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## White Paper

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### **Server Virtualization on UNIX Systems:**

**A comparison between HP Integrity  
Servers with HP-UX and IBM Power  
Systems with AIX**



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## Introduction

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### Objective

The objective of this white paper is to provide IT executives and UNIX subject matter experts (SMEs) with a high level comparison of the UNIX virtualization offerings from HP for Integrity and HP-UX<sup>1</sup> vs. IBM for Power and AIX.

To assist in making a balanced comparison, this paper provides:

- A high-level, feature-to-feature comparison of key areas of virtualization and virtualization management.
- Modular table-based comparisons.
- Information from publicly available resources.

### HP-UX on HP Integrity Servers

HP Integrity servers (based on the Intel Itanium processors) are available in a wide range of form factors including: blades, rack-mount servers, and the highly scalable Integrity Superdome 2 server. These servers are key technologies within the HP Mission-Critical Converged Infrastructure providing the flexibility to be used in a wide range of mission-critical workloads from custom-designed applications through large 3 tier mission-critical Enterprise resource planning (ERP) applications.

As key technologies of HP Mission-Critical Converged Infrastructure, HP Integrity servers run HP-UX, as well as HP NonStop and HP OpenVMS operating environments. HP CloudSystem Matrix with HP-UX, based on Integrity servers and HP-UX, protects mission-critical workloads in a private cloud environment.

HP-UX 11i v3 functionality continues to be improved and enhanced with regular updates each year. HP-UX 11i v3 is fully binary compatible with previous releases, preserving application investment made on earlier versions, and allowing customers the ability to take advantage of the newer features and platforms.

HP Integrity servers are a key element of the HP Mission Critical Converged Infrastructure framework, also facilitating consolidation, advanced virtualization, and ease-of-use.

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<sup>1</sup> HP Integrity systems are based on the Intel Itanium processor series

Integrity servers incorporate a common blade architecture, common components, and a cohesive management environment across all HP servers.

Together with the HP-UX Operating Environment, HP Integrity servers provide a dynamic and united IT environment, resiliency, virtualization optimization technologies, and investment protection.

## **AIX on POWER7 Servers**

IBM Power servers are available across a range of form factors and usage models, including blades for IBM BladeCenter and for the new IBM PureFlex System, rack-mount Express models that support a wide range of workloads, from basic through ultra-high performance, Enterprise models for the largest workloads, plus models for High Performance Computing including the BlueGene/P supercomputer. In addition, there are several Power7 server models optimized for Linux workloads.

IBM offers support for multiple operating systems on POWER7 processor-based hardware, including IBM i, its integrated midrange computing platform, IBM PowerLinux, plus the focus of this paper, IBM AIX 7.1.

IBM AIX 7.1 is binary compatible with previous releases of AIX for applications currently running on AIX 6 and AIX 5L and will even run on older IBM Power servers running on Power5 and Power6 processors.

## **Types of Virtualization Being Compared**

Mission-critical customers require multiple separate workloads on one hardware. Once the workload is separated from the physical hardware (via virtualization), a server can host multiple instances of an operating system.

This paper focuses on three methods of UNIX virtualization:

### ***Electrically Isolated Hard Partitions***

Utilized generally on high-end servers, this type of partition incorporates its own OS instance and resources, while providing electrical fault and security isolation between workloads, using either cell or blade granularity. Partitions of this kind can be carved further into virtual/logical partitions or containers. Each hard partition can run its own OS and firmware. Firmware upgrades and hardware maintenance can be executed while other partitions continue to run.

HP's hard partition solution is HP nPartitions, which is available on HP Superdome 2 servers, is now available on HP's new line of Integrity server blades.

### ***Dedicated Processor-Core Partitions***

Dedicated processor-core partitions facilitate OS, application, and resource isolation, facilitating the ability to dynamically migrate the resources between instances as workload requirements change.

The HP dedicated processor-core offering, which can be reconfigured dynamically, is HP-UX Virtual Partitions (vPars), available both in a firmware version, v5, on HP Superdome 2 servers, and as part of the converged HP-UX vPars and Integrity VM v6 (that supports all of the HP Integrity servers including blades.)

The IBM dedicated processor solution is Dynamic Logical Partitioning (DLPAR). As a feature of IBM PowerVM, DLPARs can also be reconfigured dynamically. All IBM POWER Systems running PowerVM are DLPAR-capable.

Both IBM DLPARs and HP vPARs are typically used to configure and deploy agile infrastructures capable of automating resource allocation, planning, and provisioning.

### ***Virtual Machines (VM)***

Virtual machines, also known as Shared Processor Partitions, also offer O/S, application, and resource isolation, as well as the ability to share and relocate dynamically resources on-demand.

The HP VM offering is HP Integrity Virtual Machines, a key element of converged HP-UX vPars and HP Integrity VM v6. This converged offering exploits the capabilities of the underlying Intel processor and virtualization technology. HP-UX vPars and Integrity VM v6 works closely with the HP-UX operating system, which provides time slicing, fair share scheduling, and Global Workload Manager for goal-based automation according to business policies.

The IBM Micro-Partitioning offering operates within POWER Systems environments, under control of the POWER Hypervisor. Micro-Partitioning, also referred to as Shared Processor Partitioning, is a feature of the IBM PowerVM offering, which exploits the capabilities of POWER processors. Micro-Partitioning is managed by POWER Hypervisor firmware, which controls time slicing, hardware management, dynamic movement of resources, and LPAR workloads.

## Server Manageability Layers

The layers of server manageability addressed in this evaluation are:

- **Datacenter Management:** includes hardware and software management of multiple servers within a data center.
- **System Management:** includes hardware and software management of one server, and all that is associated with it.
- **Component management:** includes individual tools for high availability, virtualization, workload management, deployment, performance, and instant capacity. These functions can be run individually, or from a system management tool.

## Outside the Scope of This Paper

There are a couple of other technologies, somewhat on the edge of virtualization, that are discussed below briefly.

### *For shared OS virtualization, containers/workload partitions*

For applications that “play together nicely,” container software technology allocates resources to specific applications and users within one operating-system instance. There is full dynamic allocation of resources, with dedicated or shared CPU and I/O, and percent-of-memory granularity. Because they are contained within one OS instance, containers are easier and faster to deploy and manage, and with lower ISV licensing costs. They can be created from the OS Command Line or Graphical User Interface. However, the shared OS instance is a single-point-of-failure for all included containers, meaning that if that OS instance goes down, all containers associated with that OS also go down.

For HP, this offering is known as HP-UX Containers, and is part of the HP-UX operating environments. For IBM, this offering is called Workload Partitions (or WPARs), which are considered part of AIX, and part of PowerVM. The new AIX 7.1 includes enhanced POWER VM virtualization capabilities, designed to facilitate consolidation of legacy, AIX v5.2 environments. The new offering, AIX 5.2 Workload Partitions for AIX 7, enables systems administrators to back-up and restore existing AIX 5.2 onto AIX 7 Workload Partitions.

Both HP and IBM offer three types of containers:

1. **System Containers**, which have the appearance of a separate system and unique filesystem space.
2. **Workload or Application Containers**, which share common filesystem space and system variables.
3. **Legacy OS Containers**: HP 9000 Containers for migrating HP 9000 environments onto HP Integrity and WPARs for legacy environments. IBM AIX binary compatibility generally eliminates the need for Legacy OS Containers. Best Practices suggest the use of System or Application containers when running software designed for older versions of AIX.

HP's workload containers have finer-granularity security control, while IBM's system containers have additional features like filesystem provisioning and Live Application Mobility between servers.

### *To easily add resources later--instant reserve capacity*

Instant capacity enables users to defer hardware activation costs, simplify capacity planning, improve resource utilization, and minimize over-provisioning by activating CPUs and OS licenses as needed, automatically.

Both HP and IBM offer the ability to increase access to the number of CPUs that can be used on a server without physically purchasing them upfront or upgrading the hardware. For HP-UX, this is HP Instant Capacity (iCAP), and for IBM, it is IBM Capacity Upgrade on Demand (CUoD). Both vendors also offer CPU and memory reserve capacity, temporary capacity, and other options.

To provide capacity where it is most needed, and better support application availability during planned system maintenance activity, HP can dynamically move temporary capacity licenses between servers automatically without a reboot, or pool temporary resources among servers.

Meeting a similar need, Power 795 servers in a Power Flex environment can move reserve capacity or workloads between servers, since they are allowed to share large portions of their virtual processor and memory resources.

There are also some additional differences. HP offers an active leasing program called Pay per Use, and temporary capacity is provided in 30 minute increments (not 24-hour). On blade and entry-class servers (up to the Power750), IBM lets customers pay for CPU activation, and then provides a no-charge option for disabling CPUs. IBM customers can



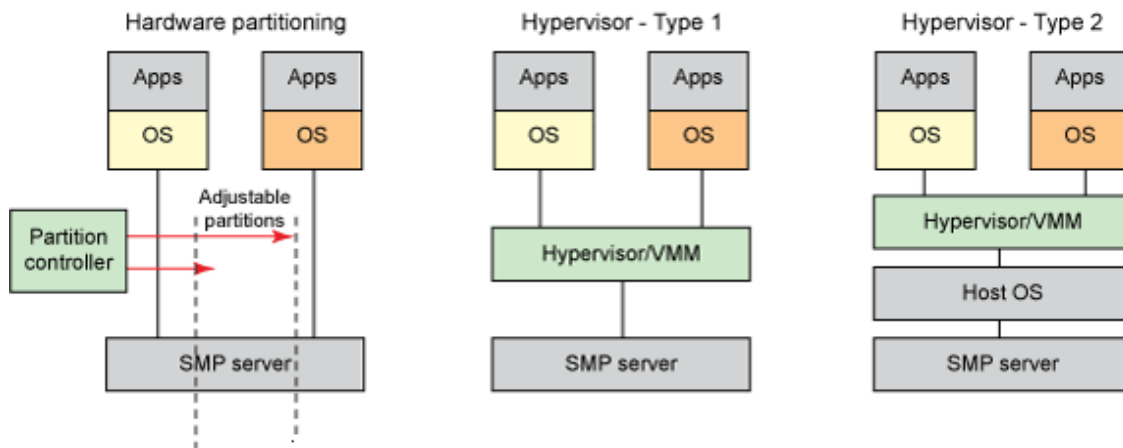
activate the core from the firmware but in order to use this for real work, the IBM customers must license the core for whatever OS/applications they want to run on top of it.

***To converge hardware within a single rack and provide solutions to ease flexing of resources between servers – HP Converged Systems or IBM Pure Systems solutions***

Both HP and IBM offer the ability to converge their servers and storage within a single rack, and sell a converged solution that enables flexing of resources between servers. As part of the HP Converged Infrastructure, different types of servers, storage and networking can be converged within one rack. Capacity licenses can be flexed across systems for increased utilization. In addition, there are a number of HP Converged Systems (AppSystems and CloudSystems) that are focused around a particular ISV or application. IBM's alternative is called PureSystems. For both HP and IBM, servers, storage and networking can be converged within a single rack. Capacity licenses can be flexed across systems for increased utilization.

## Virtualization

When you need logical/virtual partitions with their own operating systems, you can utilize HP-UX vPars and Integrity VM v6 or IBM's Power VM, for virtualization. With these offerings, you can either run workloads that need higher level performance, scalability and isolation of resources, or workloads that need more granularity or flexibility with sub- or shared-processor partitions/virtual machines. Both offerings are available across the vendor's range of servers, with a common interface and shared I/O<sup>2</sup>.



The illustration above shows the three different types of server virtualization discussed in this white paper. HP offers every type of hypervisor: nPartitions for hardware partitioning, vPars v5 is a type-1 hypervisor, and HP-UX vPars and Integrity VM v6 are type-2 hosted hypervisors with the option of having dedicated resources.

Alternatively, IBM offers a type-1 hypervisor for its PowerVM offerings. IBM's Dynamic LPARs (DLPARs, or dedicated-core partitions) function like a cross between HP's nPartitions and vPars. Although IBM's DLPARs are not electrically isolated, as HP's nPartitions are, HP nPartitions and IBM's PowerVM are both built into firmware. LPARs do have a native hypervisor built into firmware, which requires minimal overhead. Multiple operating systems can be run within different LPARs and nPars, thereby requiring that their creation be performed outside of the operating systems.

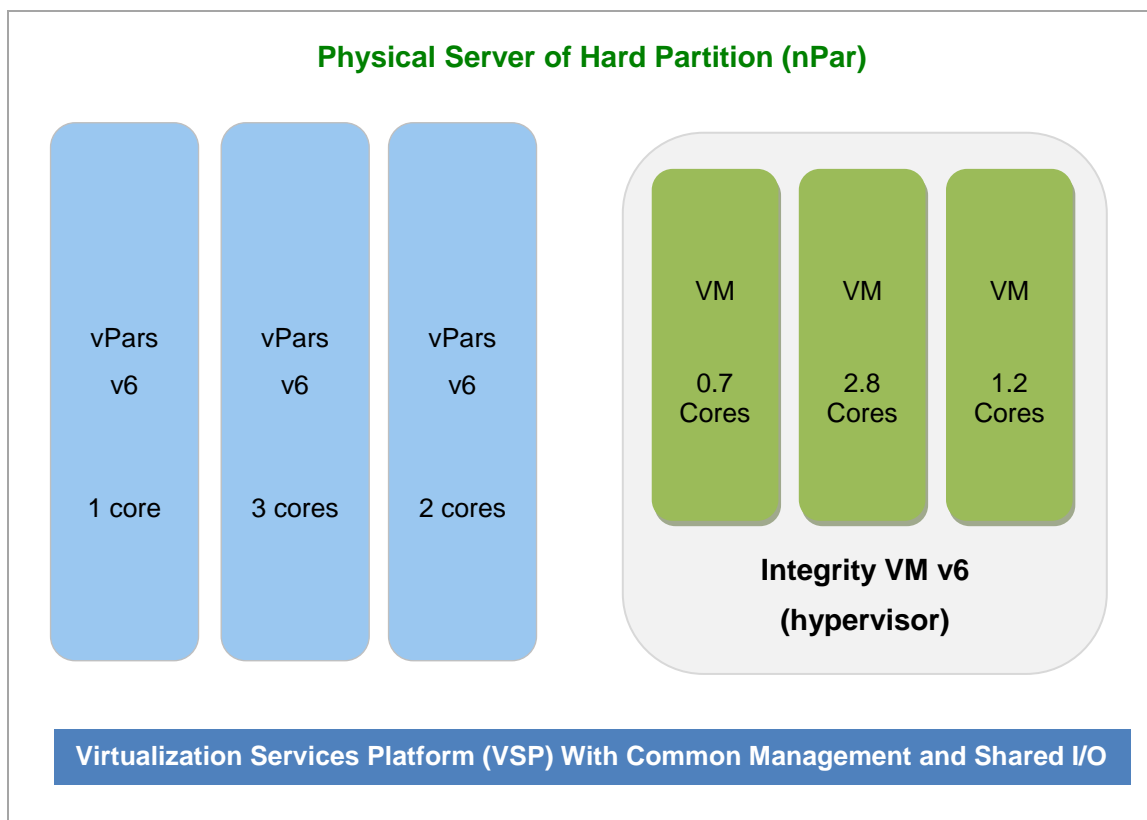
<sup>2</sup> For ease of discussion, this paper will interchangeably refer to IBM's dedicated-processor partitions as DLPARs (Dynamic Logical Partitions)

However, the PowerVM hypervisor is a single point of failure for the whole IBM server, while HP can run its virtualization within nPartitions, electrically isolating faults to smaller segments of the larger server. And, despite the similarities between IBM's LPARs and HP's nPartitions, the granularity and features of IBM's dedicated-core partitions (and LPARs) are more like HP's vPars. Despite these differences in implementations and offerings, we will compare the capabilities of the technologies as best as possible.

## Virtualization Architecture for HP-UX vPars and Integrity VM v6

HP-UX vPars and Integrity VM v6 software is available on all current Integrity servers. The Virtualization Services Platform (VSP) is a hosted hypervisor. For the dedicated core partitions (vPars), the VSP is mainly used for set up, except for coordinating shared I/O. For shared core partitions (Integrity VMs), the VSP plays the same role as a hypervisor.

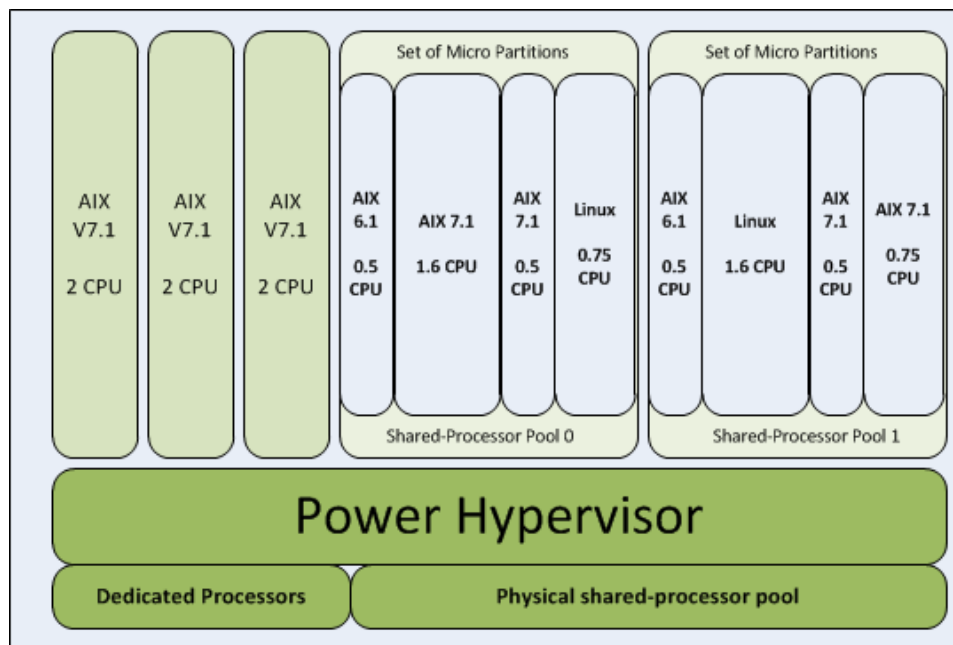
### *HP-UX vPars and Integrity VM v6 Support Stack*



## Virtualization Architecture IBM's PowerVM

IBM's Power Hypervisor is integrated with all IBM Power System servers. It provides functions as a native/ bare-metal hypervisor, since it resides in systems firmware.

DLPARs provide the dedicated core partitions, and micropartitions provide the shared core partitions.



## Virtualization Capabilities

Overall Virtualization (Capabilities)	HP-UX vPars and Integrity VM v6 (and nPartitions where relevant)	IBM PowerVM with AIX 7
Limit fault impact to a segment of a server	Integrity servers offer good Reliability, Availability and Serviceability (RAS) with multiple levels of redundancy and recovery; data integrity with: error detection, correction, and containment across all major CPU components and communication pathways; predictive failure analysis; and static hard partitioning which enables workload isolation to a	Power systems offer good RAS with instruction retry, alternate processor recovery, and core checkstop isolation.  PowerVM provides high isolation, since its hypervisor is in firmware. On Power 770, 780 and 795, IBM has expanded the implementation of Memory Mirroring for the hypervisor, so a single DIMM failure is limited

Overall Virtualization (Capabilities)	HP-UX vPars and Integrity VM v6 (and nPartitions where relevant)	IBM PowerVM with AIX 7
	<p>segment of a server, as well as maintenance efficiencies.</p> <p>HP nPartitions are on both HP Superdome 2 servers and the new Integrity server blades.</p> <p>vPars v5 (implemented on Superdome 2) provides firmware and software isolation. Integrity VM v6 uses Intel isolation.</p>	<p>to the hypervisor, and does not affect the entire machine.</p> <p>However, an LPAR is a single point of failure. Despite a high level of resilience, certain failures could affect the whole server.</p>
Online serviceability	<p>Both blade and Superdome 2 nPartitions can do firmware upgrades within an nPartition, while the others can continue to run.</p> <p>In addition, Superdome 2 can also enable online serviceability within an nPartition, while the other nPartitions continue to run.</p> <p>Although reconfiguration of the blade nPartitions is off-line, they can be reconfigured and rebooted within minutes with one click.</p> <p>HP-UX vPars and Integrity VM v6 can be reconfigured dynamically.</p>	<p>Power 7+: Hot-Node Add/Replace</p> <p>Configuration allows for full redundancy whether a fault is with an adapter, somewhere on the I/O planar, or at the I/O hub itself.</p> <p>Allows for continued connectivity to I/O devices when a CEC node is removed during a hot node-repair operation.</p> <p>IBM lets customers pay for CPU activation, and then provides a no-charge option for disabling CPUs. A customer can go right into the firmware and activate the core.</p> <p>Dynamic Logical Partitioning (DLPAR) can be reconfigured dynamically</p>
Add or replace cell resources for servers.	Dynamic migration of Instant Capacity licenses across servers with Global instant capacity (GiCAP)	Power 7+ Hot-Node Add/Repair

Overall Virtualization (Capabilities)	HP-UX vPars and Integrity VM v6 (and nPartitions where relevant)	IBM PowerVM with AIX 7
Run multiple operating systems within separate partitions.	All virtualization can run HP-UX 11i v3. Integrity VM can also run HP-UX 11i v 2. Integrity VM v4.3 can additionally host OpenVMS guests on Integrity blades and rx2800 servers.	AIX, Linux (RHEL and SLES) and IBM i (iOS)
Dedicate 1 or more processors/cores to a partition (processor/core granularity) for isolated resources.	Yes (vPars).	Yes (dedicated-core partitions/LPARs).
Maximize number of whole processor core partitions that can be run per server.	For whole processor core vPars, it is 256 (with Superdome 2 i4).	For whole processor LPARs, it is 256, which is the number of cores supported in the Power 795.
Move resources between partitions without bringing down the partitions, for flexibility and availability.	CPU, shared I/O, and with vPars v6, dynamic memory	CPU, shared I/O and memory
Direct access to I/O (Direct I/O) for performance	Yes (networking).	Yes (networking and storage).
Dedicated I/O (not shared) per partition for isolation	Yes.	Yes.
Virtual or shared I/O between partitions to best utilize I/O channels	Shared network switches and shared storage adapters, both Accelerated Virtual I/O (AVIO) and N-Port ID Virtualization (NPIV)	Virtual I/O (VIO) servers, Shared Ethernet and Virtual SCSI
Direct access to Fibre Channel adapters from multiple client partitions–virtualizing Fibre Channel, through Net Port ID Virtualization (NPIV)	Yes.	Yes.

Overall Virtualization (Capabilities)	HP-UX vPars and Integrity VM v6 (and nPartitions where relevant)	IBM PowerVM with AIX 7
Increase server utilization by enabling donation of spare CPU cycles from dedicated processor partitions to be used in the shared processor pool.	No. Spare vPars cycles cannot be donated to an Integrity VM shared pool.	Shared Dedicated Capacity
Improve server efficiency and throughput with dynamic, automatic balancing of processing power between partitions	For Integrity VM, entitlements allow multiple VMs to share CPU resources and the hypervisor determines how best to distribute the resources among the guests. For vPars, there are CPU pools for the VSP and vPars, and CPU capacity can be moved among vPars, or even between pools, dynamically. Dynamic goal- or policy-based resourcing is available with HP Global Workload Manager.	With “Shared Dedicated Capacity” (or Multiple Shared Processor Pools and uncapped partitions), IBM users can configure a traditional dedicated-core partition, and assign any unused cycles to another MicroPartition. VMcontrol also moves workloads to resources.
Easy transformation between dedicated- and sub-processor types as needed for workload requirements	Yes.	Yes.
Dynamically move a running partition from one server to another, without service disruption or application downtime. to maximize uptime	Yes for VM: Online VM Migration. For vPars, migration is done off-line.	Yes--Live Partition Mobility (for both dedicated and shared-core partitions).

Additional sub/shared-processor partitions/ virtual machines (capabilities)	HP-UX vPars and Integrity VM v6 (VMs specifically)	IBM PowerVM shared-processor partitions
Share processor cores/pools	Yes. Shared processor cores, enable/disable cores, built-in CPU capping. VMs can have any CPU increment from .05 up to the entire entitlement of the machine.	Yes. Shared processor pools, built-in CPU capping. As of Power 7, IBM MicroPartitions can have any CPU increment from .05 (now with P7+) up to the entire entitlement of the machine.
Enable small slices of CPU to be used per partition (granularity)	.05 CPU (with .01 increments)	.05 CPU (with .01 increments)
Maximize number of virtual CPUs per server	5,120 (on Superdome 2 i4)	Max vCPU is 1,024 <sup>3</sup>
Maximize number of shared processor workloads that can be run per server	4,096 on a Superdome 2 i4 with the maximum number of nPars.	For micropartitions, 1000 (for shared partitions on Power 795 (and Power 770/780 with P7+)) and 10x cores installed (for all others).
Dynamically migrate memory, and logically reserve more than physically exists (memory migration and oversubscription)	Via dynamic memory migration, Dynamic Memory Resourcing, and Automatic Memory Re-allocation. VSP manages the pool of memory shared by the VMs, and can move memory dynamically between VMs on an as-needed basis.	Yes. Active Memory Sharing.
Maximize memory resources, by expanding memory capacity through in-memory data compression, and enabling more dedicated-processor partitions per server, by reducing the physical requirements of existing dedicated-processor partitions	No.	Active Memory Expansion (feature of POWER7 architecture, which is also managed by IBM's hypervisor and the OS.)  Requires a small amount of processor resources

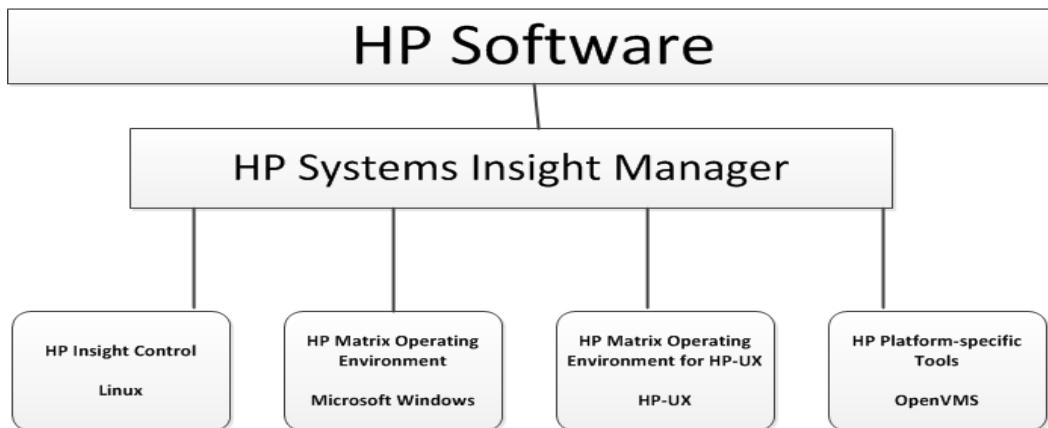
<sup>3</sup> With standard FW for the 795 partition, the scaling limit is 128 physical cores



Additional sub/shared-processor partitions/ virtual machines (capabilities)	HP-UX vPars and Integrity VM v6 (VMs specifically)	IBM PowerVM shared-processor partitions
Maximize server utilization by minimizing the amount of resources (overhead) used for the hypervisor/ Virtualization Services platform	nPars has no overhead. vPars has minimal overhead; the VSP sets up the vPars, then gets out of the way, unless it needs to coordinate shared I/O. For Integrity VM, the I/O and driver paths have been tuned for virtualization with shared network switches, accelerated virtual I/O (AVIO), and N-Port ID Virtualization (NPIV).	Since the PowerVM hypervisor is in the firmware, logical partitions (at least for dedicated processors) typically have minimal overhead. The VIO server requires some additional CPU/memory resources for Shared I/O, and IBM's best practice is to provide a backup for each VIO server for redundancy.
Enable high availability for both applications (traditional) and the virtual machines themselves	Serviceguard provides both application failover, and VM failover.	PowerHA (previously HACMP) supports application failover.
Increase server utilization and flexibility of resources, by suspending workloads temporarily (when not needed) and resuming at a later time	Yes.	Yes.
Run Linux x86 native applications directly on servers without having to recompile, and limit performance degradation	No. (End of Life due to low demand.)	PowerVM Lx86.  Note: End of life – shown for reference only

# Virtualization and Infrastructure Manageability

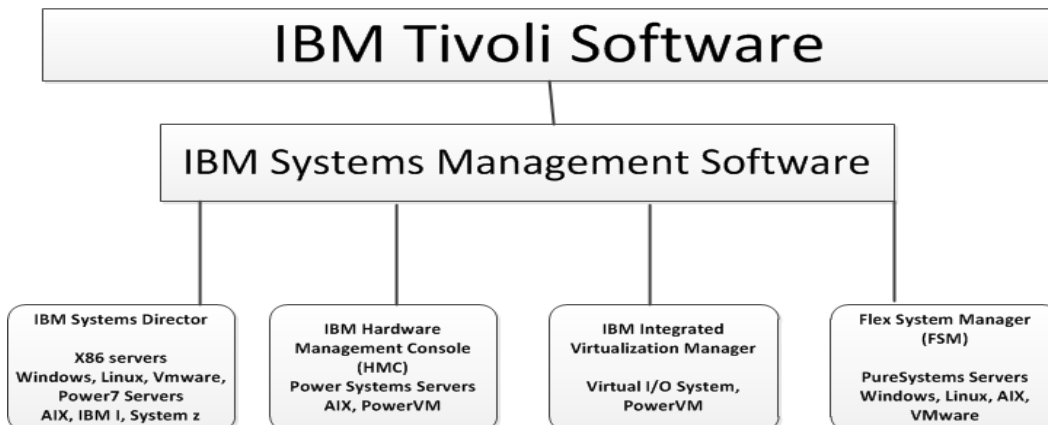
## HP's Server Manageability Architecture



Customers manage Integrity systems either through:

1. The single system, System Management Homepage (web browser-base), on the server itself,
2. or, for flexibility of managing multiple systems and devices, Systems Insight Manager (SIM), which sits atop a Central Management Station (CMS).

## IBM's Architecture for Power and AIX Virtualization and Infrastructure Management



Customers manage Power systems through:

1. The Integrated Virtualization Manager for blade and entry-class servers, which is the management console for the IBM Virtual I/O Server when there is no Hardware Management Console (HMC) available.
2. For flexibility of managing multiple systems and devices, most organizations utilize HMC. The System Director Management Console (SDMC), previously an option here, was end-of-life in spring 2012 after nine months of availability.
3. For comprehensive functionality, underlying enterprise management, System Director. IBM System Director can also be used for single system management when there is no HMC.
4. Flex System Manager (FSM) the management appliance embedded on the PureFlex environment.

## Manageability Capabilities

The following compares virtualization and infrastructure management.

Manageability (capabilities) Brief description	HP Integrity with HP-UX 11i v3 (Sept. 2012)	IBM Power with AIX 7
Manage systems, while feeding into higher-level enterprise management	<p>Systems Insight Manager (SIM) (operates atop a Central Management Station (CMS), and provides centralized interface for such functionality as:</p> <p>Discover OS running on types of partitioning or virtualization and display the relationship between virtualization and the OS objects.</p> <p>Start, stop, or reset a server or individual partition or VM. Remotely power a server or VM on/off.</p> <p>View hardware status and events.</p> <p>Also, iCAP Manager manages a set of systems that share flexible capacity between servers).</p>	<p>System Director can integrate with HMC to provide additional functionality, such as:</p> <p>Discover OS running on an LPAR and display the relationship between LPAR and the OS objects.</p> <p>Start, stop, or reset a server or individual LPAR. Remotely power a server or LPAR on/off.</p> <p>View hardware status and events.</p> <p>Also, Flex System Manager (FSM) manages PureFlex systems, (a set of systems that share flexible capacity between servers).</p>

Manageability (capabilities) Brief description	HP Integrity with HP-UX 11i v3 (Sept. 2012)	IBM Power with AIX 7
Manage multiple systems	<p>Systems Insight Manager (SIM):</p> <p>Includes manageability software which runs atop a separate Central Management Station.</p> <p>SIM is a management platform that controls managed systems, partitions and VMs, as well as Instant Capacity (iCAP), and updates. SIM allows configuration and management of servers. One SIM Central Management Station can manage one or more servers.</p> <p>Other manageability capabilities, such as storage, network and remote support are plugged into SIM to extend the manageability capabilities.</p>	<p>Hardware Management Console (HMC):</p> <p>Includes the manageability software which runs atop a separate management station. The HMC is a system that controls managed systems, logical partitions, Capacity on Demand (CoD), and updates. The HMC allows configuration and management of servers. One HMC can manage one or more servers.</p> <p>HMCs can provide redundant support by managing the same system. This enables full Power and PowerVM functionality.</p> <p>Also, FSM for PureFlex Systems</p>
Manage a single system, from that system	Browser-based System Management Homepage (SMH) on that server	<p>Yes, for any server:</p> <p>Hardware Management Console (HMC)</p> <p>Entry level: Integrated Virtualization Manager (IVM) with Virtual I/O Server (VIOS)</p> <p>System Director. However, partitioning not supported without HMC or IVM</p>
Create, configure and deploy virtualization	Virtual Server Manager (vsmgr)	VMcontrol or Integrated Virtualization Manager (creates VMs)
Manage virtualization migration	hpvmigrate command, Virtual Server Manager (vsmgr)	HMC

Manageability (capabilities) Brief description	HP Integrity with HP-UX 11i v3 (Sept. 2012)	IBM Power with AIX 7
Manage health checks and topology mappings, and do other advanced management	Matrix OE	VMcontrol, Systems Director or FSM in PureFlex
Improve server utilization with automated capacity planning, tracking historic usage, and planning advanced “what-if” simulations across servers. Used to explore configuration and workload placement options, “best-fit” recommendations, and energy consumption metrics.	Capacity Advisor	Combination of IBM Workload Estimator, System Planning tool and their performance management service, although they don’t provide “what if” analysis, easy identification of idle servers, or other general automation features.
Graphically design services, through drag and drop capabilities and a self-service portal	Matrix OE infrastructure orchestration	VMcontrol
Leverage wizards, maps and reference architectures for easing integration with ISV and third-party applications	Via CloudMaps for various ISVs.	Via CloudBurst reference architectures for IBM applications, and Patterns of Expertise for PureFlex systems.

## Virtualization and Manageability Bundling

### *HP’s Virtualization and Manageability Bundling*

There are three HP-UX 11i v3 OEs which are available across the server portfolio. While nPars and HP-UX Containers are in the base OE, vPars and VM, and infrastructure management are in the VSE-OE. HP includes all capabilities for these features within the VSE-OE. The Data Center OE (DC-OE) additionally adds onto the VSE-OE the HP-UX Serviceguard high availability suite. *Note: not all capabilities of the OEs are available on every system.*

Base OE vs. Virtual Server OE (VSE-OE)	
Base OE (BOE)	Virtual Server OE = Base OE plus
<b>HP-UX Operating System plus:</b> <ul style="list-style-type: none"> <li>• nPartitions</li> <li>• HP-UX Containers</li> <li>• Accelerated Virtual IO</li> <li>• Partitioning providers and management tools:               <ul style="list-style-type: none"> <li>▪ Trial gWLM agent</li> <li>▪ iCAP (TiCAP &amp; GiCAP)</li> <li>▪ Pay per use</li> <li>▪ Systems Insight Manager (SIM)</li> <li>▪ System Management Homepage</li> </ul> </li> </ul>	<b>Matrix OE which delivers:</b> <ul style="list-style-type: none"> <li>• gWLM</li> <li>• Capacity Advisor</li> <li>• vPars and Integrity VM</li> <li>• Online VM Migration</li> <li>• Infrastructure Orchestration               <ul style="list-style-type: none"> <li>▪ Virtualization Manager                   <ul style="list-style-type: none"> <li>▪ HA monitors</li> </ul> </li> </ul> </li> <li>• MirrorDisk/UX</li> <li>• Online JFS</li> <li>• GlancePlus Pak</li> </ul>

### IBM's PowerVM Bundling

There are three PowerVM "Editions" available across the portfolio. *Note: not all editions are available on every system.*

IBM Power VM Features/Edition	Express Edition	Standard Edition	Enterprise Edition
<b>Servers Supported</b>	Most editions of IBM AIX 7.1 are supported across IBM Power7 Server families. (Express Edition is not supported on PureFlex, Enterprise or High Performance servers): <ul style="list-style-type: none"> <li>• Blades (for BladeCenter)</li> <li>• Express (Rack Mount Servers)</li> <li>• Enterprise</li> <li>• High performance computing</li> <li>• PureFlex System</li> </ul>		
<b>Max LPARS</b>	3/Server	1000/Server	1000/Server
<b>Management</b>	VMControl, IVM	VMControl, IVM (only 1 Virtual I/O Server, not on Enterprise or HPC Servers), HMC, FSM.	VMControl, IVM (only 1 Virtual I/O Server, not on Enterprise or HPC Servers), HMC, FSM.

<b>IBM Power VM Features/Edition</b>	<b>Express Edition</b>	<b>Standard Edition</b>	<b>Enterprise Edition</b>
<b>VIOS</b>	Yes	Yes (Dual)	Yes (Dual)
<b>Suspend Resume</b>	No	Yes	Yes
<b>NPIV</b>	Yes	Yes	Yes
<b>Shared Processor Pools</b>	No (Not PS Blades)	Yes	Yes
<b>Shared Storage Pools</b>	No	Yes	Yes
<b>Thin Provisioning</b>	No	Yes	Yes
<b>Active Memory Sharing</b>	No	No	Yes
<b>Live Partition Mobility</b>	No	No	Yes

## Conclusions

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In general, there are many similar virtual server environment capabilities between HP Integrity servers running HP-UX and IBM Power servers running AIX, now that HP-UX offers the converged HP-UX vPars and Integrity VM v6 across all of the current HP Integrity servers.

Both HP and IBM offer the ability to provide logical/virtual partitions (with dedicated- or sub/shared-core), shared OS containers, live migration, instant reserve capacity, and infrastructure manageability offerings, although they may implement these features differently, or there may be variations within specific features.

However, there are some key differences.

### *HP Integrity with HP-UX was found to be stronger in the following areas:*

- Limiting fault downtime, and providing online serviceability for partition-specific firmware upgrades. affecting only that segment of the server with the affected hard partitions (and not the entire server).
- Simplifies and reconciles management with an integrated, central pane of management across the entire server line, as provided by HP Systems Insight Manager (SIM), which underlies HP-UX VSE-OE, HP Converged Infrastructure, HP Software, and HP CloudSystem solutions.
- Improves server utilization with automated capacity planning, tracking historic usage, and with planning advanced “what-if” simulations across servers. This allows users to explore configuration and workload placement options, “best-fit” recommendations, and energy consumption metrics.
- Simplifies ordering and delivery with all virtualization and infrastructure management capabilities available in the Virtual Server OE (VSE-OE).

### *IBM Power with AIX 7 was found to be stronger in the following areas:*

- Online serviceability with the addition or replacement of nodes.
- Maximizing uptime and avoiding service disruption or application downtime by dynamically moving a running dedicated-core partition or container from one server to another (assuming the system is first configured properly).



- Increased server utilization by enabling donation of spare CPU cycles from dedicated processor partitions to be used in the shared processor pool. (Shared Dedicated Capacity).
- Maximized memory resources by expanding memory capacity through in-memory data compression, and enabling more dedicated-processor partitions per server by reducing the physical requirements of existing dedicated-processor partitions (active memory expansion).

Mission-critical UNIX customers require the flexibility of enhanced virtualization technologies to meet their most demanding workloads. Both HP-UX and AIX provide comprehensive virtualization and infrastructure management offerings to meet the needs of these environments. Customer's platform choice should be based on the application and third party tools that customers have, since the UNIX virtualization technologies on both platforms have matured to meet the mission critical requirements.

## For More Information

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### HP

- [www.hp.com/go/hpuxvirtualization](http://www.hp.com/go/hpuxvirtualization)
- [www.hp.com/go/hpux](http://www.hp.com/go/hpux)

### IBM

- <http://www-03.ibm.com/systems/power/software/virtualization/index.html>
- <http://www-03.ibm.com/systems/power/software/aix/index.html>