

### Overview

Currently shipping versions:

- HP Integrity VM (HP-UX 11i v2 VM Host) v3.5
- HP Integrity VM (HP-UX 11i v3 VM Host) v4.0

Integrity Virtual Machines (Integrity VM) is a soft partitioning and virtualization product that can be used to subset an individual hard partition or server into several smaller virtual servers, each with their own operating system, resources, and applications. Any application or operating system related failure can only impact or bring down the virtual machine (VM) in which it is executing—without affecting other VMs executing on the same system.

HP Integrity Virtual Machines increases server utilization by enabling customers to partition any Integrity server, HP hard partition (nPartition), or Integrity blade, and its associated processor, memory and I/O resources, into separate, secure virtual machines, each with its own O/S instance, which can be tuned to individual application needs.

HP Integrity Virtual Machines provides the ability to allocate processor and I/O resources to an application at a granularity less than that of the physical hardware, yet keeps applications separate from one another in their own operating system instance. This allocation model allows customers to increase their server utilization (by running more applications on a server), while maintaining application fault and security isolation.

The physical processor, memory, and I/O resources are virtualized for the Virtual Machines (VMs). Processor and I/O resources can be shared across virtual machines reducing cost and increasing utilization.

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### Features

- Provides complete software fault and security isolation within a server or nPartition
- Failure is isolated to that specific virtual machine; other VMs are unaffected
- Designed for multi OS (see "Requirements" sub-section below, then "Software", then "Operating Systems")
- Each virtual machine (VM) is tuned for up to eight virtual processor cores
- Virtualized: processor, I/O, memory
- Shared processor; up to 20 virtual servers per processor core
- Dynamic memory migration (shrink and grow—especially for disaster recovery scenarios)
- Processor oversubscription
- Built in dynamic processor (processor shares are dynamically allocated to the Virtual Machines as needed), and I/O resource allocation, based on demand and entitlement
- Shared I/O
- Provides operating system parameter independence—including version and patch configuration per VM
- Online creation, modification, and deletion of VMs without a system or nPartition reboot. Some devices can be dynamically added to a VM, some changes may require a VM reboot to take effect.
- Individual reconfiguration and reboot of virtual machines
- Enables application-specific O/S tuning
- Has multiple ways for deploying, managing and providing high availability, via integration with Virtual Server Environment for HP UX 11i and other tools:
  - Visualization and configuration via GUI, VM Manager, that is WBEM based, and plugs into HP Systems Management Home Page and VSE Management tools
  - Full featured command line interface
  - Faster deployment via Ignite/UX
  - Automatic, policy-driven resource allocation between VMs via gWLM
  - Additional resources through iCAP
  - Failover/migration capabilities:
    - 1) hpvmmgrate command (off-line)
    - 2) Failover/migration integration with Serviceguard (automatic upon failover):

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- - Virtual Machines as Serviceguard packages, (i.e., Serviceguard on the VM Host for automatic VM failover or proactive off-line VM migration)-with suggested use of the Serviceguard for Integrity VM Toolkit
  - Virtual Machines as Serviceguard cluster nodes (protecting applications running in the VM)
- 3) Simplified, migration on blades with Virtual Connect (simplified I/O configuration)

### Configuration

- The individual virtual machines (VMs) are tuned up to eight virtual processor cores
- 512 MB - 64 GB memory per Virtual Machine (minimum and maximum size supported varies by guest operating system type)
- Memory is virtualized, but not shared so there must be enough physical memory on the VM Host to accommodate the memory requirements of all running virtual machines
- Maximum number of VMs varies by number of processors and memory of the server
- Storage and networking (Ethernet only) I/O that is supported on the version of HP UX running on the VM Host is also supported by the Integrity VM Host
- Device classes currently virtualized by Integrity VM: Serial port, SCSI-2 mass storage, Ethernet networking, and USB DVD
  - Integrity VM virtualizes the Intel Gigabit Ethernet card
  - All mass storage is visible to guests as SCSI disks regardless of the physical connection
  - VM storage can reside on a SAN controller (managed from the Integrity VM host)
  - SAN management cannot be done from a VM
- Virtual machine storage can be mapped to logical storage that is locally attached or connected via SAN and includes files, logical volumes, disks, and RAID array LUNs.
- Applications that depend on the following will not run in an Integrity virtual machine:
  - Devices not virtualized by Integrity VM, such as: FC HBAs, storage array controllers, and USB devices other than DVD
  - Devices requiring direct hardware control
  - Tape drives (SCSI & FC, including SAN tape drives), USB DVDs, and optical media (CD/DVD) burners and changers are accessible from a VM via Attached I/O (which uses a SCSI pass-thru driver).
  - SAN based management of storage arrays must be performed from the VM Host, not from the VMs
- Targeted for non-performance-sensitive workloads
- Accelerated virtual I/O (with Integrity VM (HP-UX 11i v2 VM Host) v3.5, plus Accelerated Virtual I/O drivers)
  - For increased network and storage I/O performance for HP-UX 11i v2 VMs (starting in HP-UX 11i v2 December 2007 Operating Environment Update Release)
  - Increased network I/O performance for HP-UX 11i v3 VM guests (starting in HP-UX 11i v3 Update 2 (March/April 2008))
- Overhead of virtualization technology:
  - depends on the particular workload being run
  - impacts only the nPartition or server that the Integrity Virtual Machines are running in
  - similar overhead to comparable offerings
- Certain applications/tools provide functionality appropriate for the VM Host, but are not necessary in the VMs (e.g., iCAP, APA, Glance). These applications will not fail in the VMs, but add little value when executed there.
- Certain other applications should only run in the VM Host. (They will not run in the individual Virtual Machines.) These include: Veritas Volume Manager, Veritas Cluster Volume Manager, Veritas Cluster File System, and multi-pathing software from various HP or 3rd parties.
- The combination of HP-UX Virtual Machines as Serviceguard packages and HP-UX Virtual Machines as Serviceguard nodes on the same VM Host is NOT supported. In other words, a virtual machine running HP-UX can be part of a SG package or a member of a SG cluster - but not both.
- Customer workloads are to be executed in virtual machines and are not supported on the VM Host
- Features uniquely available in HP Integrity VM (HP-UX 11i v3 VM Host):
  - HP-UX 11i v3 capabilities in the VM Host:
    - native multi-pathing solution
    - new mass storage stack (to simplify administration of guest storage)
    - Integration with HP-UX 11i v3 Dynamic nPartitions to provide cell on-line addition of processors and memory to the VM Host "pool" of resources

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- Accelerated Virtual I/O benefits for HP-UX 11i v3 guest storage
- Improved Accelerated Virtual I/O performance for HP-UX guests overall
- Support of larger VMs (max: 8 virtual processor core)
- Capping of specified CPU resources
- New hpvmsar tool to assist performance analysis

### Support

A variety of service options are available from HP. For this product, there are software support services, ranging from standard reactive services up to mission critical support services, as well as implementation services, consulting services and training. For more information, please contact your local HP office or your HP authorized reseller.

#### Support for Windows when running as a guest OS on Integrity Virtual Machines:

HP Services support can provide full support of Integrity server environments with Windows Server 2003, including the capability to support Windows guests with Integrity Virtual Machines. HP Services was the Microsoft Global Support partner of the year for 2005. HP Microsoft (product) support services will provide comprehensive support, engaging Microsoft on the customer's behalf, were it to be necessary.

### Requirements

Hard partitions can contain multiple virtual machines; however, a virtual machine cannot span multiple hard partitions.

#### Hardware:

- HP Integrity VM (HP-UX 11i v2 VM Host) runs on any HP Integrity nPartition or server (including HP Integrity blades), running HP UX 11i v2 December 2007 or beyond,
- HP Integrity VM (HP-UX 11i v3 VM Host) runs on any HP Integrity nPartition or server (including HP Integrity blades), running HP UX 11i v3 September 2008 or beyond,
- At this point, there are no restrictions on the I/O or storage devices supported beyond the valid HP UX 11i v2 or v3 configurations defined in the HP UX 11i v2 or v3 Ordering and Configuration Guidelines. However, only Ethernet network devices may be used for virtual machine networking.
- Minimum VM Host physical memory
  - HP-UX 11i v2 VM Host:
    - For VM Host: 750 MB plus 7.5% of remaining physical memory
    - For Virtual Machine guests: 107% of total memory required by the VMs
  - HP-UX 11i v3 VM Host:
    - For VM Host: 1.2 GB plus 8.5% of physical memory
    - For Virtual Machine guests: 108% of total memory required by the VMs
  - Swap space = 4 GB plus the size of total physical memory-including physical memory used by virtual machines
  - Mass storage space of 15 GB for the VM host in addition to total mass storage requirements for individual virtual machines (guests)
- Virtual machine configuration:
  - No specific requirements for virtual machines beyond those for the OS and applications.
  - However, HP Integrity Virtual Machines must be tested for appropriateness with particular workloads before purchase. Also, each virtual machine OS (memory, kernel parameters) should be appropriately tuned for its workload-as you would for the workload on a native server
  - Use recommended hardware configuration (e.g., memory size, disk space) for the operating system to be installed on the virtual machine
  - Include requirements for applications to be run on the virtual machine
  - For more assistance, see the Integrity VM Sizer on <http://www.hp.com/go/ActiveAnswers> under "What's New", then "ActiveAnswer Tools" then "Solution Sizers".

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#### Operating System:

- In the HP Integrity VM (HP-UX 11i v2 VM Host) license, an HP-UX 11i v2 Foundation OE license is included, for use (only) in the Integrity VM Host
- In the HP Integrity VM (HP-UX 11i v3 VM Host) license, an HP-UX 11i v3 Base OE license is included, for use (only) in the Integrity VM Host
- Separate HP-UX OE licenses must be purchased for the VM guests
- Virtual Machine guest operating systems supported:
  - HP-UX 11i v2 May 2005 (or later)
  - HP-UX 11i v3
  - Microsoft Windows Server 2003 Enterprise or Datacenter OS Editions + SP1 or SP2 for 64 bit Itanium based systems (including Japanese version)
  - Red Hat Enterprise Linux Advanced Platform (RHEL AP) 4.4 and 4.5 for HP Integrity servers
  - Novell SUSE Linux Enterprise Server (SLES 10 update 1) for HP Integrity servers

#### Windows VM requirements (beyond above):

- Installation from DVD, ISO file, PXE server
- Smart Setup Media (SSM) for Integrity VM and VSE components
- 32 bit apps through IA 32 Execution Layer (EL)

#### Linux Red Hat or SLES VM requirements (beyond above):

- Installation from DVD or ISO file
- Integrity Essentials for Linux Management CD installation for Integrity VM and VSE components

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### Miscellaneous

- The media for this product is currently distributed in the following manner:
  - For T2767AC, HP Integrity VM (HP-UX 11i v2 VM Host): 1 Virtual Partitions (either purchased stand-alone, or in the VSE Suite): independent media
  - If T1335B/CC, HP-UX 11i v2/v3 Virtual Partitions (either purchased stand-alone, or in either: VSE Suite, HP-UX 11i v3 VSE or DC-OE Operating Environments): on the HP-UX 11i Application Releases

**NOTE:** The Sept. 2008 VSE Suite still includes the independent media for HP-UX 11i v2/v3 Virtual Partitions, so customer can get used to getting the media via the Application Release

#### Optional products to integrate in the VM Host:

- Other components of the HP Virtual Server Environment for HP UX: This includes:, global Workload Manager (gWLM) (the intelligent policy engine), HP Serviceguard (for high availability), and utility pricing, so customers can pay for what they use (HP Instant Capacity (iCAP) and Pay Per Use (PPU)).
- GlancePlus, version 4.6 or later: provides performance monitoring on the VM Host.

#### Software licensing:

- HP Integrity Virtual Machines is licensed on a per processor core basis; for active processor cores within nPartitions or servers running Integrity Virtual Machines.
- Virtualization Licensing provides two options for purchasing HP UX OE or layered software products, (on a per core licensing basis), when running within a vPar:
  1. Software may be licensed for all of the active physical processor cores in the nPartition or non partitioned server. (This allows you to run as many instances of the software in the virtual machines as you desire without requiring additional licenses. It is beneficial if you intend to run the same software across all or most virtual machines or if you intend to change the

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configuration often and don't want to worry about compliance.)

2. Software may be licensed for the maximum virtual processor cores that the software will be run on within the virtual machines. (For example, if you are running HP OnlineJFS in a virtual machine with one virtual processor core on a server with four physical processor cores, you could pay for just one Per Core License. This method will be most beneficial when you intend to run the software on only a small portion of the nPartition or non partitioned server. When applicable, this new licensing option can significantly reduce licensing costs for customers versus previous licensing options.)

For more information about HP's Virtualization Licensing terms and policies, please see:

- Virtualization Licensing information at: <http://www.hp.com/go/virtualizationlicensing>
- contact your local HP office or your HP authorized reseller

Other information:

- For details on Integrity Virtual Machines, please see the "HP Integrity Virtual Machines Installation, Configuration, and Administration Guide" at: <http://docs.hp.com/en/hplex.html#HP%20Integrity%20Virtual%20Machines>.

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