compete effectively in today's always-on world. As such, the infrastructure powering these applications plays a crucial role in your business success. An essential part of this infrastructure is the operating environment, and when it comes to your vital workloads, you need an operating system with the right capabilities to support them, so you can maximize uptime and minimize business risk. HP-UX 11i v3 is designed to deliver an available, efficient and proven infrastructure demanded for mission-critical computing. It integrates proven UNIX® functionality with advances in high availability, security, virtualization, workload management and instant-capacity-on-demand. And it maximizes flexibility while reducing risk and delivering compelling value.

HP-UX 11i v3:

- Provides a proven operating environment delivering a highly resilient UNIX platform that ensures your mission-critical applications are always-on and secure without compromise
- Offers the stability required to power the processes vital to your enterprise and the core mission critical applications that support them
- Is managed seamlessly within your infrastructure. Delivers built-in integration of virtualization and management software to optimize IT infrastructure dynamically

Features and functionality described in this HP-UX 11i v3 QuickSpecs includes HP-UX 11i v3 2017 update release. Update releases to HP-UX 11i v3 deliver significant benefits and functionality. Hewlett Packard Enterprise recommends updating to the most current release for maximum availability and performance, simplified management and enhanced security and scalability.

Release notes for each update release identify 'what's new' for that release. To look for a specific release set of features please see: **http://h20565.www2.hpe.com/portal/site/hpsc/public/psi/home/?sp4ts.oid=3367813.**

For the latest version of the HP-UX Support Matrix, please refer to **http://www.hpe.com/h20195/V2/GetDocument.aspx?docname=4AA4-7673ENW**.

NOTE: QuickSpecs are also available for HPE Integrity servers, HPE 9000 systems, HP-UX 11i v3 software, HPE storage products and more at: **http://www.hpe.com/info/QuickSpecs**.

Operating Environments

HP-UX 11i v3 is available in four operating environments that deliver pre-tested, integrated sets of software to meet particular user requirements, as follows:

HP-UX 11i v3 Base OE (BOE)- run your critical applications with comprehensive security and system management
The HP-UX 11i v3 BOE delivers the entire UNIX operating system plus comprehensive, integrated security for systems, data, and identity, as well as hard partitions and containers. The BOE includes HPE Systems Insight Manager functionality with power management, health check, and deployment tools. It also provides full performance analysis tools for kernel processes and applications, as well as base file system and volume management.

HP-UX 11i v3 Virtualization Server OE (VSE-OE)-increase server efficiency with flexibility and agility
In addition to the Base OE, HP-UX 11i v3 VSE-OE integrates advanced file system and volume management with system-level performance analysis, plus a full complement of HP-UX virtualization and infrastructure management software including capabilities for dedicated or shared resource virtualization, goal-based workload management, capacity planning, automated infrastructure provisioning, and advanced physical and virtual infrastructure management.

HP-UX 11i v3 High Availability OE (HA-OE)-achieve the highest levels of availability
HP-UX 11i v3 HA-OE supplements the BOE with integrated HPE Serviceguard solutions for high availability, fault protection, downtime-free maintenance, and system-level performance analysis with advanced file system and volume management. HPE Serviceguard delivers high service availability and supports both local and stretch clusters for cost-effective disaster recovery. Additionally, tested and proven Serviceguard toolkits enable you to protect key databases, including Oracle RAC and SAP, all easily managed with intuitive GUI-based cluster management software.

HP-UX 11i v3 Data Center OE (DC-OE) - reach the highest levels of flexibility and availability for your most vital workloads
HP-UX 11i v3 DC-OE delivers the complete set of HP-UX mission-critical UNIX software in a single package, combining the value in the HA-OE and VSE-OE-both of which include the BOE software. The DC-OE is the ideal environment for resiliency and optimization, leveraging the tight integration of HPE advanced infrastructure management software for high availability, virtualization, workload management, and performance optimization.

The chart below identifies the components of the HP-UX 11i v3 Base Operating Environment:

HP-UX 11i v3 Base OE			
HP-UX 11i operating system	IPSec	Languages	Partitioning providers & management tools
I/O drivers	PAM_Kerberos	nPartitions	Trial gWLM agent
Accelerated Virtual I/O	Kerberos client services	Auto Port Aggregator	Ignite-UX
Bastille	Role-based Access Control	Caliper with ktracer	Distributed Systems Admin Utilities
Host Intrusion Detection	LDAP-UX Client Services	iCAP (inc. TiCAP & GiCAP)	SysFaultManagement
IPFilter	HP-UX Directory Server	Pay per use	System Management Homepage
Software Assistant	CDE	CIFS server	VSE Mgmt, VSE Assist
Install-time Security	Internet Express	NFS	Oracle C++ Linker
Boot Authentication	HP-UX Apache Web Server	Dynamic Root Disk	Process Resource Manager & libraries
Insight Control power management	HP-UX Tomcat	Logical Volume Manager	Message passing interface
Shadow Passwords	Firefox Web browser	Base VERITAS Volume Manager	Systems Insight Manager
Strong Random Number Generator	Mozilla Web browser	Base VERITAS File System	Libc enhancements

Operating Environments

HP-UX Containers	HP-UX Web Server Suite	EMS framework	3D graphics
OpenSSL	Java™ jconfig, HPjmeter	Software Distributor-UX	Math libraries
Secure Shell	Java RTE, JDK, JPI	Software Package Builder	

The BOE is included in the VSE-OE, HA-OE and DC-OEs. The following chart describes the additional components included in the other HP-UX 11i v3 Operating Environments in addition to the Base OE:

HP-UX 11i v3 OE Comparison	**Virtual Server (VSE-OE)**	**High Availability (HA-OE)**	**Data Center (DC-OE)**
Base Operating Environment	x	x	x
GlancePlus Pak	x	x	x
Mirrordisk/UX	x	x	x
OnlineJFS	x	x	x
High Availability Monitors	x	x	x
Capacity Advisor	x		x
Global Workload Manager	x		x
Integrity Virtual Machines	x		x
Online VM Migration	x		x
Virtual Partitions (vPars)	x		x
Matrix OE visualization	x		x
Matrix OE for HP-UX	x		x
Workload Manager	x		x
Matrix OE infrastructure orchestration (license rights)	x		x
Workload Manager Toolkits	x		x
Enterprise Cluster Master Tooklit		x	x
Serviceguard		x	x
Serviceguard NFS Tooklit		x	x
Serviceguard Extension for RAC*		x	x

Until March 2008, HP-UX was sold in different operating environment packages. Customers on support contract are entitled, through the 'rights to new versions' term of those contracts, to update to the new operating environments for no additional charge. In all cases, moving from old OEs* to the new OEs results in more high-value software, and no software lost in the transition. Read more at: **https://www.hpe.com/us/en/servers/hp-ux.html**

Old OEs* are: Mission-Critical OE, Enterprise OE, Foundation OE, and Technical Computing OE.

Virtualization

HPE Virtualization Continuum for HP-UX

Hewlett Packard Enterprise nPartitions

Description

Hewlett Packard Enterprise nPartitions (nPars) is a hard partition technology providing electrical isolation for HPE integrity servers, enabling you to configure a single cell based server like a Superdome, rx8640/rx8620, rx7640/rx7620 or Superdome 2 server as one large server or as multiple, smaller, independent servers. With the introduction of the HPE Integrity BL870c i4 Server Blade and BL890c i4 Server Blade nPars are now supported on the c-class blades as well. Each nPartition has one or more cells or blades (containing processors and memory) that are assigned to the partition for its exclusive use. Each nPartition has its own processor, memory and I/O resources, consisting of the resources of the cells allocated to the nPartition. Any I/O chassis that is attached to a cell or blade, belonging to a partition, is also assigned to that partition. Each nPartition hosts its own: operating system instance, applications and users isolating this environment form other to prevent a problem in another part of the machine from affecting it.

Features

- Closely corresponds to a stand-alone system
- Provides electrical isolation; hardware failures are isolated to the specific hardware partition (nPartition)
- Granularity down to 1 cell or blade(or cell-blade on Superdome 2 servers)
- Enables multiple Operating Systems and applications to be run on the same physical system
- Each nPartition has: independent processor, memory, and I/O resources allocated
- Resources can be moved using commands without manipulating hardware
- Can increase/decrease processing power by adding/deleting cells to an nPartition
- Certified safe and meeting the security requirements of the Common Criteria.
  - The benefit is a third-party evaluation of protections against an approved protection profile. nPartitions is a safe method of partitioning assuring that an application within an nPartition is isolated.
- Can be configured through an easy-to-use GUI, Partition Manager (parmgr), available as a free web download.
- On Superdome 2, customers can use the Onboard Administrator to manage nPartitions and HP-UX Virtual Partitions (vPars).
  - Users simply log into the Onboard Administrator, via a web browser, and run the partition management GUI or CLI to create nPartitions and vPars.
- On Integrity blades, customers can use the iLO console.

Configuration

- Configuration changes may require a system reboot, depending upon configuration.
- Majority of hardware upgrades affect only a specific nPartition.
- Recommend using Partition Manager GUI, a system management tool for configuring and managing hard partitions.

NOTE: HP-UX Virtual Partitions v5 and the vPars and Integrity Virtual Machines v6 SW bundle cannot be run within the same nPartition.

NOTE: HP-UX Virtual Partitions does not integrate with dynamic nPartitions (on those legacy Integrity mid-range and high-end cell-based servers that are using it).

Partition Manager

Partition Manager (parmgr) allows system administrators to configure Superdome and other systems that support hardware partitions through an easy to use, familiar graphical user interface. Newer systems have the partition Management GUI embedded into the OA or iIO of the system for easy access.

HP-UX Virtual Partitions

HP-UX Virtual Partitions (vPars) is a software and/or firmware-based partitioning technology within the -Matrix OE for HP-UX bundle that enables customers to increase server utilization and flexibility by enabling customers to carve a single nPartition into several smaller, virtual partitions with more granularity than an nPar as well as resource flexibility.

Virtualization

Each virtual partition hosts its own instance of the HP-UX11i Operating Environment, as well as its own subset of dedicated processor, memory and dedicated or shared I/O resources. Granularity is provided to the processor core level.

HP-UX Virtual Partitions provide software isolation enabling stronger application and operating system fault isolation.
Any application or operating system-related failures will only impact the vPar in which it is executing-without affecting other virtual partitions executing on the same system.

Since vPars simply parses separate resources to different virtual partitions, and gets "out of the way" during normal processing, there is minimal overhead.

HP-UX 11i Virtual Partitions v5 has been evaluated as safe and secure and meeting the security requirements of the Common Criteria CCOPP-OS protection profile. Enterprise compliance is enhanced, and isolation is evaluated, at the highest 24-country mutually-recognized assurance level.

vPars A.05.08 is the latest firmware based version of HP-UX Virtual Partitions. It requires the HP-UX 11iv3 September 2011 update release or later. This version supports Dynamic core capability on Superdome 2.

vPars 6.3 is delivered as part of HP-UX vPars and Integrity VM v6.3 product, which is a component of (and requires) the HP-UX 11i v3 March 2014 Update Release. It supports all currently supported Integrity servers, and enables vPars and Integrity VM to be run within the same nPar or server (with coexistence within the same Virtualization Services Platform.

HP-UX vPars and Integrity VM 6.5 extends vPars mobility and manageability with enablement of online vPar migration

For more information on HPE Virtualization Continuum for HP-UX, go to: **https://www.hpe.com/us/en/servers/hp-ux.html**

HPE Integrity Virtual Machines

HPE Integrity Virtual Machines (Integrity VM) is a software virtualization or hypervisor technology within the -HPE Matrix OE for HP-UX that enables you to increase server utilization and flexibility, with the ability to create multiple virtual servers or machines with shared resourcing within a single HPE Integrity server, or nPartition. Each virtual machine has its own "guest" operating system instance, applications, and users. Integrity VM provides automatic, dynamic, resource allocation, based on demand and entitlement. Each virtual machine hosts its own applications in an environment that provides full software fault and security isolation.

Integrity VM provides shared processor and shared I/O, and automatic, dynamic resource allocation that are built in. The physical resources of the HPE Integrity server are shared amongst any of the virtual machines it hosts, based on demand and entitlement.

Integrity VM 6.3 is delivered as part of HP-UX vPars and Integrity VM v6.3 product, which is a component of (and requires) the HP-UX 11i v3 March 2014 Update Release. It supports all currently supported Integrity servers, and enables vPars and Integrity VM to be run within the same nPar or server (with coexistence within the same Virtualization Services Platform.

In March 2014, HP-UX vPars and Integrity VM 6.3 provides highly scalable and flexible virtualization across the entire current Integrity server portfolio, with:

- VM scalability with: 2X the virtual cores (up to 32), 2X the memory (up to 256GB), and greater storage and networking scalability for large guests
- Multi-queue support for VM guests
- Dynamic reconfiguration of virtual server I/O via: online replacement of physical I/O adapters, and dynamic addition of virtual I/O to a vPar or VM
- Dynamic VM workload migration between Integrity i2 and i4 server families
- Simplified management of vPar and VM transformation through the Virtual Server Manager
- 5-year support life for Integrity VM v6.3

For more information on the HP-UX Virtualization Continuum, go to: **https://www.hpe.com/us/en/servers/hp-ux.html**

HPE Online VM Migration

Virtualization

HPE Online VM Migration is a valuable capability for Integrity VM (HP-UX 11i v3 VM Host). It enables a running VM, its guest OS and its applications to be moved to a different VM Host without service interruption. Services remain active with no OS reboots or application restarts. All I/O connections to storage and networks remain active during the migration, leaving the change transparent to applications and users.

HPE Online VM Migration reduces downtime & costs, while increasing flexibility. Using Online VM Migration allows an administrator to do online, proactive maintenance (patch, update, or reconfigure) of VM Hosts, as well as balance server workloads, without interruption to the VM Host or virtual machines. The functionality can be used in conjunction with other Hewlett Packard Enterprise tools, such as HPE Serviceguard Solutions and HPE Logical Server Management, in order to provide improved availability and flexibility.

For more information on the HPE Virtualization Continuum for HP-UX, go to: **https://www.hpe.com/us/en/servers/hp-ux.html**

HP-UX Containers (formerly known as HP-UX Secure Resource Partitions)

HP-UX Containers enable shared O/S virtualization, to consolidate multiple workloads within a single instance of the HP-UX 11i v3 operating system.

HP-UX Containers provide built-in dynamic resourcing, sharing processor cores, memory and I/O. Increased security is achieved by ensuring that a process running in one container cannot communicate with processes in another container. Both CPU and memory allocations can be managed with either dedicated or guaranteed minimum share model. Like Integrity VM, HP-UX Containers offer granular resource control, permitting applications to run in as little as one percent of a processor core.

Three HP-UX Container types are provided on HP-UX Container (SRP) A.03.10, depending on workload requirements:

1. Workload containers: lightweight containers that require minimum ongoing maintenance. (Users can have highly granular configuration of container security properties)
2. System containers: Provides many of the user space capabilities of a virtual machine guest without the associated management and performance overhead.
3. HPE 9000 Containers to easily transition HPE 9000 environments to Integrity (more information in "development tools" section). This is a separate web downloadable product that is deployed on HP-UX Containers. New with v3.1 of containers is the ability to run multiple HP9000 containers in a single instance of HP-UX.

Each HP-UX Container can have:

- A container home directory tree, which is isolated from other containers.
- A dedicated network IP interface.
- Force-to-wire capability ensuring that all network packets are processed through intranet firewalls.
- Isolated inter-process communication (IPC) and process view. (Processes in one container cannot view or communicate with processes in other containers, unless it's through normal communication paths like the network.)
- A container-specific login environment.
- Per-container CPU and memory resource entitlements.
- Per-container initialization and shutdown capabilities. (You can start or stop a container as you would start or stop a single system.)
- Import and export containers between systems to facilitate workload balancing. Clone containers to support high availability environments.
- Host/domain name, systems services, file system view, and network/NFS configuration:
  - Shared with workload containers
  - Private or shared with system containers

Starting with v2.2, the SRP Manager GUI simplifies management by providing viewing, configuring, starting, stopping and migration of HP-UX Containers with:

- Integration into HP-UX System Management Homepage
- A container overview page displaying status and resource utilization for all containers on the system
- Detailed management of container configuration

For more information on the HPE Virtualization Continuum for HP-UX, go to:
https://h20392.www2.hpe.com/portal/swdepot/displayProductInfo.do?productNumber=HP-UX-SRP

Virtualization

HPE Process Resource Manager (resource partitions)

HPE Process Resource Manager is a software-based, application stacking technology (bundled into the HP-UX 11i v3 Base Operating Environment) that creates resource partitions within a single HP-UX operating system image. It provides very dynamic and granular allocation of resources, permitting applications to run in as little as one percent of a processor core. Resource partitions also support controls for real memory and disk I/O bandwidth, offering a high degree of dynamic control and flexibility.

Management and automation

Management and Automation

HP-UX 11i v3 provides a rich set of tools to provide maximum control and efficiency for system administrators responsible for HP-UX 11i v3 systems. HP-UX software deployment and configuration management capabilities automate routine administration and simplify many complex tasks, while providing deep-level system control where needed. The choice of an enhanced CLI, menu-driven TUI, and web-based GUI ensure that both experienced and junior administrators alike can be productive quickly when working with HP-UX. In addition, these single-system tools also work seamlessly with higher level multi-system and enterprise management environments, including HPE Systems Insight Manager. As a result, administrators gain more visual abstracted views of their heterogeneous IT assets, while also having the ability to automatically launch HP-UX management tools from within Systems Insight Manager when system-level precision tuning is required.

Infrastructure Management

Central Point of Configuration - HPE SIM

HPE Systems Insight Manager (SIM) is the foundation for Hewlett Packard Enterprise's unified server-storage management strategy. It is a multiple operating system, hardware level management product that supports HPE Integrity, HPE ProLiant and HPE 9000 servers. HPE SIM is easily extensible, integrating other Hewlett Packard Enterprise management products.

HPE Systems Insight Manager (SIM) helps you control IT infrastructure with unified management of your HPE Integrity server environment running HP-UX 11i v3. Hewlett Packard Enterprise provides modular, integrated system management software for complete Integrity server management of multiple platforms and operating systems, including HP-UX 11i v3.

HPE Matrix Operating Environment for HP-UX

HPE Matrix OE (formerly Insight Dynamics - VSE) is infrastructure management software for HPE Integrity servers, which allows you to instantly adjust to dynamic business demands. With the addition of infrastructure orchestration, not only can you easily plan, configure, and automate your physical and virtual resources in the same way, but now you can also provision and modify a complex infrastructure in minutes. HPE Matrix OE provides an automated virtual infrastructure that can adapt in seconds with mission-critical reliability. It allows you to provision your infrastructure in minutes with automated activation of servers, storage and networking, optimize infrastructure confidently with built-in capacity planning and rebalancing tools, and protect continuity of services with automated failover. HPE Matrix OE for HP-UX also integrates with the HPE Virtualization Continuum, High Availability (through the Serviceguard solutions) and Instant Capacity products. A subset of these products is available as part of Matrix OE for HP-UX, as well as in the VSE-OE and DC-OE.

Matrix OE for HP-UX 7.6 is the latest version that is available with HP-UX 11i v3 with these enhanced capabilities:

- For private cloud workloads:
  - Increase scalability by provisioning larger virtualized workloads running within vPars v6.
  - Increase security and performance by provisioning Direct I/O networking support.
- With Capacity Advisor:
  - Improve the performance of data center up to 10% when identifying systems running an infinite loop process
  - Simplify capacity planning by improving reports with a new CPU trend, CPU growth rate

Monitor memory and I/O for virtualized workloads running within HP-UX vPars and Integrity VM v6.

HPE Matrix OE visualization

HPE Matrix OE visualization provides a central point of control for managing all the resources in your HPE Matrix OE Environment for HP-UX. It's a powerful way to connect IT resources to real business needs. HPE Matrix OE visualization includes an easy-to-use interface that lets you build a picture of your available virtual resources in seconds rather than taking hours or days to "manually"

Management and automation

construct a picture of your virtual environment. It lets you see how UNIX applications and virtual resources are being used, and how they relate to your physical infrastructure in real time. HPE Matrix OE visualization can also be used to seamlessly configure new virtualization resources-and reconfigure existing ones-for high efficiency. On Integrity Blades and with Integrity Virtual Machines, HPE Matrix OE visualization also provides the logical server capability. A logical server is a server profile which can be easily created, freely moved and stores as a template. This brings the flexibility of virtualization to physical Integrity Blades and Integrity Virtual Machine environments.

HPE Capacity Advisor

HPE Capacity Advisor is an easy-to-use tool that captures server utilization data and virtualization configuration scenarios so you can perform ongoing capacity planning. It allows you to view historical resource usage data through an intuitive graphical interface and use that data to pre-test different scenarios before you make changes to your critical applications. The Smart Solver technology collects and analyzes real-time, historical data across thousands of variables on all virtual and physical resources using a unique algorithm from Hewlett Packard Enterprise Labs. Additionally, Capacity Advisor has a 5-Star rating system that makes it easy to identify best-fit candidates for logical server profiles. With Capacity Advisor you can make better decisions, match workloads to servers more precisely, and get more from your existing server resources.

HPE Global Workload Manager and HP-UX Workload Manager

HPE Global Workload Manager (gWLM) and HP-UX Workload Manager (WLM) provide the intelligent control for HPE-Matrix OE for HP-UX. They enable automated, dynamic allocation of server resources among applications according to predefined policies so that resource utilization improves and service levels are maintained. While gWLM and WLM have a subset of unique features which are suited for a different type of Virtual Server Environment deployments, they both provide the following capabilities:

- Managing the real-time resource allocation between separate environments (vPars, HPE Integrity VMs or HP-UX Containers)
- Shifting Instant Capacity licenses between nPars or servers based on business priorities, or resizing servers based on demand by activating or deactivating Temporary Instant Capacity
- Synchronizing resource management policies to re-allocate server resources in the case of a failover

HPE gWLM is ideal for single systems or high availability clusters, as well as large-scale deployment with multiple servers. A typical example is a centralized-IT deployment, where a single IT department manages servers for multiple business units, and many applications run on a large number of servers - each with several partitions. HPE gWLM's ease of use features include centralized policy administration, pre-defined policies and reporting features to enable IT to easily set-up, manage and track resource usage. These benefits also make gWLM a suitable solution for many common types of IT environments, where fine-tuned policies and specialized resource management are not applicable.

HP-UX Workload Manager (WLM) was designed to manage workloads on a single system or high availability cluster. As is also true with gWLM, WLM is a suitable for solution for a line-of-business (LOB) consolidation in which the LOB owns its servers but relies on an IT team to manage them. HP-UX WLM also gives you the ability to fine-tune policies to support specialized resource management needs. HP-UX Workload Manager (WLM) is intended for existing configurations and solutions that currently utilize WLM. For new configurations and solutions requiring workload management, Hewlett Packard Enterprise recommends that Global Workload Manager (gWLM) be utilized.

HPE Matrix OE infrastructure orchestration

HPE Matrix OE infrastructure orchestration capabilities let you provision infrastructure in minutes to automatically activate physical and virtual servers, storage, and networking from pools of shared resources. Whether you need a single virtual machine or infrastructure for a complex three-tier application, Matrix OE infrastructure orchestration finds available resources, streamlines the approval process, and automatically provisions and configures what's needed across infrastructure silos. Delivering infrastructure to the business becomes faster, more efficient, and more reliable.

HPE System Management Homepage (HPE SMH)

HPE System Management Homepage (HPE SMH) is the launch point for all single system management applications for HP-UX 11i. SMH provides web-based systems management functionality, at-a-glance monitoring of system component health and consolidated log viewing. SMH also provides Text-Based User Interface (TUI) and Command Line Interface (CLI). Some of the SMH applications continue to be available in X-Windows based interface, which can be opened from SMH.

Management and automation

HPE Systems Insight Manager (HPE SIM) is the HPE solution for multi-system management. Customers can seamlessly move from multi-system views in SIM to more detailed single system information in SMH.

Ignite UX

Ignite-UX addresses the needs of HP-UX 11i system administrators who perform fast deployment for one or many servers. It provides the means for creating and reusing standard system configurations, enables replication of systems, permits post-installation customization, and is capable of operating in both interactive and unattended modes.

HP-UX can be installed from either a DVD or an Ignite-UX Install Server. Administrators have a choice of full, update, and cloned installations. Installation Services are available for those customers who would like an experienced HPE Software Specialist to install the software.

Ignite-UX released on AR1209 media supports:

- Agile only DSFs mode ACL for PAX based archive and recovery

With Ignite-UX version C.7.18.63 released on AR1403 media:

- Simplify deployment with easier creation of Golden Images for server clients.
- Increase flexibility when configuring root- and data- disk groups with cold installation and archive/restore support, with Veritas File System/Volume Management 5.1SP1 software.
- Enhance the secure development life cycle by supporting signature verification in a signed depot.

Software Distributor- UX

Software Distributor-UX (SD-UX) is the HP-UX administration toolset used to deliver and maintain the HP-UX operating system and layered software applications. Delivered as part of HP-UX, SD-UX can help manage the HP-UX operating system, patches, and application software on HPE Integrity servers.

Software Package Builder is an intuitive, graphical user interface (GUI)-based tool for packaging software into SD-UX packages so that they can be installed and managed in the same way as the HPE system software.

Update-UX

- Update from one version of HP-UX to another (e.g., 11i v2 to 11i v3)
- Update from one release to another (e.g., 11i v3 0709 to 11i v3 0903)
- Data and configurations are preserved
- TUI and command line interface
- Integrated with Dynamic Root Disk - can update an inactive system (older version of 11i v3 to 11i v3 March 2009 or later)
- Preview mode (analysis only)

Software Assistant (SWA)

SWA simplifies patch and security bulletin management on HP-UX systems, and offers the following features and benefits:

- Analyzes a system for patch warnings, critical defects, security bulletins, missing Quality Pack patch bundle, and user-specified patches and patch chains.
- Uses an HPE-supplied catalog file to analyze your system and generate reports.
- Optimizes the automatic selection of patch dependencies by assessing the quality of the dependency, providing the best case scenario for the dependency, minimizing changes to the system, and assessing future patch dependency changes.
- Produces the Action, Issue, and Detail Reports as well as a consolidated HTML report for you to see what issues are relevant to the software on the system or in the depot.
- Provides the ability to download and verify patches, then build a Software Distributor (SD-UX) depot which will fix many of the issues in the report. You can also use SWA to see recommended additional actions in the report, which you need to take care of manually to fix the remaining issues.
- Has selected features integrated with HPE SIM 5.2 and later for simultaneous analysis of up to 100 systems, also provides a command line interface (CLI).

Management and automation

- In the HTML report, patches that are included because they are dependencies are flagged as such. This allows the report to provide enhanced dependency relationship information to help users better understand why patches are included in a report.
- New toolbox options are available that give privileges to non-root users
- Download reports to your local system
- Runs from both an HP-UX 11i or Windows CMS

For more information, go to:
https://h20392.www2.hpe.com/portal/swdepot/displayProductInfo.do?productNumber=B6834AA

Dynamic Root Disk

Dynamic Root Disk (DRD) provides customers the ability to clone an HP-UX 11i system image to an inactive disk, then:

- Perform system maintenance on the clone while the system remains online
- Quickly re-boot during off-hours once the desired changes have been made
- Utilize the clone for system recovery if necessary
- Rehost the clone onto another system for testing or provisioning purposes (on Integrity VMs or Blade Systems using Virtual Connect; LVM only)
- Perform an OE Update on the clone from an older version of HP-UX 11i v3 to HP-UX 11i v3 March 2009 (Update 4) or later.
- DRD Sync allows you to compare the clone to the original disk. It checks for changes that may have occurred since the clone was created, and allows you to propagate them from the original disk to the clone. With HP-UX 11i v3 September 2010 update and later releases, system administrators will have the ability to sync more than once to the same clone. DRD will keep record of the most recent data on both clone and original and apply or protect that data.
- Support LVM 2.2 boot/root volume

DRD supports both HPE Logical Volume Manager (LVM) and Veritas (VxVM) root volumes, except as specifically noted above for rehosting. DRD can reduce planned downtime by up to 50% for updates and maintenance.

Integrity power management

HP-UX 11i v3 delivers multiple controls to manage power consumption balanced with performance requirements:

- Green Idle Processor - the system tunable pwr_idle_ctl can be set to a value from 1-5 (default is 'off'), to instruct the system to power down the processor to various levels. The higher the value, the higher the processor power savings: up to 10% of processing power consumption can be saved for idle processors.
- Green Active Processor - The pstateect1 command enables, and sets to static or dynamic, the ability to power down active processors, saving up to 8% of active processors.
- Green Idle Cell - the parolrad and frupower commands power down unused floating cells in a cell-based server, saving up to 1kWatt per cell.
- Green Idle I/O - the olrad command powers down unused I/O cards, saving up to 25Watts per card

With HP-UX 11i v3 September 2010 update and later releases, systems can be ordered with the kernel tuned to the optimal power savings level: Green Idle Processors is set at the highest power saving level and Green Active Processors is set at the highest power saving level.

Capacity Advisor, included in VSE-OE and DC-OE, supports power capacity planning.

Insight Control power management

Insight Control power management is a SIM-based tool that allows systems with iLO2 and later chips to:

- Graphically monitor power consumption and thermal output.
- Discovers and monitors PDUs from Hewlett Packard Enterprise and other vendors and allows definition power topology to servers
- Power regulation
- Data Center power control which allows automated event response to power events

Management and automation

Power Capping is available on Integrity Blade and rx2800 servers:

- Safely limits system power and protects circuit breakers
- Single server: Cap to device peak and save
- Enclosure: Cap to workloads' peak and save more

GlancePlus Pak

HPE GlancePlus Pak provides a single product for managing a system's availability and performance. It is an integrated product included in the VSE-OE, HA-OE and DC-OE that includes:

- HPE GlancePlus - GlancePlus provides immediate performance information about a system. It lets a customer easily examine system activities, identify and resolve performance bottlenecks, and tune the system for more efficient operation.
- HPE Performance Agent - The HPE Performance Agent is the logging, alarming, and collection component of HPE GlancePlus Pak. It keeps a history of the system's performance and sends alarms of impending performance problems.

As an integrated product, the GlancePlus Pak includes the real-time diagnostic capabilities of GlancePlus and the historical data collection capabilities of the Performance Agent. The performance agent is used with other availability and performance management products, thus providing an integrated real-time and historical performance management solution.

With GlancePlus Pak, a wide range of system performance and availability problems can be handled to get the best from the system and the applications running on it.

HPE Storage Data Protector

The HPE Storage Data Protector software is enterprise data protection and disaster recovery, ensuring recovery from any disruption. Data Protector integrates a variety of techniques to eliminate backup and recovery windows. The capabilities to eliminate planned downtime range from online backup and backup of open files to zero-downtime, zero-impact backup. The software provides industry-leading instant recovery as well as several disaster recovery alternatives to eliminate unplanned downtime, allowing recovery of entire data centers in minutes.

System Fault Management and Online Diagnostics

HP-UX 11i Base OE and higher OEs deliver tools that support hardware diagnostics and are integrated with central management tools System Management Homepage (SMH) and Systems Insight Manager (SIM).

The Online Diagnostics software consists of two product bundles:

- SysFaultMgmt (SFM)
- OnlineDiag (legacy support)

These bundles include many tools to help diagnose and self-heal Integrity and HPE 9000 server hardware such as processors, memory, power supplies, fans, interface cards and mass storage devices.

SysFaultMgmt is a WBEM based hardware diagnostics solution. It provides powerful combination of in-depth diagnosis, alerting, and self-healing and is recommended to be used on current shipping systems running HP-UX 11i v3.

The SysFaultMgmt bundle includes the System Fault Management (SFM) software that includes the following tools.

- SFM Providers that monitors the health of Hewlett Packard Enterprise servers and retrieves information about hardware such as memory, processors, power supplies, and cooling devices. SFM operates in the Web-based Enterprise Management (WBEM) environment.
- EVWEB is packaged with SFM and can be used to view and administer WBEM indications generated on the HP-UX 11i v3 system.
- EMT enables customers to view most errors that can occur on HP-UX 11i v3 systems. It also provides probable cause for errors, and recommended actions.

The key benefits of using SysFaultMgmt product are:

- SFM monitors platform health, guides system self-healing, and alerts administrators when corrective action or repair is

Management and automation

required
- Communicates to administrative tools such as HPE SIM for datacenter management, and HPE SMH for single server management
- Provides remote supportability through WBEM providers to HPE Insight Remote Support
- Coordinates the system response to critical system faults by collecting the system state information used in analysis of machine check conditions by WEBES System Event Analyzer

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Web-Based Enterprise Management (WBEM)

WBEM (Web-Based Enterprise Management) is a DMTF (Distributed Management Task Force) standard based on the CIM (Common Information Management) model.

WBEM allows customers to manage their systems consistently across multiple platforms and operating systems, providing integrated solutions that optimize their infrastructure for greater operational efficiency.

WBEM enables management applications to retrieve system information and request system operations wherever and whenever required.

HPE WBEM Services version A.02.09.08 and later supports Insight Remote Support (IRS) configuration on HP-UX 11i v2 and HP-UX 11i v3 and is included in Update 9 release.

Event Monitoring Services (EMS)

The HPE Event Monitoring Service (EMS) is a system monitoring application designed to facilitate real-time monitoring and error detection for Hewlett Packard Enterprise products in the enterprise environment. This framework provides centralized management of hardware devices and system resources and provides immediate notification of hardware failures and system status.

HPE EMS reports information that helps to detect loss of redundant resources, thus exposing single points of failure and eliminating the threat to data and application availability. HPE EMS capabilities cover the entire system: system components, storage, and network interfaces.

Hyper-Threading for HP-UX 11i v3

HP-UX 11i v3 fully supports Itanium Processor Family Hyper-Threading (HT) technology. Each hardware thread appears as a complete processor to the operating system. Logical Processors (LCPUs) provide control for hardware threads in HP-UX 11i v3.

On HP-UX 11i v3, the HT technology is enabled at different levels. The Intel® Hyper-Threading feature is enabled or disabled at system boot time through the firmware setting. When the HT feature is enabled, the LCPU feature can be dynamically enabled so that kernel threads are scheduled on each hardware thread. All interfaces available for general use by applications that deal with CPU IDs will expose LCPUs as processor core objects. Therefore, there is no impact to applications from a programming perspective. LCPUs are integrated with HP-UX Processor Sets (PSETs), as a way to offer simultaneous availability of processor cores and LCPUs in a single OS instance.

LCPUs are dynamically enabled or disabled for all cores within a PSET on an HT capable system. HP-UX 11i v3 customers may tailor each system specifically to the needs of the applications being run on that system. Applications that benefit from Hyper-Threading can run in PSETs with LCPUs enabled. For those applications that do not benefit from Hyper-Threading, PSETs may be configured to allow the application to run on cores without LCPUs enabled. This new use of PSETs allows for finer granularity control of HT through the use of an existing and well-tested mechanism. Furthermore, this use provides control for HT manipulation without requiring programming changes for applications. This approach is fully dynamic and allows all customer applications to co-exist within a single OS instance regardless of the use of HT.

File system and storage

Next generation mass storage stack

The next generation mass storage stack meets the greater challenges of today and also establishes a solid foundation for future development. It delivers improved performance and scalability, higher levels of availability and simplified management of mass storage devices. Some of the features and benefits include:

- SAN (Storage Area Network) Agility - agile addressing of devices. A new, single persistent device special file (DSF) per logical unit (LUN) which will not change with reconfiguration of the SAN infrastructure. Hardware Path aliasing provides the ability to shorten the long string of characters in a Hardware path string and used a simplified and more meaningful name
- Immense scalability - architected to support up to 16 million devices (LUNs), up to 16 million I/O controllers, over 4 billion I/O paths and disk sizes up to 8 zettabytes
- Built-in native multi-pathing and load balancing fully integrated with HP-UX 11i v3 - no more need for additional investment in add-on multi-pathing products
- Automatic detection and auto configuration of new mass storage devices, device configuration and SAN changes
- All paths to a device are automatically configured for multi-pathing and load balancing
- Resilience to link failures with persistent DSFs and native multi-pathing. Faster and pro-active path failover of impacted I/O paths by utilizing SAN infrastructure notifications
- Increased performance through use of parallelism and concurrency of I/O operations which can also result in significantly faster ioscan time
- Architected to exploit OS and platform hardware features such as Cell Local Memory, Processor Allegiance, etc. for maximum performance
- User settable tunables for further optimization of device access
- Ability to increase queue depth for SAN ports, eliminating port congestion resulting in increased performance and avoiding the need to overprovision SAN ports
- Disk Scrub feature to sanitize hard drives for use, eliminating the possibility that old data can be reconstructed, through DoD-approved method of overwriting and erasing the drive in place, in the system
- Integration with CIM/WBEM based system and storage management utilities such as the HPE System Management Homepage (SMH), Systems Insight Manager (SIM) and Storage Essentials (SE)
- Enhanced performance metrics and improved performance tools, including port level metrics and separation of read and write operations within sar
- OLARD (online addition, replacement, deletion) of I/O interfaces while I/O activity continues
- Ability to quickly and easily detect missing SAN components and devices when SAN changes are made
- Compatible with HP-UX 11i v2 - no retraining of IT staff required in most update cases. Update to HP-UX 11i v3 and begin using without additional training requirements. Only need to adopt new features when ready to or when exceeding HP-UX 11i v2 limits
- Asymmetric Logical Unit Access (ALUA) for transparent Active/Passive, Asymmetric Active/Active array support
- Integrated LUN/path deletion for snap/clone
- Improved load balancing algorithms including preferred Tgt Port, closest path and weighted round robin
- Configurable path ping (none, basic, extended)
- Deferred path recovery (immediate, count_based, time_based)
- Target Port Alias
- Device Data Repository (DDR) name generation (scsimgr ddr_name)
- Selective stale device deletion (rmsf -x -H <hwpath>)
- Fibre Channel symbolic names for host node/port, array/port
- Fibre Channel failover optimization

HPE OnlineJFS, VxFS, Base-VxFS

HPE sells Symantec file system VxFS under the name of HPE OnlineJFS. Base-VxFS is the base file system included in the base HP-UX 11i operating system. HPE invests in integration, testing and quality assurance of OnlineJFS and Base-VxFS with the HP-UX 11i operating environments.

HPE OnlineJFS extends the functionality of Base-VxFS by providing the online management of the journaled file system. It delivers a set of features that adds higher levels of data management capability and substantially increases the availability by enabling online data management without interrupting user and application access to the data.

File system and storage

HPE OnlineJFS is available as a stand-alone add-on HP-UX 11i v3 software product included in the High Availability, Virtual Server and Data Center Operating Environments for HP-UX 11i v3 and as a product in the Serviceguard Storage Management Suite for HP-UX 11i v3.

Some of the features in VxFS 5.0 include:

Multi-volume file system (MVS)
MVS allows a file system to exist in multiple volumes. It provides flexibility to the customer to customize the mapping between their data requirements and the most appropriate choice of performance, availability, and cost available from their storage configurations.
NOTE: MVS is only available as part of HPE Serviceguard Storage Management Suite products (SGSMS).

Dynamic Storage Tiers aka Quality of Storage Service (QoSS)
With MVS you can control where storage is allocated for a given file, directory, or checkpoint. However, the value of that data can change over time. With Dynamic Storage Tiers and QoSS built on top of MVS, you can further configure relocation policies to ensure these files are stored on the storage most appropriate to matching their characteristics at a given time, thus reducing storage costs.
NOTE: QoSS is only available as part of some of the HPE Serviceguard Storage Management Suite products (SGSMS). To find out which SG SMS products support this feature, please refer to the release notes at **http://docs.hp.com/en/T2771-90036/relnotes_A0200_Reprint_v2.pdf**

Cross-platform Data Sharing (CDS)
CDS provides a means for the serial sharing of a VxFS file system across heterogeneous platforms that have direct access to the physical devices that contain the data. This may be useful for migrating from one platform to another (e.g., Solaris or AIX to HP-UX) or for the serial processing of data across multiple platforms (e.g., HP-UX and Linux).

Cluster File System
Through use of the cluster file system, you can concurrently share file systems and files between nodes in the cluster.
NOTE: CFS is only available as part of Serviceguard Storage Management Suite with CFS.

VxFS 5.1 SP1

Starting with the March, 2014 HP-UX update release, in the BOE, HA-OE, VSE-OE, and DC-OE the default install is VxFS 5.1 SP1 over LVM. Base-VxFS is the default install for the BOE, while OnlineJFS is the default install for HA-OE, VSE-OE, and DC-OE.

The 5.1 SP1 version of Base-VxFS and OnlineJFS will have the following enhancements:

- Simplify storage management and reduce backup times with new individual file backup capability provided
- Improve business application efficiency and transaction performance [for write-intensive applications] with new partition directory mechanism.

VxFS 6.1

Starting with June 2016 VxFS 6.1 is available for HP-UX 11iv3 and provides following enhancements:

- Scale better and provide right data at right time at optimal cost
- Better management with dynamic reconfiguration of storage with easy-to-use tools
- Make applications available with I/O shipping in a clustered environment
- Improved protection against hardware failures and handling infrastructure disruptions.
- Improve efficiency of storage utilization with multi-threaded thin reclamation.

HPE Logical Volume Manager and Mirrordisk/UX

The HPE Logical Volume Manager (LVM) is included with HP-UX 11i and provides basic volume manager functions and features needed for most configurations. New enhancements to LVM include:

- Dynamic LUN expansion for improved manageability and to minimize downtime
- Support for Online disk replacement (OLR)
- Improved ability to change existing volume group configuration (vgmodify)
- Increased maximum logical volume size, from 2TB to 16TB

File system and storage

- Performance improvements (scan time, activation time, etc.)
- Support for storage array snapshots and clones (volume group quiescing)
- Support for striped mirroring providing increased availability
- LVM command line interface parse-ability with HP-UX 11i v3
- Full support of native multi-pathing on HP-UX 11i v3

With the HP-UX 11i v3 March 2009 (Update 4), the Logical Volume Manager (LVM) has been enhanced with the following key features in the areas of scalability, manageability, availability, flexibility, and performance:

- Scalability -- Volume groups can now be resized on versions 2.0 and 2.1 with the improved vgmodify command
- Manageability -- Dynamic LUN expansion and Dynamic LUN contraction are now supported on versions 2.0 and 2.1 with the improved vgmodify command
- Availability -- Volume group resizing, Dynamic LUN expansion, and Dynamic LUN contraction can be performed online on versions 1.0, 2.0, and 2.1 without loss of application availability
- Flexibility -- Volume groups with version 1.0 can now be migrated to versions 2.0 or 2.1 using the new vgversion command
- Performance -- Faster volume group scanning with the improved vgscan and vgimport commands

With the HP-UX 11i v3 September, 2009 (Update 5) release Logical Volume Manager includes the following new capabilities:

- Multi-node online reconfiguration for SGeRAC clusters: Customers will be able to make LVM configuration changes from the master node without deactivating other nodes in the cluster
- VGMove: Customers will be able to move LVM Volume Groups from one array to another with no application downtime
- PVMove autorebalance-: Customers will be able to rebalance all of volume groups and have optimal distribution of data across physical volumes
- LVM VG Forced Deactivation: Customers can now deactivate volume groups when resync is going.

With the HP-UX 11i March 2010 (Update 6) release, the Logical Volume Manager includes the following new capabilities:

- LVMove capability: reduces the amount of steps required for the previously-available command PVMove. LVMove function takes these three steps: 1) extend vg 2) use PVMove to move data from source to destination 3) delete source data, and turns them in to these steps: 1) simply utilize LVMove command to move source data, 2) delete source data
- Snapshots: LVM can take two types of Snapshots:
  Space efficient - Space is allocated only when the data changes.
  Fully allocated - Capacity is equivalent to the original volume.
  The read/write capable snapshots give administrators confidence to when doing back-ups and/or experimenting with new applications and software. Having a picture of the volume configuration can save many headaches.
- L2 boot: LVM can now be booted with Layout 2 volumes. Layout 2 of LVM includes massively increased scalability along with manageability, high-availability and mobility features.

Mirrordisk/UX software (product number (B2491BA) prevents data loss due to disk failures by maintaining up to six copies of data on separate disks. Applications can continue to access data even after a single disk failure. In addition, on-line backups can be performed to avoid user and application disruption.

To prevent the failure of a single I/O interface from causing a system failure, Hewlett Packard Enterprise recommends that mirrored disks be connected to separate interface cards.

Features and Benefits

- Striped mirrors (RAID 0+1) and Mirrored stripes (RAID 1+0) for improved performance and availability
- No single point of failure - separate controllers/power supplies
- Up to 6-way disk mirroring (RAID 1)
- On-line backup while maintaining mirroring
- Application transparency
- Dynamic mirror configuration
- Selective mirroring of data
- Fast data synchronization
- Menu-driven administration tools

Veritas Volume Manager (VxVM), Base VxVM

File system and storage

The Veritas Volume Manager for HP-UX is an alternative to the HPE Logical Volume Manager and HPE Mirrordisk/UX products. Base VxVM 4.1 (included in HP-UX 11i Base OE at no additional cost) provides many volume manager features and benefits such as:

- Root disk mirroring
- Rootability support for improved manageability of the root disk
- Split brain avoidance for high availability
- Java-based administrative GUI
- Heterogeneous platform support

In addition to the above features offered in Base VxVM 4.1, the full VxVM 4.1 product (product number B9116BA) and the full VxVM 5.0 (product number B9116CB) can be purchased separately to obtain many more features and benefits including:

- Full mirroring capability (RAID1) up to 32 copies
- Striping (RAID 0) to distribute data across storage devices for improved performance
- Striped mirrors (RAID 0+1) and Mirrored stripes (RAID 1+0) for improved performance and availability
- Dynamic LUN expansion for improved manageability and to minimize downtime -
  NOTE: Dynamic LUN Expansion is not available with Full VxVM or Base VxVM. Dynamic LUN Expansion is enabled by any of the HPE Storage Management products (Serviceguard bundles optional)
- Active load balancing or Dynamic Multi Pathing -
  NOTE: Dynamic Multi-pathing is not available in VxVM 4.1 on HP-UX 11i v3, but is available on VxVM 4.1 on HP-UX 11i v2. It is available in VxVM 5.0 on both HP-UX 11i v2 and HP-UX 11i v3.
- Online relayout provides uninterrupted data access during maintenance
- Online volume reconfiguration balances performance and minimize downtime
- Hot relocation restores data after disk failure
- HP-UX 11i v3 March 2014 release includes VxVM 5.1SP1 replacing the corresponding VxVM 5.0.1 components.

VxVM 5.0 new capabilities:
VxVM 5.0 is available for HP-UX 11i v2 (product number B9116CA) and HP-UX 11i v3 (product number B9116CB). Base VxVM 5.0 is included at no additional cost in HP-UX 11i v3 September 2008 (Update 3). Some of the VxVM 5.0 new capabilities include:

- The faster startup time for the VxVM configuration daemon provides significantly faster discovery of new devices, initialization of dynamic multipathing, and the importing of disk groups.
- Enhancements to the Dynamic Multipathing (DMP) feature include more tunable parameters, faster detection of failures, and a tunable parameter to control the duration of retries for Persistent Group Reservations.
- Easier management of disks cloned via hardware replication.
- Many other features such as enhancements to volume tags, disk tags, and the data migration commands.

Further benefits of VxVM 5.0 and VxFS 5.0 on HP-UX 11i v3 over HP-UX 11i v2 include integration with OS features, e.g. agile device naming, and native Multi Pathing support in the base products (clusters do not support native MP).

The HPE CIFS Product Suite

The Common Internet File System (CIFS) is the native network file system protocol in Microsoft Windows operating systems. HPE CIFS for HP-UX 11i integrates UNIX with Microsoft Windows environments by providing remote file sharing, printer access and authentication services between HP-UX and Windows systems.

The Samba based HPE CIFS Server provides CIFS client access to HP-UX 11i file systems to Windows.

The HPE CIFS Suite includes the HPE industry-leading CIFS Unix Extensions, which allow connections between CIFS Clients and Servers to utilize Unix file system attributes within the CIFS protocol.

HPE CIFS product suite is provided as a standard component of HP-UX 11i Operating Environments and free with HP-UX 11i Application Releases. It is automatically ignited with HP-UX 11i. Both CIFS Server and CIFS Client products are included.

Network File System

The Network File System (NFS) allows a client node to perform transparent file access over the network. By using NFS, a client node

File system and storage

operates on files residing on a variety of servers and server architectures, and across a variety of operating systems. File access calls on the client (such as read requests) are converted to NFS protocol requests and sent to the server system over the network. The server receives the request, performs the actual file system operation, and sends a response back to the client.

NFS has been updated for HP-UX 11i v3 with a completely new implementation of the NFS version 2 (NFS v2) and version 3 (NFS v3) protocols. Some of the new features and benefits include:

- NFS v3 support for read, write, and readdirplus requests as large as 1MB for file systems mounted using TCP. This feature allows NFS clients and servers performing large data transfers to utilize CPU and network resources more efficiently.
- Client-side failover, for read-only file systems, allows the NFS client system to automatically and transparently switch to a backup NFS server if the original system stops responding
- Configurable pools of asynchronous I/O threads that replace the biod daemons on the client, offering improved client stability and fault tolerance. The default number of threads is 8 per mount point.
- A configurable pool of nfsd threads that replaces the user-space nfsd daemons on the server, offering consistent request processing for both UDP and TCP requests. The default number of threads is 16.
- Support for the Unified File Cache, which enables significantly improved performance for many application workloads
- New kctune kernel parameters and configuration files to control the performance and behavior of the NFS product
- NFS server logging facility that enables administrators to determine which NFS clients are using server resources
- Support for Access Control Lists to allow users on NFS client systems to view and modify ACLs, providing more granular file and directory permissions and security
- WebNFS support that authorizes NFS servers to be accessed via WebNFS-aware browsers and clients
- Integrated security, both enhanced user authentication and data encryption, so customers can feel safe sharing files over private and public networks
- NFS services may be configured to run on specific port numbers, allowing system administrators to easily configure NFS server systems behind hardware firewalls or software firewalls such as IP Filter
- IPv6 support allows administrators to share files across IPv6 networks
- Support for NFS v3 client to send Asynchronous NFS Direct I/O requests to the NFS server. This feature allows the NFS client to send multiple I/O requests to the server without a synchronous wait for individual request. This helps in improving the performance of the database with large sequential I/O.
- NFS v2 and v3 support for reverse name lookup on NFS files that are open on NFS client.
- Support for HP-UX Secure Resource Partitions (SRP) A.03.00 software. All versions of the NFS client protocol namely, NFSv2, NFSv3 and NFSv4 can operate in the SRP environment.

HP-UX 11i v3 also introduces NFS Version 4 (NFS v4), the latest version of the NFS protocol. NFS v4 delivers many customer-requested features, including:

- Support for WebNFS an extension of NFS enabling easy access to files across the Internet making filesystems at remote locations appear as a local filesystem even through firewalls.
- SecureSharing of Directories NFS now uses the AUTH_DH stronger security modelthat uses public private keypairs to authenticate users.
- Client Failover allows for a redundant NFS server to be named to eliminate filesystem downtime due to network faults, server orderload or server crashing.
- Compound Remote Procedure Call (RPC) packets, which combine multiple operations into a single over-the-wire request, thus reducing network latency and security processing overhead
- Integrated security for enhanced user authentication and data encryption, so customers can safely share files over both private and public networks
- Integrated file locking, file system mounting and ACL support
- Support for IPv6 networks
- Improved Firewall and IP Filter Support, since all NFS v4 requests are sent to a single TCP port
- Improved interoperability with Microsoft® Windows clients via enhanced file attributes and share locks
- Support for read, write, and readdir requests as large as 1MB, allowing NFS clients and servers performing large data transfers to utilize CPU and network resources more efficiently
- File Delegation support, allowing the NFS v4 client to perform I/O operations against a locally cached version of the file without informing the NFS server, thus improving application performance
- Client-side failover, for read-only file systems, allowing the NFS v4 client to automatically and transparently switch to a backup NFS server if the original system stops responding
- New kctune kernel parameters and configuration files to control the performance and behavior of the NFS product
- Support for all versions of NFS (v2, v3 and v4) to be active on the system simultaneously

File system and storage

- Updates to the AutoFS subsystem to support NFS v4
- Cross mount traversal, allowing clients to seamlessly traverse the shared directories and cross the physical file system boundaries on the server without having to explicitly mount each shared file system independently
- Referrals feature that allows an NFSv4 client to traverse shared directories and seamlessly cross the physical file systems located on different servers

Hewlett Packard Enterprise is continually making improvements to the NFS product family, both in terms of features, stability and performance. These product enhancements are delivered via Independent Software Units (ISU), available as a free download from The HPE Software Depot website: **http://software.hp.com/portal/swdepot/displayProductInfo.do?productNumber=ONCplus**. The most recent ONCplus ISU includes numerous performance improvements that benefit most applications using NFS. Hewlett Packard Enterprise strongly encourages customers to install the most recent version of the ONCplus ISU to reap these performance and stability benefits.

HPE Serviceguard Storage Management Suite

The HPE Serviceguard Storage Management Suite (SG SMS) is the latest addition to the HP-UX 11i high availability portfolio. This suite of products combines the power of HPE Serviceguard with the Veritas Storage Foundation offerings by Symantec to produce a comprehensive solution that offers proven availability, performance and manageability.

There are different products included in the Serviceguard Storage Management Suite - each to address different customer mission critical requirements. Some products are specific to Oracle database environments, Oracle RAC environments and others provide advanced file system volume management capabilities and cluster file system manageability.

Serviceguard Storage Management Suite A.04.01 based on Serviceguard 11.20 and Veritas Storage Foundation 5.1SP1 is available on HP-UX 11i v3.The value of HP-UX 11i v3 extends beyond the benefits gained through the Serviceguard Storage Management Suite by offering these storage management solutions on top of HP-UX. These high availability-based solutions integrated with the HPE Virtual Server Environment to maximize resource utilization and improve ROI. SG SMS is also available leveraging the integration and simplified manageability of HP-UX 11i Operating Environments (OEs). Pre-integrated with the HP-UX 11i v3 Data Center Operating Environment, and the HP-UX 11i v3 High Availability Operating Environment, SG SMS provides a quick-to-deploy advanced storage management solution.

For additional information regarding the HPE Serviceguard Storage Management Suite, go to:
http://h20566.www2.hpe.com/portal/site/hpsc/public/psi/home?sp4ts.oid=4162092&ac.admitted=1495207820599.125225703.1938120508

Availability and clustering

The information contained in this section provides a high-level overview of the Serviceguard high availability and disaster recovery solutions portfolio. For more detailed information, including configuration requirements, please refer to the High Availability, Manageability and Virtualization chapter of the most recent HPE Integrity, HPE 9000, and carrier grade servers Configuration Guide.

HPE Serviceguard High Availability Clustering Software

HPE Serviceguard builds upon the concept of virtualization by grouping multiple servers or partitions into a cluster to provide highly available application services that ensure data integrity. Within the cluster, HPE Serviceguard monitors the health and status of software and hardware components and uses enhanced cluster management tools to efficiently manage multiple systems. If a threshold is exceeded or a failure occurs, HPE Serviceguard provides automatic failover and fast failback of the business-critical applications.

While HPE Serviceguard is effective in handling unplanned events, it can also be used for planned maintenance of your clustered environment. Applications can be moved among servers so that services can remain available to the end user while software or hardware upgrades are implemented.

HPE Serviceguard A.11.20 is available as a stand-alone product or, as part of the HP-UX 11i v3 High Availability Operating Environment, the Data Center Operating Environment, and in the Serviceguard Storage Management Suites.

HPE Serviceguard is available for environments with HP-UX enabling a consistent cluster strategy for both operating systems.

HPE Serviceguard Disaster Recovery Solutions

HPE Disaster Recovery solutions for HP-UX stretch beyond the realm of typical high-availability by providing comprehensive protection when a site-wide disaster or system failure occurs. Disaster recovery solutions utilize multiple data centers and multiple copies of data so that if one data center fails, a second one will continue to operate. Regardless of the distance, the company will survive the loss of a data center and maintain access to critical data and applications. The result-clusters that are resistant to multiple points of failure or to singular, massive failures.

Starting Oct 2016, Smart quorum is available to increase the availability of complex application workloads by preventing their expensive failover during the split-brain scenario which may be noticed in a cluster spread across sites.

Extended Distance (Campus) Cluster

Extended Distance Cluster is the most cost effective of the HPE suite of Disaster Recovery (DR) Solutions for customers seeking to protect their data and maximize application availability. It uses software-based data replication. Disaster Recovery Solutions are sold separately for use with HP-UX 11i v3 OEs.

Key features:

- This configuration implements a single Serviceguard cluster across two data centers, and uses either Mirrordisk/UX or VxVM mirroring for data replication. No cluster license beyond Serviceguard is required for this solution, making it the least expensive to implement.
- Customers may choose any storage supported by Serviceguard, and the storage can be a mix of any Serviceguard-supported storage.
- Writes are synchronous unless the link or disk is down, so data remains current between the primary disk and its replica.

Extended Distance Cluster is most appropriate in the following situations:

- Distance is less than 100km. Extended Distance Cluster does not support asynchronous data replication. While data currency is maintained between the two data in normal operations, longer distances between the data centers increases the likelihood of performance impact.
- Data is less critical. Extended Distance Cluster provides no built-in mechanism for Serviceguard to determine the state of the data before starting up the application. Unlike Metrocluster or Continentalclusters, an application package will start successfully if volume group activation is successful. For example, nothing prevents an application from starting if the

Availability and clustering

Logical Volume Manager (LVM) mirrors are split. This scenario will increase the exposure to loss in the event of a site disaster.

Only a carefully designed architecture coupled with proper implementation (e.g. adding additional intelligence to package control scripts, selecting appropriate volume group activation options, incorporating monitoring tools like Event Monitoring Services, etc.) can help to avoid undesirable behavior or consequences.

Metrocluster and Continentalclusters

Metrocluster and Continentalclusters offer the most robust recovery mechanisms in the HP-UX 11i suite of geographically dispersed clusters that also includes Extended Distance Cluster.

Key features:

- Automatic and bi-directional failover of mission-critical data and applications so both data centers can be active, protected and capable of handling package failover to each other. Metrocluster also supports manual site switching for added flexibility.
- Support for three data center disaster recovery configuration for all types of workloads
- Cluster can be stretched up to 300km, support for up to 16 HPE Integrity and HPE 9000 servers
- Robust, reliable fast fail-over and fail-back via array-based data replication
- Integration with Serviceguard Manager for centralized GUI based configuration, monitoring and administration of Metrocluster packages
- Metrocluster support for cluster verification which helps verify that the cluster is configured correctly with a single easy to use command
- Disaster Recovery Rehearsal feature for Continentalclusters for both two data center and three data center architectures for increased availability and greater readiness
- Optimized resource utilization and performance with HP-UX Workload Manager and On-Demand Solutions
- Special integration for Oracle 11g RAC databases with SGeRAC
- Integration with HPE Insight Dynamics - VSE capabilities such as capacity planning, workload management, infrastructure orchestration, Utility Pricing solutions, HPE Virtualization Continuum for HP-UX solutions and Integrity Virtual Machines

Metrocluster can be used with HPE StorageWorks Continuous Access XP, Continuous Access EVA, 3PAR Remote Copy for storage systems or EMC's Symmetrix Remote Data Facility (SRDF) in the following situations:

- The integration with storage is used to mirror data between sites
- Application performance is of critical importance
- Fast fail-over and fail-back are required

HPE Serviceguard Storage Management Suite

For details on HPE Serviceguard Storage Management Suite, please see the File system and storage section of this document, or refer to:
http://h20566.www2.hpe.com/portal/site/hpsc/public/psi/home?sp4ts.oid=4162092&ac.admitted=1495207820599.125225703.1938120508

HPE Serviceguard Enterprise Cluster Master Toolkit (ECMT)

Hewlett Packard Enterprise offers a wide range of toolkits to enable customers to integrate their applications with HPE Serviceguard in an easy and effective manner saving both time and money. With the latest release, Enterprise Cluster Master Toolkit contains toolkits for the following applications:

- Oracle single instance database
- DB2
- Sybase ASE
- EnterpriseDB PPAS
- MySQL
- Apache
- Tomcat

Availability and clustering

- CIFS

These toolkits ensure that an application is integrated correctly into a cluster, and also significantly reduce the amount of time required to integrate an application into an HPE Serviceguard cluster. ECMT supports improved Cluster File System integration for better manageability, Live Application Detach capability for reduced planned downtime as well as Cluster wide Device File Names (CDFs) for ease of storage management across all toolkits. In addition, the Oracle Single Instance toolkit has been enhanced to support easy deployment through the Serviceguard Manager graphical interface as well as cluster verification to verify that the cluster is configured correctly for increased availability and readiness. With the latest release ECMT now includes a toolkit for easy integration of EnterpriseDB PPAS database into a Serviceguard cluster.

HPE Serviceguard Toolkit s for Database Replication Solutions

HPE Serviceguard Toolkits for Database Replication Solutions is a bundle of toolkits that enables customers to easily integrate database disaster recovery and replication products of industry standard databases into a Serviceguard cluster. This toolkit bundle consists of the Serviceguard Toolkit for Oracle Data Guard and the Serviceguard Toolkit for IBM DB2 HADR. Using these toolkits customers can complement the high availability provided by Oracle Data Guard or IBM DB2 HADR to their mission critical environment while mitigating the risk involved with a custom integration.

The Serviceguard Toolkit for IBM DB2 HADR provides high availability to the DB2 HADR replication tool itself enabling you to minimize downtime and data loss in your mission critical DB2 environment. Key features include:

- Start/Stop/Monitor for both primary and standby DB2 databases
- Manage the role of DB2 HADR database
  - Change the role of the standby database to 'primary' whenever the primary database becomes unavailable with the option to switch the role back to the original state if the original primary database comes back up and successfully starts as standby database
- Configuration, monitoring and administration of DB2 HADR packages through the Serviceguard Manager GUI
- Toolkit Maintenance Mode

NOTE: Depends on the ECMT IBM DB2 toolkit to manage the DB2 database

The Serviceguard Toolkit for Oracle Data Guard provides high availability for Oracle Data Guard itself while allowing you to extend easily the disaster recovery offered by Metrocluster and Continentalclusters to the entire stack including Oracle Data Guard. With the latest release this toolkit supports Oracle 11gR1 RAC 1 (raw volumes over SLVM) and Oracle 11gR2 RAC (with RAW volumes over SLVM and CFS 5.0.1 as well) as well as Oracle 10gR2, 11gR1 Single Instance databases.

Key features include:

- Start/Stop/Monitor the Oracle Database:
  - Primary database
  - Physical Standby database
  - Logical standby database
- Active Data Guard (11g only)
- Configuration, monitoring and administration of Oracle Data Guard packages through the Serviceguard Manager GUI
- Support for Cluster verification to verify that packages and the cluster are configured correctly with a single and easy to use command
- Toolkit Maintenance Mode

NOTE: Depends on the ECMT Oracle toolkit to manage the database and the listener(s) in a single instance oracle database environment. Depends on SGeRAC to manage the RAC database in RAC environment.

HPE Serviceguard Extension for RAC (SGeRAC)

HPE Serviceguard Extension for RAC allows multiple servers to be configured as a highly available enterprise cluster that supports Oracle 9i, 10g, and 11g Real Application Clusters (RAC). These two products work together to provide the best aspects of the HPE enterprise clusters and Oracle RAC: high availability, data integrity, scalability, and reduced database administration costs. To create a completely available solution, the application environment should be designed to remove all single points of failure and to reduce the impact of various component failures. SGeRAC provides a comprehensive and consistent continuity solution for the database, non-database data, and higher-level applications for Oracle 10g and 11g RAC environments.

Availability and clustering

SGeRAC A.11.20 is available bundled along with HP-UX 11i v3 High Availability Operating Environment (HA-OE) and Data Center Operating Environment (DC-OE) or can be purchased separately.

Key Features:

- Rapid automatic failure detection and recovery times
- Ability to withstand multiple node failures
- Advanced cluster arbitration mechanisms and the use of robust volume managers help remove data corruption and preserve data integrity
- Robust I/O fencing provides data integrity protection among nodes, both inside and outside of the cluster
- Flexible storage management options for Oracle RAC: CFS, Shared Logical Volume Manager (SLVM), Cluster Volume Manager (CVM), Automated Storage Management (ASM) on SLVM, and raw volumes
- Seamless integration with HPE System Management tools and both Serviceguard CFS and HPE volume managers
- Easy deployment with the ability to configure the cluster, prepare storage and deploy packages through graphical interface provided by Serviceguard Manager
- Integration with HPE -Matrix OE for HP-UX
- Value-added volume manager features with HPE Serviceguard Storage Management Suite (SG SMS)
- Support for Cluster-wide Device Special Files for easier storage configuration
- Support for Reliable Datagram Sockets (RDS) over InfiniBand switches with Auto Port Aggregation (APA) for cluster interconnect to achieve higher throughput
- Support for packaging user defined database services with Oracle RAC

NOTE: Serviceguard and Serviceguard Extension for RAC are required components for Oracle9i Real Application Clusters on HP-UX servers.

HPE Serviceguard Extension for Oracle E-Business Suite (SGeEBS)

HPE Serviceguard Extension for Oracle E-Business Suite enables customers to easily integrate Oracle E-Business Suite (EBS) with Serviceguard while saving on cost and time. Using SGeEBS, customers can mitigate the implementation risk associated with custom integration. Key features include:

- Deployment of both application and database tiers of Oracle EBS
- Support for modular style packages
- Easy Deployment through Serviceguard Manager
- Support for Cluster verification to verify that packages and the cluster are configured correctly with a single and easy to use command
- Support for Live Application Detach which allows upgrades to Serviceguard or hardware while the application continues to run leading to reduced planned downtime
- Support for Oracle 11gR2
- Support for multiple storage options:
  - VxFS over LVM and VxVM
  - Raw devices over LVM and VxVM

HPE Serviceguard Extension for SAP (SGeSAP)

HPE Serviceguard Extension for SAP expands Serviceguard's powerful failover capabilities to SAP environments. It continuously monitors the health of each SAP node and automatically responds to failures or threshold violations. HPE Serviceguard Extension for SAP automates and accelerates the failover of SAP application failover and restart. As an added bonus, it can minimize planned downtime when performing SAP upgrades.

SGeSAP provides a single, uniform interface to cluster SAP NetWeaver systems and SAP applications based on ABAP or Java stacks in a vast range of supported release versions. SGeSAP also clusters underlying databases. On demand, SAP liveCache cluster packages or SAP Master Data Management packages can be created. With the latest release SGeSAP supports Sybase ASE in the databases in addition to Oracle, IBM DB2 or SAP MaxDB.

Key Features and Benefits:

- Builds on top of Serviceguard clusters to simplify deployment
- Protects the SAP central instance, SAP system central services, SAP dialog instances, SAP replication instances, SAP liveCache, SAP MDM, SAP Web dispatcher and underlying Oracle, IBM DB2,SAP MaxDB or Sybase ASE databases

Availability and clustering

- Failure detection and restoration of any SAP application maximizes application uptime
- Faster upgrade of SAP, OS or middleware to reduce planned downtime
- Integrated with Serviceguard Manager to provide a graphical interface for easier configuration and management of SGeSAP packages
- Support for Cluster verification to verify that packages and the cluster are configured correctly with a single and easy to use command
- Compatibility with Serviceguard disaster recovery solutions offers disaster protection for SAP environments
- Utilizes SAP-replicated enqueue technology to become a complete cluster solution that provides fully automated and transparent zero-impact failover for SAP single points of failure in the software stack
- No need for a dedicated secondary node to serve as backup-during normal operation, the secondary node can function as an application server in the production SAP environment or run as a separate SAP development or test instance
- Reduce recovery time for SAP liveCache from hours to less than two minutes
- Fully tested and backed by SAP to ensure compatibility with new releases
- Mission-critical support for SAP offers coordination with SAP for problem prevention and faster resolution

Now includes out of the box Hot Standby protection for SAP liveCache, the first and only high availability solution for SAP liveCache that is proven in production and co-developed with and recognized by SAP. Using HPE Hot Standby for liveCache, Serviceguard Extension for SAP slashes SAP liveCache recovery time from days or hours to as little as two minutes and is recognized by SAP as the first solution of its kind on the market.

HPE Serviceguard Manager

Serviceguard Manager provides a graphical configuration, monitoring, and administration tool to display and manage Serviceguard high availability clusters including- Serviceguard Extension for RAC, Serviceguard Extension for SAP, Serviceguard Storage Management Suite, Enterprise Cluster Master Toolkit, Serviceguard Extension for Oracle E-Business Suite, Serviceguard Toolkit for Database Disaster Recovery Solutions, Serviceguard Toolkit for Integrity Virtual Servers, Extended Distance Cluster, Metrocluster and Continentalclusters, that maintain high availability.

Using Serviceguard Manager, administrators and operators see color-coded, graphically intuitive icons to get the big picture view of multiple clusters so that they can proactively manage the clusters, nodes, and applications. Serviceguard Manager is integrated with HPE Systems Insight Manager and HPE Operations Manager, providing a comprehensive management solution for all your hardware and software.

For information on Serviceguard Manager, see the Virtualization/management and automation section of this document, or refer to: **https://www.hpe.com/us/en/product-catalog/detail/pip.hpe-serviceguard-for-linux.376220.html**

Serviceguard extensions are sold separately for use with HP-UX 11i v3 OEs.

Security

The most basic goal of operating system security is to preserve the integrity of the system in the face of attack. The HP-UX 11i operating system includes a number of features that assist the administrator in locking down the platform and securing your data. All of these functions are available as the Base Operating Environment:

- HP-UX Bastille B.3.3.01, hardens the system against attack by locking down unused or vulnerable system services, networking ports, configuration files, and other platform components. Administrators are guided via a graphical interface to select the lockdown tasks appropriate to their systems, or can choose from pre-defined security profiles
- Install-Time Security enables a system to be installed with default level of lockdown. Administrators can select from a menu of security profiles to be applied via Bastille during the operating system installation process
- Host Intrusion Detection System (HIDS) version 4.4 is host-based security software that enables administrators to proactively monitor, detect, and respond to attacks. HIDS uses kernel-level system audit information to continuously monitor for attacks, generating alerts and optionally responding in real time.
- IPFilter 18.0 provides system firewall capabilities, including stateful connection filtering to limit the "attack surface" of the platform, and connection throttling to limit the effectiveness of denial-of-service attacks.
- Install-Time Security eases default lockdowns by offering a menu of security profiles that may be applied as part of the operating-system installation process.
- Software Assistant (SWA) incorporates key security monitoring for important security patches to make sure your system is up to date with the latest security patches for your system.
- Execute-Protected Stack prevents common types of buffer overflow attacks, which are a leading contributor to platform compromise.

HP-UX HIDS version 4.4 can be downloaded from the HPE Software Depot website.

Whitelisting (WLI)

HP-UX White Listing provides a new approach to security by only allowing access to your data from a known, trusted "WhiteList" of applications--instead of protecting and restricting access to data from any and every variety of processes on a system. Once a relationship is established, only the approved applications can access the data and the identity of the approved application is validated through a cryptographic handshake. This handshake takes place at the lowest levels of the system so that this technique cannot be circumvented even by a 'root' user. This is also very helpful for protecting system configuration files from modification, so the approved system configuration remains intact.

Key features and benefits of Whitelisting include

- Restricting access to files residing on VxFS (aka JFS), HFS, and NFS file systems through file access policies.
  - WLI prevents the modification, deletion and renaming of critical files with File Lock Access Control (FLAC) policy enabled on it.
  - WLI restricts the access to critical files with Identity Based Access Control (IBAC) policy enabled on it. This policy allows only the executables authorized by WLI to access such files.
- WLI reduces the security threats on the system by restricting the access to certain restricted system resources. Access to these restricted resources is allowed only to the WLI authorized applications or executables.
- WLI reduces the effort required for certifications like PCI Data Application Data Security Standard (PCI-DSS) by preventing the unauthorized access to the critical data files.
- WLI has been tested to work in ServiceGuard clusters, with HPE Data Protector, and Symantec Net Backup

For more information see:
https://h20392.www2.hpe.com/portal/swdepot/displayProductInfo.do?productNumber=WhiteListInf

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Identity management and accountability

- Standard Mode Security Enhancements offer granular account and password policies, long passwords of up to 256characters on a system-wide or per-user basis, including the ability to generate detailed system audits for user accountability.
- Enhanced Auditing capabilities include Audit filtering tools efficiently controlling the amount of data audited through pre-filtering and sample audit reports able to generate reports based on the most common compliance requirement of SOX and

Security

PCI.

- HP-UX Directory Server (HPDS) provides an industry-standard, centralized directory service on which to build your intranet or extranet. Your HP-UX 11i servers and other directory-enabled applications use the directory service as a common, network-accessible location for storing shared data such as user and group identification, server identification, and access control information. In addition, you can extend the HP-UX Directory Server to support your entire enterprise with a global directory service that enables centralized management of all enterprise resource information.
- HP-UX LDAP-UX client services simplify identity management by allowing system authentication and naming services to leverage a new or existing LDAP directory.
  - The NIS/LDAP Gateway acts as an NIS server, storing data in an LDAP directory server rather than in NIS maps. The NIS/LDAP Gateway provides Simple Access to LDAP Directory Server, allowing current NIS clients to use the LDAP directory server with few or no changes. In addition, the gateway server converts NIS Remote Procedure Call (RPC) requests into LDAP operations, and then converts answers back into NIS replies
  - The LDAP-UX Client Services provides tools for managing the data in the LDAP directory server and a second set of tools that provide native access to the directory server, bypassing NIS
- Kerberos server and clients offer enterprise-class Single-Sign-On (SSO) services as well as enhanced interoperability with Windows® ADS. Additionally the HP-UX Kerberos server can operate with an LDAP directory providing integrated identity management for authentication and access control
- HP-UX AAA server (RADIUS) authenticates provides authentication services for Virtual private networks, wireless LANs, Unix login, and RADIUS enabled applications. HP-UX AAA server is scalable from enterprise to service provider deployments and also provides two factor authentication for PKI and OTP (One Time Password) deployments.
- PAM_RADIUS supports RADIUS-based authentication for login, Secure Shell, ftp and other Unix services. It can be used to access an existing RADIUS authentication server, or to add two-factor authentication for your HP-UX users.

Common Criteria certification

Compartmentalized Operations Protection Profile (CCOPP)

HP-UX 11i v3 September 2008 (Update 3) running on HP9000 and HPE Integrity platforms has successfully been evaluated to Common Criteria Evaluation Assurance Level 4 (EAL4), augmented with ALC_FLR.3 (flaw remediation). It is evaluated in conformance to the new Commercial off the Shelf (COTS) Compartmentalized Operations Protection Profile (CCOPP-OS).

The CCOPP-OS specifies the extensive range of security requirements necessary to solve the security problem that organizations encounter when trying to implement readily available operating systems to handle compartmentalized environments. It is conformant with both the Controlled Access Protection Profile (CAPP) and the Role Based Access (RBAC) Protection Profile. CCOPP-OS also contains requirements for Mandatory Access Control to implement compartmentalization in a real-world environment.

This successful certification to the CCOPP-OS profile certifies HP-UX 11i v3 UNIX® operating system against the most extensive range of security protections of any commercial off the shelf operating system.

The certification report and the security target are available at **http://www.commoncriteriaportal.org/products_OS.html#OS.**

See also: **https://www.hpe.com/us/en/servers/hp-ux.html**

Many enterprise and government customers require this vendor-independent security certification because it increases confidence in the product's security assurance, functionality, quality and effectiveness. Many governments, including the United States, require certification for government IT procurement.

New in this evaluation: Virtual partitions (vPars) or soft partitioning provides granularity and flexibility to cell-based servers allowing multiple instances of HP-UX to run independently within a hard partition or nPars. These are both included in the evaluated configuration of the HP-UX 11i v3 operating system. Hardware partitions (nPartition) provide both hardware and software isolation so that hardware or software faults in one nPartition do not affect other nPartitions within the same server complex The server is split into a number of cells that can be allocated to the nPartitions. Each cell contains processor(s) and system RAM and may be associated with its own peripheral devices. Learn more about the Common Criteria certification advantage of HPE Integrity nPartitions.

Security

Encrypted Volume and File System (EVFS)

HP-UX 11i Encrypted Volume and File System (EVFS) is an operating system service that addresses industry specific regulatory and compliance requirements for encryption of data at rest. It protects data at the file and volume level, preventing unauthorized access by parties who may have obtained access to the physical storage medium.

Files and databases from your current environment can be encrypted without any changes to the application or the storage infrastructure. EVFS is easy to use and greatly reduces the threat of data compromise. Alternatively individual file-level encryption to provide unique symmetric keys for individual files. The distinction is that with volume-level encryption, all files residing in a file system (mounted on an encrypted volume) are encrypted using the same symmetric key. By comparison, file-level encryption enables individual files residing in the same file system to have unique (or no) symmetric encryption keys.

Key Features and Benefits:

- High-performance bulk data encryption using AES symmetric keys.
- Application transparency – No change to application needed.
- Investment protection – No change to storage infrastructure required.
- Flexible and robust key management.
- "Secure erase" – Once the encryption keys are destroyed, data cannot be recovered.
- Scalable performance based on number of CPUs

EVFS is available as a free download from the HPE Software Depot website:
https://h20392.www2.hpe.com/portal/swdepot/index.do?productNumber=EVFS

Developers tools

Ipv6

HP-UX 11i supports Ipv6, the next generation internet protocol. The Ipv6 implementation supports dual stacks (Ipv4 and Ipv6) to facilitate Ipv6 deployment. This allows existing applications to coexist on both Ipv4 and Ipv6 networks. Application modification is required only when the application needs to take advantage of the new Ipv6 features Some benefits of Ipv6 are:

- Increased address space – IP address size increased from 32 bits to 128 bits, supporting many more addressable nodes and levels of addressing hierarchy
- Plug-and-Play address auto-configuration – A "link-local" IP address is automatically to allow immediate communication with directly connected hosts, printers, or other devices.
- IP security extensions for authentication, data integrity, and data confidentiality ensured by a standard header extension.
- Natural Mobility support through auto-configuration, routing headers, destination options, anycast address, encapsulation, security, and flow label management all contribute to Ipv6's natural mobility support.

The B.11.31.0803 version of the Ipv6Upgrade bundle supported the privacy extension to Ipv6 auto-configuration feature, which is based on RFC 4941 (Privacy Extensions for Stateless Address Autoconfiguration in Ipv6)

Starting with the B.11.31.0809 of the Ipv6Upgrade bundle, the following new Ipv6 functionalities are supported on HP-UX 11i v3:

- RFC 3484 – Default Address Selection for Ipv6
- RFC 3810 – Multicast Listener Discovery Version 2
- RFC 3678 – Socket Extension to Multicast Source Filter API
- RFC 3493 – Basic Socket Interface Extensions for Ipv6
- RFC 3542 – Advanced Sockets Application Program Interface for Ipv6
- RFC 4193 – Unique Local Ipv6 Unicast Addresses
- RFC 4213 – Basic Transition Mechanisms for Ipv6 Hosts and Routers
- RFC 4291 – IP Version 6 Addressing Architecture
- RFC 4443 – Internet Control Message Protocol for Ipv6
- RFC 4584 – Extension to Socket API for Mobile Ipv6
- RFC 4941 – Privacy Extensions for Stateless Address Autoconfiguration in Ipv6
- Support for Ipv6 over VLAN

HP-UX Mobile Ipv6

Ipv6 addresses are topologically correct, meaning Ipv6 nodes attached to the same physical network or LAN segment must have the same Ipv6 network address prefix. Mobile Ipv6 allows Mobile Nodes, such as laptops and PDAs, to change network attachment points, remaining reachable at all times and with no disruption in network connectivity using a single, fixed Ipv6 address for extended periods of time. Without Mobile Ipv6, Mobile Nodes cannot use a single, fixed Ipv6 address while they roam. Instead, each time a Mobile Node moves and changes network attachment points, it must manually re-configure a new IP address and default router based on its current location-temporarily losing its network connections and ability to communicate in the process.

HP-UX Quality of Service

With the rapid growth in networking traffic and the utilization of server resources near their capacity, Enterprise IT departments and ISPs are confronted with a dilemma in providing applications and users the guaranteed bandwidth to meet the service levels that they have signed up for. To address this business need, HP-UX IPQoS provides IETF DiffServ-compliant network quality of service controls for IP-based network communications.

Multimedia Protocols

HP-UX provides a multimedia infrastructure to be used for multimedia applications. The following lists the protocols that Multimedia Streaming Protocols (MSP) includes:

RTP

Real Time Transfer Protocol (RTP) is a transport protocol that provides end-to-end network transport functions for applications transmitting data with real-time properties, such as interactive audio and video. RTP consists of Real-Time Control Protocol (RTCP), a closely linked protocol, which provides a mechanism for reporting feedback on the transmitted real-time data.

Developers tools

RTSP
Real Time Streaming Protocol (RTSP) controls the transfer of real-time media data and serves as a network-remote-control for multimedia sessions.

SDP
Session Description Protocol (SDP) describes the general real-time multimedia sessions

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BIND

BIND, a Berkeley implementation of the Domain Name System (DNS), is a distributed network service that maps host names to Internet addresses and Internet addresses to host names, and facilitates Internet mail routing. BIND 9.3.2 version provides better security and manageability in the networking communications, and offers new features such as 'DNSSEC Implementation Based on RFC 4033, 4034, and 4035,' 'New Resource Records,' 'Transition Support for Ipv4 and Ipv6.'

Starting with C.9.3.2.5.0 version, the functionality related to Unique Local Ipv6 Unicast Addresses is in accordance with RFC-4193 specification. BIND 9.9.4.5.0 is the latest web release available.

Sockets

BSD Sockets is a set of programming development tools for inter-process communication. Hewlett Packard Enterprise implementation of BSD Sockets is a full set of sockets from the networking services originally developed by the University of California at Berkeley (UCB).

STREAMS

STREAMS/UX for the HPE 9000 is Hewlett Packard Enterprise's implementation of the AT&T de facto standard environment for communications protocols.

STREAMS/UX consists of the STREAMS environment, Transport Layer Interface (TLI), and XTI. TLI is an industry de facto standard application program interface for implementing transport-level communications by means of STREAMS-based network protocol stacks. HPE also provides a Data Link Provider Interface (DLPI) adapter with the core operating system. DLPI is one industry standard definition for message communications to STREAMS-based network interface drivers.

Network performance enhancements for HP-UX 11i v3

The HP-UX 11i v3 networking stack automatically adapts to a range of enterprise networking requirements from low-bandwidth wireless environments to high-bandwidth, high throughput data center environments. There are several significant performance enhancements and optimizations as follows:

- Improved throughput with mobile clients by avoiding unnecessary TCP retransmissions due to varying response times.
- Improved throughput over congested networks by making the estimate of the network path's capacity more accurate.
- Tcphashsz tunable made auto-tunable so that the system can decide the optimal value of tcphashsz at boot time.
- Improved scalability and CPU utilization for high end systems involved significant reduction of spinlock usage and time spent within a spinlock (contention avoidance).
- Improved bandwidth with high speed network interfaces involved implementing NOSYNC capabilities in the STREAMS framework and the IP Lower STREAMS module.
- Improved CPU utilization on cell-based systems involved several different methods to reduce cache misses and the associated latency of retrieving memory across cross-bars.
- Enhancement to the TCP stack and a backward compatible extension to socket send (2) API to improve performance of short lived connections such as web traffic.

Stream Control Transmission Protocol (SCTP)

SCTP is a connection-oriented transport layer protocol that enables reliable transfer of data over IP-based networks. In an IP stack, it exists at a level equivalent to that of Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). SCTP offers all the

Developers tools

features that are supported by TCP and UDP. It also overcomes certain limitations in TCP and adopts the beneficial features of UDP.

The HPE implementation of SCTP is available as a web release on the HP-UX 11i v2 and HP-UX 11i v3 operating systems.

SCTP supports the following features:

- Multihoming
- Mulstreaming
- Conservation of Data Boundaries
- Support for Ipv4 and Ipv6 Addresses
- Dynamic Address Reconfiguration
- Reporting Packet Drops to an Endpoint
- Support for ECN-Nonces
- Partially Reliable Data Transmission

See: **https://h20392.www2.hpe.com/portal/swdepot/displayProductInfo.do?productNumber=SCTP**

Dynamic Host Configuration Protocol (DHCP)

HP-UX 11i v3 DHCP Server contains all the benefits inherent in DHCP, plus a number of advantages that are unique to the Hewlett Packard Enterprise version. DHCP is available for IPv4 and IPv6 networks. The most recent versions of DHCP, DHCPv6, are available on www.software.hp.com. This version is for IPv6 networks and can coexist with DHCPv4 on the same host.

HP-UX Web Server Suite

HP-UX 11i provides the industry leading, Apache Web Server as a total solution for web server deployment. The version of Apache featured on HP-UX 11i is based on the Open Source Apache Web Server 2.0 software developed by the Apache Software Foundation (Apache HTTP Server Project described at: **http://httpd.apache.org**. Also, there is a latest version of Apache featured on HP-UX 11iv2 & 11iv3 which is based on the Open Source Apache Web Server 2.2 software developed by the same Apache Software Foundation.

Internet Express

HP-UX 11i Internet Express is a collection of the most popular and up-to-date open source based Internet, web, security services and tools, combined with a graphical administration utility for ease of management and easy installation of services and configuration. Included with every HP-UX 11i OE Media Kit, the Open Source software is pre-built, fully tested, and qualified for HP-UX 11i supported HPE Integrity and HPE 9000 systems.

The HP-UX 11i Internet Express software package consists of the most recognized security products, mail servers, news and chat servers, and a variety of tools for providing dynamic Web content.

All the Open Source Internet components and administration software included with the product are configured and available for use when the installation is complete. HP-UX 11i Internet Express can be installed using a command-line script or using a graphical user interface. Many of the HP-UX 11i Internet Express Open source components are configured through the HP-UX 11i Webmin-based administration utility. The HP-UX 11i Internet Express media is part of every OE media kit and the products that make up Internet Express are open source community supported products.

HP-UX 11i Internet Express is available on both HPE Integrity and HPE 9000 platforms.

OpenSSL

HP-UX 11i operating environments implement the Secure Socket Layer (SSL v2/v3) and Transport Layer Security (TLS v1) protocols using the OpenSSL Toolkit developed by the OpenSSL Project **http://www.openssl.org**.

Federal Information Processing Standard (FIPS) 140-2 OpenSSL libraries have been added to the OpenSSL product.

- Customers can now develop FIPS 140-2 certified applications using the FIPS libraries provided in the OpenSSL product.

Developers tools

- Libraries for both 32-bit and 64-bit application development are provided.

OpenSSL 1.0.1 is supported on HPE Integrity platforms.

HPE Auto-Port Aggregation (HPE APA)

HPE APA, the HPE link aggregation or trunking product, provides the ability to logically group two or more physical network ports into single "Fat Pipes", often called "trunks". Network traffic is load balanced across all of the links in the aggregation, which allows a customer to build large bandwidth logical links into the server that are highly available and completely transparent to the client and server applications. HPE APA is available for HP-UX 11i v2 and v3, and is included in the Base OE for v3.

The LAN Monitor mode of HPE APA provides a failover group capability with Serviceguard-like configuration tools. LAN Monitor does not support Serviceguard. In the event of link failure, LAN Monitor will automatically migrate the data flow from the primary link to one of the standby links in the failover group.

Hewlett Packard Enterprise has tested switches from the following vendors to work with HPE APA:

- 3Com
- Cisco
- HPE
- Foundry
- Alteon
- Nortel
- Extreme

HPE Fortran

HPE Fortran is a modern, powerful mathematical and scientific language that supports array-handling, data abstraction, and data hiding. HPE Fortran is available on both HPE Integrity and HPE 9000 servers, and includes the following features:

- Full Fortran 95 compiler, based on International ANSI/ISO standards
- Full OpenMP v2.0
- Object-oriented Fortran feature optimizations
- Math intrinsic inlining support
- Standard Fortran library
- Native and cross compilers for HPE Integrity and HPE 9000 systems
- HPE WDB debugger support
- HPE Caliper

HPE Fortran products are increasingly the language of choice for software engineers writing scientific applications and who demand superior run-time performance, code portability, and programmer productivity.

The latest release of HPE Fortran Integrity compilers now support the Fortran 2003 standards

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HPE C/aC++ Developer's Bundle

The HPE C/ANSI C Developer's Bundle and HPE aC++ compiler products for HP-UX are now combined into a single product: the HPE C/aC++ Developer's Bundle. The new product includes all of the components of the original products and more; all for one price with consistent per-CPU license terms on all components. The developers' bundle is sold separately for use with HP-UX 11i v3 OEs. The HPE C/aC++ Developer's Bundle provides the tools for compiling, linking, and debugging C and C++ programs. It also includes performance analysis tools, code analysis tools, and the HP-UX Developer's Toolkit. This product runs on HP-UX 11i v3 for both HPE Integrity and HPE 9000 systems.

The HPE C/aC++ Developer's Bundle includes:

- HPE C/ANSI C compiler
- HPE aC++ compiler
- HP-UX developer's toolkit

Developers tools

- HPE WDB debugger (Hewlett Packard Enterprise supported version of Gnu GDB debugger)
- HPE Caliper performance analyzer
- HPE Code Advisor (cadvise) analysis tool

This new offering will make it easier to order, upgrade, install, and maintain your compiler products.

The latest version of the compilers is A.06.26. With the latest release of the compilers, The latest release of the compilers has features which enable easier porting of GNU C and C++ applications to HP-UX 11i v3 with improved GNU compatibility and new GNU features.

The C++ compilers also have initial support for the latest upcoming release of the C++ standards. In the latest release, the C++ compilers have better C++0x language extensions standards.

HPE Caliper

HPE Caliper is a general purpose performance analysis tool for applications, processes and systems. It monitors the execution of an application and identifies ways to improve performance. It has both a command line interface as well as a GUI, which can be used interchangeably. HPE Caliper with ktrace is included with the Base OE (BOE) and higher OEs. The ktrace functionality is built in to Caliper and provides the following capabilities:

- Ability to trace data on callers, callees, arguments, absolute and elapsed time
- Report symbolically on lock names, system calls, variable names and traps
- Customize the trace points with choice of granularity (functions, modules and libraries)
- Provide flexible selection of traces: single process, multiple processes and even outside the process

HPE Caliper 5.3 is the latest release and provides the following new functionality:

- A new option -sw-process-list helps specify the list of processes to analyze in system-wide mode. This considerably reduces the overhead for Caliper in system-wide mode
- HPE Caliper can now, additionally, read debug information from +objdebug and debug side files. It could read debug information from binaries and load modules earlier.

HPE Code Advisor

HPE Code Advisor is a static analysis tool that finds coding errors in C and C++ programs. Beyond finding coding errors, this tool also enables programmers to identify porting issues, and security vulnerabilities. HPE Code Advisor Version C.02.15 is the latest version. The new features in HPE Code Advisor are the following:

- Comparison of Program Database Reports (pdb) is more detailed and improved than previous versions
- More diagnostics have been introduced to help detect more programming errors
- The effectiveness of existing diagnostics have been improved to help enhance defect detection and migration capabilities

The FORTRAN compiler now has HPE Code Advisor like features which provide similar functionality and help detect programming errors within FORTRAN programs.

HPE WDB Debugger

The HPE WDB debugger is an HPE-supported implementation of the GDB debugger. It supports source-level debugging of object files written in HPE C, HPE aC++, Fortran 90, and FORTRAN77.

HPWDB 6.0 is the recommended debugger for HP-UX 11i v3. Other debuggers, such as xdb and HPE DDE, are no longer supported.

PERL

Perl is an interpreted programming language often used for Unix script development. Perl provides powerful text processing facilities and a rich set of extensions for supporting a variety of external services and data formats. HP-UX Perl includes Active State Perl,

Developers tools

which contains a rich set of Perl library modules, the Perl debugger, and many pages.

Java™ 2 Platform Standard Edition™ (Java SE) for HP-UX

The HP-UX Java Development Kit (JDK) for the Java™ Platform Standard Edition (J2SE) provides the programming tools and runtime environment which allow customers to deploy Java technology with the best performance on HPE Integrity and HPE 9000 servers running HP-UX 11i v3. Hewlett Packard Enterprise supports the three most recent versions of Java: Java SE 6.0 JDK, Java SE 7.0 JDK, Java SE 8.0 JDK.

The Java Platform, Standard Edition 8 is a major release. It includes many new features, enhancements, and updates, and also preserves upward compatibility with previous releases. The HPE JDK/JRE 7.0 also includes the

- Oracle 8.0 update 8u66
- HotSpot 8.0.00 Server JVM
- HP's Java SE features include:
- Standard Java™ SE JDK tools Core API support
- HP technology enhancements to enable greater performance New JVM monitoring & management API
- HP Integrity and HP 9000 support

In addition, Hewlett Packard Enterprise provides several valuable Java tools, which are free, downloadable from the HPE Java website, and are available for use with all of the HPE Java SE releases.

HPjmeter is the 100% pure Java tool for analyzing the performance and behavior of your Java applications. Measure, view, and improve Java™ application performance with HPjmeter, with both offline analysis and real-time monitoring modes. HPjmeter analyzes the profiling information generated by the Java Virtual Machine in Java SE. HPjmeter is also a Java Garbage Collection (GC) visualization tool for analyzing garbage collection activity in a Java program. The GC visualization can be combined with visualization of GlancePlus data for a comprehensive view of Java application and HP-UX system performance. Also, HPjmeter visualizes Java heap dump files, enabling you to understand the contents of the Java heap. HPjmeter Version 4.2.0.00 is the latest version, providing new capabilities and improved usability features, including support for Java 7 and enhanced visualization of objects in Java heap dumps.

HPjconfig is a tool for configuring HP-UX 11i HPE Integrity and HPE 9000 systems to run Java workloads. It aids system administrators in configuring the recommended OS patches and system kernel parameters to match the characteristics of the applications running on the system. HPjconfig provides kernel parameter recommendations tailored to a customer's Java enterprise services (Web server, Application Server, etc.) and HP-UX hardware platform. It offers save and restore functions for easy distribution of tailored recommendations across multiple systems. HPjconfig is supported on all versions of HP-UX 11i, on both HPE Integrity and HPE 9000 systems.

Java Out-of-Box is a stand-alone bundle that that configures the system for running typical Java server applications. Upon installation, Java Out-of-Box will install startup (RC) scripts, modify kernel parameters, rebuild the kernel, and reboot the system. The startup scripts will then modify system tunables, thus providing better "out of the box" behavior for Java.

Aries Technology for HPE 9000 to HPE Integrity transition

Shipped with every HP-UX 11i release for Integrity servers, ARIES is a binary translator that automatically executes PA-RISC applications on Integrity servers running HP-UX. Applications that run on HPE 9000 systems, when copied to an Integrity server running HP-UX will run. The ARIES technology does not require recompilation of the code. More details about Aries including whitepapers, documentation, etc. can be found at: **https://www.hpe.com/us/en/product-catalog/detail/pip.5147795.html**
NOTE: On Integrity servers, HPE 9000 and HPE Integrity applications and libraries cannot be mixed. To port or simply qualify an application on Integrity servers, make sure that the libraries for this platform are available.
HPE Integrity and HPE 9000 binaries cannot be mixed in any one executable.

HPE 9000 Containers

HPE 9000 Containers is based on HPE ARIES and provides an easy, cost-effective solution to transition HPE 9000 applications to

Developers tools

HPE Integrity HP-UX 11i systems. HPE 9000 Containers allow the entire HPE 9000 application ecosystem (the HPE 9000 application and its dependent execution subsystem in the user space) to be imaged and moved over to an HPE Integrity system. This HPE 9000 application image is then hosted in a Secure Resource Partition (SRP) compartment which provides a secure and isolated execution environment for this application to be run under HPE ARIES. This saves time and efforts as costly rediscovery of application dependencies need not be rediscovered and recreated.

HPE 9000 Containers supports HPE 9000 applications for the HP-UX 11i v1, v2 and the v3 environments. More details on HPE 9000 Containers is available at
https://h20392.www2.hpe.com/portal/swdepot/displayProductInfo.do?productNumber=HP9000-Containers

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Parallelized Scientific Subroutine Lib (MLIB)

HPE MLIB is a package of high-performance mathematical software in the form of subroutine libraries. The MLIB product is designed for use by software engineers who develop, port, or optimize engineering or scientific programs. These programs rely heavily on computational kernels such as the Basic Linear Algebra Subprograms, linear algebra computations (solving linear equations or eigenvalue problems), discrete Fourier transforms, or convolutions. Using MLIB will save you the effort of developing, testing, or optimizing these algorithms.

Included in this bundle are subprogram libraries containing software for:

- Dense vector operations, including the Basic Linear Algebra Subprograms (BLAS)
- Sparse vector and matrix operations, including the Sparse BLAS
- Matrix operations, including the Level 2 and Level 3 BLAS
- Linear equation solution, including LAPACK
- Eigensystem solution, including LAPACK
- Parallel linear equation solution using MPI, including ScaLAPACK
- Parallel eigensystem solution using MPI, including ScaLAPACK
- Parallel sparse nonsymmetric linear systems solution using MPI, including SuperLU_DIST
- Sparse symmetric and structurally-symmetric linear equation solutions
- Full METIS functionality
- Sparse symmetric ordinary and generalized eigensystem solutions
- Discrete Fourier transforms
- Convolution and correlation
- Miscellaneous tasks, such as sorting and generating random numbers

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HPE STK for platform transitions

The HPE Software Transition Kit contains tools and documentation to help transition applications from older to newer versions of HP-UX, from Tru64 Unix to HP-UX and from Linux to HP-UX. More specifically HP-UX STK supports application transition from older version to newer versions of HP-UX. STKT supports application transition from Tru64 UNIX to HP-UX transition. STKL supports Linux to HP-UX application transition. The HPE STK assists with topics such as:

New features in the latest HP-UX release and how to take advantage of them:

- Deciding on 32-bit or 64-bit version of applications.
- Qualifying software (for example, run a 10.x executable on HP-UX 11.x) versus porting (create a new HP-UX executable on the destination platform).
- Transitioning software to Integrity processors.

An STK consists of:

- a set of file scanning tools with associated database and information, which checks source files, makefiles, and scripts for identifiers which may indicate transition problems
- a library of useful documents
- A search engine which searches the man pages, impacts and documents

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Solaris to HP-UX Porting Kit (SHPK)

Developers tools

The Solaris-HP-UX Porting Kit (SHPK) is a porting environment for enterprise businesses to use to automate Solaris to HP-UX migration - further reducing the TCO of an HP-UX solution.

SHPK is a result of the Hewlett Packard Enterprise commitment to make the migration experience as painless as possible for customers. It identifies the build environment and API differences between Solaris and HP-UX 11i and automatically addresses them. This automation drastically reduces the time and effort it takes for Solaris applications to be up and running on HP-UX.

The latest version of SHPK has the following new features:

- The SHPK scanner has been enhanced to identify transition impacts for 90 additional libraries and 400 additional APIs. These include APIs for math, thread, string, wide character, signal, stack etc. operations.
- The SHPK Migration Environment has been updated to provide 35 new wrapper APIs. These include wide character conversion APIs, networking APIs, string operations, asynchronous read/write operation APSs etc. This update also handles 12 additional header file differences.
- binaryScan is a planning tool that can be used to scope the porting effort. It scans the dynamically linked executables on a Solaris system and produces a listing of the APIs used by the shared executable, along with the transition impact for each. The Solaris to HP-UX binaryScan has been updated to support Solaris 9, 10 and HP-UX 11i v3 platforms.

AIX to HP-UXPorting Kit (AHPK)

The AIX to HP-UX Porting Kit (AHPK) is similar to the SHPK except the source platform is AIX. It is a porting environment to use to automate AIX to HP-UX migration. AHPK identified the build environment and API differences between AIX and HP-UX and automatically addresses them. This automation drastically reduces the time and effort to port AIX applications to HP-UX.

The AHPK is a brand new product and the first release will provide support for migrating applications from AIX versions 5.2 and 5.3. The target platform will be HP-UX 11i v3. Source code files written in C, C++ and FORTRAN are supported. Additionally, shell scripts and Makefiles can also be automated. Both 32-bit and 64-bit applications can be ported to HP-UX. In addition to the HPE aCC compilers support for GNU's C/C++ compilers is also provided.

Cell Local Memory Support

Memory can be configured into "interleaved" and "cell local" memory. Interleaved memory is a hardware-provided feature that mixes memory from different cells with a very fine granularity. This has the effect of spreading out memory accesses and eliminating "hot spots." Cell local memory provides faster access to processes running on the same cell as the memory, but slower access to processes running on any other cell.

The system administrator has the ability to configure how much memory will be interleaved and how much will be cell local via the command line (parcreate or parmodify) or Partition Manager GUI (parmgr).

Applications can control which locality they execute in using the locality binding and launch policy features.

Shells

HP-UX systems support the Bourne Shell, the C Shell, the POSIX Shell, and the Korn Shell command interpreters.

Dynamic Loader

HP-UX 11i uses an SVR4-compatible loader to dynamically load shared libraries. This loader provides SVR4 symbol resolution semantics, including symbol preemption.

The COFF object file format is supported for all forms of object files.

Data Link Provider Interface (DLPI)

HP-UX 11i provides a Data Link Provider Interface to allow applications to directly use the data link layer services in order to interact directly with the network device drivers.

Developers tools

Dynamically Loadable Kernel Modules

Dynamically Loadable Kernel Module (DLKM) provides the means to add a device driver to a running UNIX system without rebooting the system or rebuilding the kernel. This feature also makes it possible to dynamically remove a device driver from the UNIX system when the driver is no longer needed, thereby freeing system resources for other use.

The DLKM feature not only provides the infrastructure to load drivers into a running kernel, but it also allows a driver to be statically linked into the kernel. Simply setting a flag in one of the driver's configuration files determines whether a driver is to be configured as dynamically loadable or statically linked.

Downloadable Kernel Modules of I/O drivers (DLKM) have been available since HP-UX 11i v3 September 2007 OEUR.

Standards

UNIX System Standard

The Single UNIX Specification is an industry standard promulgated by the Open Group. The Open Group has released three versions of this specification starting with UNIX 95 in 1994. The UNIX 98 version was released in the first half of 1998. The UNIX 2003 version was released in 2002. While the Single UNIX Specification is a software, not a hardware standard, version 3 of HP-UX 11i is branded UNIX 95 on the HPE 9000 platform and UNIX 2003 on the Integrity platform.

Since 1996, HP-UX has been branded with the UNIX 95 profile and all HP-UX11i releases are all branded to this specification.
NOTE: More info for The Open Group at: **http://www.opengroup.org**

POSIX.1 and FIPS 151-2

HP-UX conforms to the IEEE Standard 1003.1-2004 Edition, and to the Federal Information Processing Standard, FIPS 151-2.

IEEE Standard 1003.1-2004 Edition, ISO/IEC 9945-1, Portable Operating System Interface (POSIX)

Information Technology-Portable Operating System Interface (POSIX®)-Part 1: System Application: Program Interface (API) [C Language].

POSIX_ASYNCHRONOUS_IO
POSIX_CHOWN_RESTRICTED
POSIX_FSYNC
POSIX_JOB_CONTROL
POSIX_MEMLOCK
POSIX_MEMLOCK_RANGE
POSIX_MESSAGE_PASSING
POSIX_NO_TRUNC
POSIX_PRIORITY_SCHEDULING
POSIX_REALTIME_SIGNALS
POSIX_SAVED_IDS
POSIX_SEMAPHORES
POSIX_SHARED_MEMORY_OBJECTS
POSIX_SYNCHRONIZED_IO
POSIX_SYNC_IO
POSIX_THREADS
POSIX_THREAD_ATTR_STACKADDR
POSIX_THREAD_ATTR_STACKSIZE
POSIX_THREAD_PRIORITY_SCHEDULING
POSIX_THREAD_PRIO_INHERIT
POSIX_THREAD_PRIO_PROTECT
POSIX_THREAD_PROCESS_SHARED
POSIX_THREAD_SAFE_FUNCTIONS
POSIX_TIMERS
POSIX_VDISABLE
POSIX2_C_BIND
POSIX2_C_DEV
POSIX2_CHAR_TERM
POSIX2_LOCALEDEF
POSIX2_SW_DEV
POSIX2_UPE

Open Group Standard XNS 5.2 Networking Standard (Sockets)

Subsumed by UNIX 2003.

IEEE Standard 1003.2-1992

Subsumed by IEEE Standard 1003-1, 2004 Edition.

IEEE Standard 1003.1-1996

Subsumed by IEEE Standard 1003-1, 2004 Edition.

SVID

HP-UX is based on the UNIX System V Release 3.2 operating system and includes important features from the Fourth Berkeley Software Distribution. It has been extended to support SVID-3 BASE and SVID-3 KERNEL EXTENSIONS.

Standards

Real-Time

HP-UX provides a real-time user and programming environment that complies with the IEEE1003.1-2004 standard. Support is provided for:

- Real-time clocks and timers
- Real-time queued signals
- Fixed-priority scheduling policies
- Real-time scheduler priorities
- Counting semaphores
- Shared memory
- Process memory locking
- Asynchronous I/O
- Synchronized I/O
- Process communications facilities
- Thread-safe implementation of real-time libraries

HPE Message Passing Interface (MPI)

HPE MPI is an implementation of the MPI standard for HPE systems. Engineers from the High Performance Technical Computing Lab of Hewlett Packard Enterprise have developed a high-performance, robust, high-quality, native implementation of MPI for Hewlett Packard Enterprise servers and workstations.

HPE MPI uses OS-specific enhancements to provide low latency and high bandwidth point-to-point and collective communication routines. It supports multi-protocol execution of MPI applications on clusters of shared-memory servers. HPE MPI supports 32- and 64-bit applications, single- and multi-threaded, and provides tools to debug and instrument MPI execution.

Symmetric Multiprocessing (SMP)

HP-UX supports symmetric multiprocessing (SMP), which enables systems with two or more processors to execute the same copy of the operating system, access common memory, and execute instructions simultaneously. SMP functionality fully exploits the additional compute capabilities of multiple processors.

Threads

HP-UX 11i provides software developers the ability to write multithreaded programs that take full advantage of SMP using POSIX Threads. POSIX Threads provide a pthreads interface that complies with the POSIX 1003.1c semantics. The POSIX Threads implementation provides user space threads that are supported by and cooperate with the threaded kernel of HP-UX 11i in a comprehensive two-level scheduling model that transparently maintains full concurrency when a thread blocks. In addition, for building libraries whose routines can be called in either a single-threaded or multi-threaded context, POSIX Threads provide a thread-independent services (TIS) interface.

Shared Libraries

HP-UX 11i v3 provides a full complement of dynamic shared libraries based on System V semantics, which increase system performance, reduce minimum hardware requirements, and ease system management. HP-UX 11i v3 also provides static versions of most of these libraries.

Internationalization

The HP-UX 11i v3 internationalization environment, tools, and localization features enable the development and execution of internationalized software without re-engineering the user application.

Unicode Support

HP-UX 11i v3 includes Unicode 5.0 support. Unicode 5.0 is aligned with the revised ISO 10646-1:2003 standard and defines 99,089 characters. This includes 48,830 new characters beyond the previously supported Unicode 3.0 version. HPE UX 11iv3 March 2013 brought upgraded support for Unicode 6.1 along with the currently supported Unicode 5.0.

Euro Currency Support

HP-UX 11i supports the processing of the new Euro currency symbol through the use of the ISO 8859-15 character set, and Unicode V5.0. ISO 8859-15 is a newly ratified character set that differs from ISO 8859-1 by supporting eight new characters. Specific enhancements are provided to allow Euro display, input, and processing capabilities.

Chinese Character Set Standard GB18030

HP-UX conforms to the People's Republic of China National Standard GB18030-2005. This is a mandatory standard and supports the Chinese Character Set Standard for Information Interchange.

Hardware Requirements

QuickSpecs for **HPE Integrity servers** and for **HPE 9000 systems** describe how to configure and order the systems that run HP-UX 11i.

The HP-UX 11i Operating System can execute on supported HPE 9000 and HPE Integrity systems and must include the following minimum system configuration:

- Minimum main memory - 2 GB for HP-UX 11i v3
- Minimum swap space on disk - 1 GB
- The minimum disk space requirement for installing the HP-UX 11i Operating System is 1 GB to accommodate the EFI Boot Disk and the HPE Service Partition.

HP-UX 11i v3 File Partition Disk Space Allocation by Operating Environment for Cold Install

Partition	Base OE	HA-OE	VSE-OE	DC-OE
/	1 GB (29% used)	1 GB (30% used)	1 GB (30% used)	1GB (30% used)
/stand	1.8 GB (11% used)	1.8 GB (10% used)	1.8 GB (11% used)	1.8 GB (10% used)
/var	8.5 GB (7% used)	4.5 GB (16% used)	8.5 GB (7% used)	4.5 GB (16% used)
/usr	4.3 GB (63% used)	4.4 GB (63% used)	4.3 GB (63% used)	4.4 GB (63% used)
/tmp	.5 GB (4% used)	.5 GB (4% used)	.5 GB (4% used)	.5 GB (4% used)
/opt	7 GB (56% used)	7.3 GB (57% used)	7.4 GB (57% used)	7.3 GB (58% used)
/home	112 MB (5% used)	104 MB (5% used)	112 MB (5% used)	104 MB (5% used)
/swap	1GB	1GB	1GB	1GB
Itanium EFI Boot	500 MB	500MB	500MB	500MB
Itanium HPE Service	400 MB	400MB	400MB	400MB
Itanium Total	25 GB	21.5GB	25.4GB	21.5GB

1. The results are from using the bdf (1M) command; the results may vary if the du (1) command is used.
2. Totals are not exact due to rounding.

Supported Hardware

Combinations of hardware options are subject to limitations, such as bandwidth, physical configuration constraints, and electrical load and power supply.

Hewlett Packard Enterprise reserves the right to change the number and type of devices supported by HP-UX. The minimum hardware requirements for future versions and updates of HP-UX may be different from current requirements. Please check the platform specific requirements:

For HPE Integrity server options: **http://www.hpe.com/info/missioncritical**

HP-UX 11i v3

Supported HPE Integrity server models

The current Integrity server family models supported by HP-UX 11i v3 are listed below.

- HPE Integrity Superdome 2
- HPE Integrity BL890c i4 Server Blade
- HPE Integrity BL870c i4 Server Blade
- HPE Integrity BL860c i4 Server Blade
- HPE Integrity rx2800 i4 Server
- HPE Integrity BL890c i6 Server Blade
- HPE Integrity BL870c i6 Server Blade
- HPE Integrity BL860c i6 Server Blade
- HPE Integrity rx2800 i6 Server

For a complete list of supported HPE 9000 and HPE Integrity servers supported with HP-UX 11i, please reference the **HP-UX Support Matrix**.

Supported HPE Storage models

Hewlett Packard Enterprise offers a wide variety of resilient Storage options to scale, flex and future proof your Mission critical environment.
HP-UX 11iv3 supports a number of HPE Storage products ranging from JBODs, MSA, 3PAR, XP, Disk and Tape Libraries.

With the HP-UX 11i v3 March 2016 update release, further support for 3PAR Flash arrays and LTO-7 tape drive have been added for increased performance. For a complete list of Storage products supported, please refer to the HPE Storage interoperability matrix at: **https://h20272.www2.hpe.com/spock/**

Optional Device Support

The HP-UX 11i Version 3 Release Notes provides a complete list of supported network and mass storage drivers, and SCSI devices.

Utility pricing and licensing

Instant Capacity On Demand for HPE Integrity and HPE 9000 Servers

Instant Capacity Hardware

The Instant Capacity program allows inactive processors, cell boards and memory modules to be installed in the server for a fraction of the price. When additional resources are required, the remainder of the purchase price for the hardware, plus any needed software licenses and/or support fees are paid, and the hardware can be instantly activated typically with no downtime. Instant Capacity provides a linear upgrade path and also allows resources to be load balanced between partitions within the server as needed. Systems can be more highly available with automatic activation of iCAP processors when processor failure is detected, and the upgrade path of servers is extended as resources are simply activated with a simple command as needed. The Instant Capacity Software manages the system locally and no communication to Hewlett Packard Enterprise outside the data center is required. Additionally, every Instant Capacity processor core includes five days of Instant Access Capacity (IAC), which provides 5 days of temporary capacity per core.

Temporary Instant Capacity for Processors (TiCAP)

Temporary Instant Capacity provides 30 processor core days of prepaid activation time for Instant Capacity processors. A processor core day equals 24 hours of activation for one processor core. Accounting is done in 30 minute intervals and there is no expiration date on the TiCAP license. With this option, processors may be activated and deactivated as needed without a need for a reboot. TiCAP also includes temporary licenses for all HP-UX Operating Environments and OpenVMS Foundation, Enterprise and Mission Critical Operating Environments, the Matrix OE Suite, and temporary hardware and software support. TiCAP is applied at the server level and can be used to temporarily activate any number of Instant Capacity processor cores in the complex.

Global Instant Capacity (GiCAP)

GiCAP is a unique Hewlett Packard Enterprise differentiator that allows servers to loan resources to each other, optimizing resource utilization and reducing over-provisioning. Just as Instant Capacity can migrate resources between partitions within a server, GiCAP allows resources to be migrated between partitions on different servers, regardless of where those servers are located. In the event of a partition failure, hardware usage rights and the Operating Environment and Matrix OE software licenses used by that partition can be migrated to a failover partition on another server with the same or subset OE. These migrated usage rights and software licenses can then be used to activate idle Instant Capacity resources on the failover partition. GiCAP also facilitates load balancing across servers, disaster recovery and even allows TiCAP to be shared with other servers in the group.

Platform availability

HP-UX 11i Instant Capacity is available on HPE Integrity mid-range, Superdome and Superdome 2 servers.

Pricing

There is no premium pricing for iCAP. At any given time, the Instant Capacity hardware purchase fee plus the Right to Use (which activates the iCAP hardware) is equal to the purchase price of the equivalent active hardware component.

Easy to implement, activate, and afford, iCAP supports both current and future customers, can be installed on existing servers, and will be available on all future midrange and Superdome-2 servers. It can be ordered pre-installed on new servers and thus can be delivered "ready to go."

The iCAP program is extremely flexible. A customer does not need to order a full complement of processors and cells, and can order any combination of traditional and iCAP components up to the full capacity of the system. This flexibility is vital for those who may be limited by environmental considerations such as power and cooling.

Pay per use for HPE Integrity and HPE 9000 Servers

The unique HPE Pay per use (PPU) solution is designed for businesses with widely varying or unpredictable demand for computing resources. With Pay per use, customers pay a variable monthly bill for HPE Integrity servers running HP-UX or based on socket utilization. Two usage metrics are available to compute socket utilization: Percent Socket and Active Socket. The following servers are currently available under Pay per use: HPE Pay Per Use is available on HPE Integrity Superdome 2.

Utility pricing and licensing

The automated metering technology is simple to use, meets customer needs for security, and has negligible impact on operations. Server agents periodically collect utilization data for individual cores and forward this data to a utility meter that securely sends it to Hewlett Packard Enterprise over the Internet using encrypted messages via email or HTTPS.
Pricing

There is no premium required for Pay per use. The total payment guaranteed to be no more than a reference lease.

Software Licensing

The licenses for the HP-UX 11i v3 Operating Environments provide the right to use the software as described in these QuickSpecs. Customers will receive updates to new versions of HP-UX 11i v3 if they have a software contract that includes Rights to New Versions (RTNV). Customers with no support contract are required to purchase the license in order to update to later versions.

Services

Services

A variety of service options are available from Hewlett Packard Enterprise. For information about services related to HP-UX.

Please visit the "Services" tab on **https://www.hpe.com/us/en/servers/hp-ux.html** or contact your local Hewlett Packard Enterprise office.

Summary of Changes

Date	Version History	Action	Description of Change
05-Jun-2017	From Version 24 to 25	Changed	Overview, Operating Environments, Virtualization, Management and automation, Security, Developers Tools, Supported Hardware, and Services sections were updated.
16-Dec-2016	From Version 23 to 24	Changed	Availability and Clustering section was updated.
06-Jun-2016	Form Version 22 to 23	Changed	File System and Storage section was updated.
31-Mar-2016	From Version 21 to 22	Changed	QuickSpecs was updated.
30-Mar-2015	From Version 20 to 21	Changed	Overview, Operating Environments, Standards, Supported Hardware and Utility pricing and licensing sections were updated.
31-Mar-2014	From Version 19 to 20	Changed	Changes were made throughout.
25-Mar-2013	From Version 18 to 19	Changed	Changes were made in the following sections: Overview Virtualization Management and automation - Ignite UX Developers tools - BIND Internationalization - Unicode Support
24-Sep-2012	From Version 17 to 18	Changed	Changes were made throughout the entire QuickSpecs.
26-Mar-2012	From Version 16 to 17	Changed	Changes were made throughout the entire QuickSpecs.
14-Nov-2011	From Version 15 to 16	Changed	Operating Environments was modified HP-UX Virtual Partitions, HPE Integrity Virtual Machines, HPE Online VM Migration, and HP-UX Containers were revised in Virtualization Java 2 Platform Standard Edition (Java SE) for HP-UX 11i was updated in Developers tools
30-Aug-2011	From Version 14 to 15	Changed	Changes were made throughout the entire QuickSpecs.
05-Apr-2011	From Version 13 to 14	Changed	Changes were made throughout the entire QuickSpecs.
24-Sep-2010	From Version 12 to 13	Changed	Changes were made throughout the entire QuickSpecs.
16-Mar-2010	From Version 11 to 12	Changed	Changes were made throughout the entire QuickSpecs.
16-Sep-2009	From Version 10 to 11	Changed	Change made in the Introduction section only.
15-Sep-2009	From Version 9 to 10	Changed	Changes were made throughout the entire QuickSpecs.
13-Apr-2009	From Version 8 to 9	Changed	Changes were made throughout the entire QuickSpecs.
02-Sep-2008	From Version 7 to 8	Changed	Changes were made throughout the Operating Environment, Virtualization/Management and Automation, File System and Storage, Availability and Clustering, Security, Partitioning, Internet and Networking, Developers Tools and Standards sections.
		Removed	Directory-Enabled Computing section from the QuickSpecs.
14-Mar-2008	From Version 6 to 7	Changed	Changes were made throughout the entire QuickSpecs.
11-Mar-2008	From Version 5 to 6	Changed	Changes were made throughout the entire QuickSpecs. Note that the title has changed.
10-Sep-2007	From Version 4 to 5	Changed	Changes were made throughout the entire QuickSpecs. Note that the title has changed.
15-Feb-2007	From Version 3 to 4	Changed	This QuickSpecs was completely rebuilt. Note that the title has changed.
07-Sep-2006	From Version 2 to 3	Changed	This QuickSpecs was completely revised.
17-Sep-2004	From Version 1 to 2	Changed	Changed "HP-UX" to "HP-UX 11i" in applicable instances throughout the document.

Summary of Changes

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