HP Virtual Server Environment for HP-UX 11i

Optimized server resources

in real time

Robert Sakic
21.4.2004

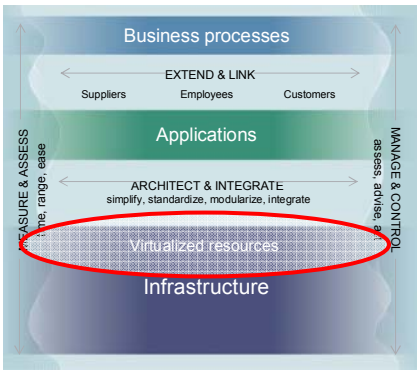
Agenda

- HP Adaptive Enterprise and Virtualization
- Element Virtualization
  - HP Partitioning Continuum
  - Process Resource Manager
  - Instant Capacity On Demand
- Integrated Virtualization
  - HP Virtual Server Environment
  - HP-UX Workload Manager
  - HP Serviceguard extension for Oracle RAC
- Summary

Adaptive Enterprise vision

Business and IT synchronized to capitalize on change

1. Measure, assess and maintain a dynamic link between business and IT
2. Architect and integrate heterogeneous IT environments
3. Extend and link business processes across suppliers and customers
4. Manage and control business processes, applications and the whole IT environment



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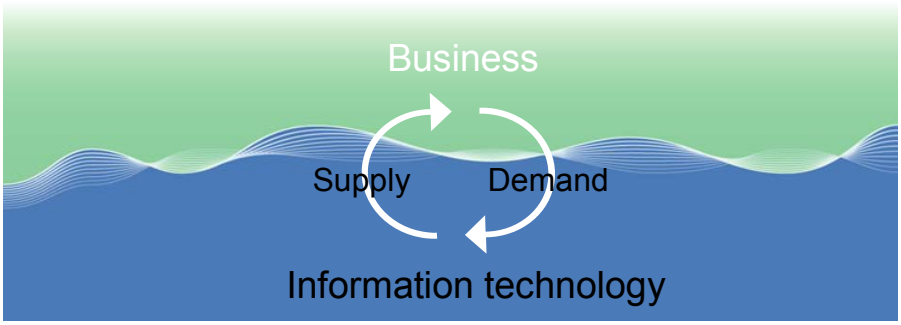
Virtualization

An approach to IT that pools and shares resources so utilization is optimized and supply automatically meets demand



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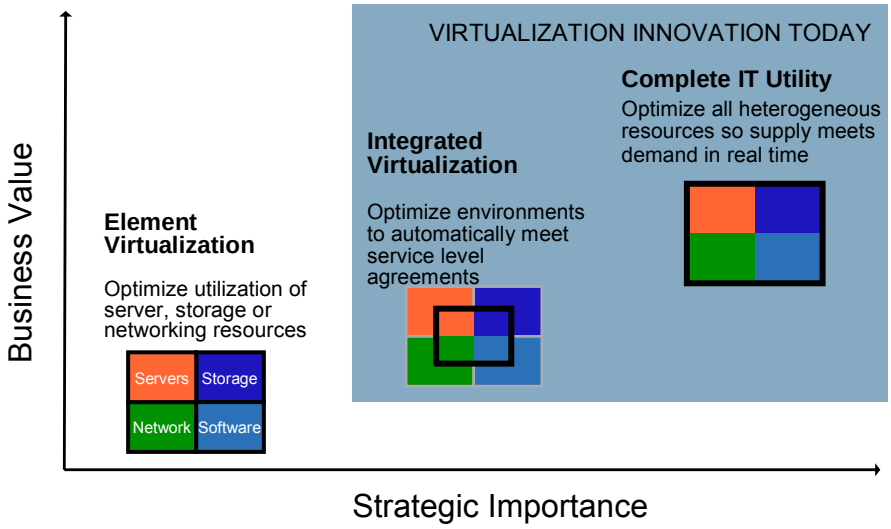
HP virtualization spectrum: Optimizing resources from desktop to datacenter



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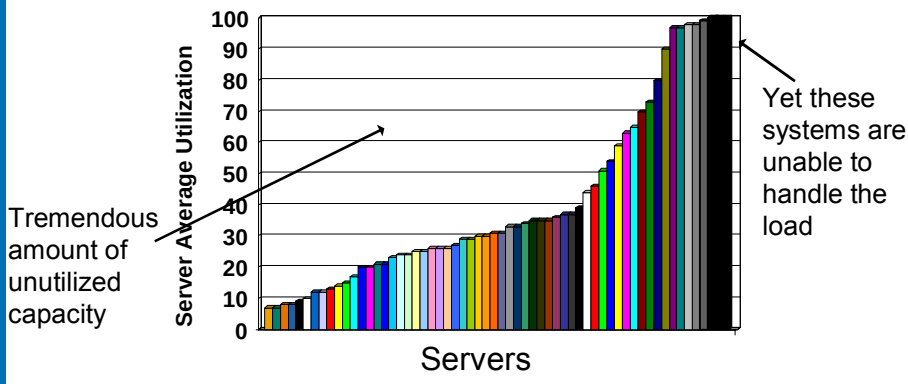
Challenge: Enterprises have unused server capacity yet still can't meet demand

Utilization at an actual HP customer



Most reports put average utilization at approx 30%

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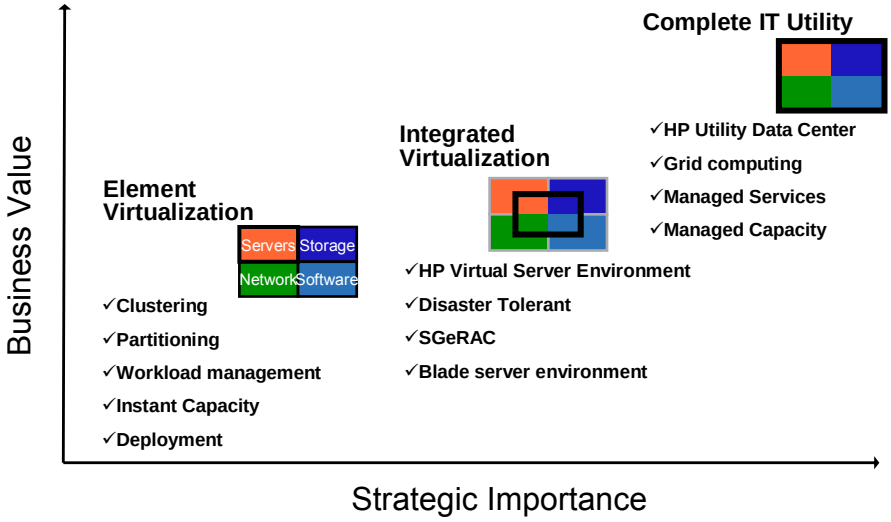
Server Virtualization Solutions



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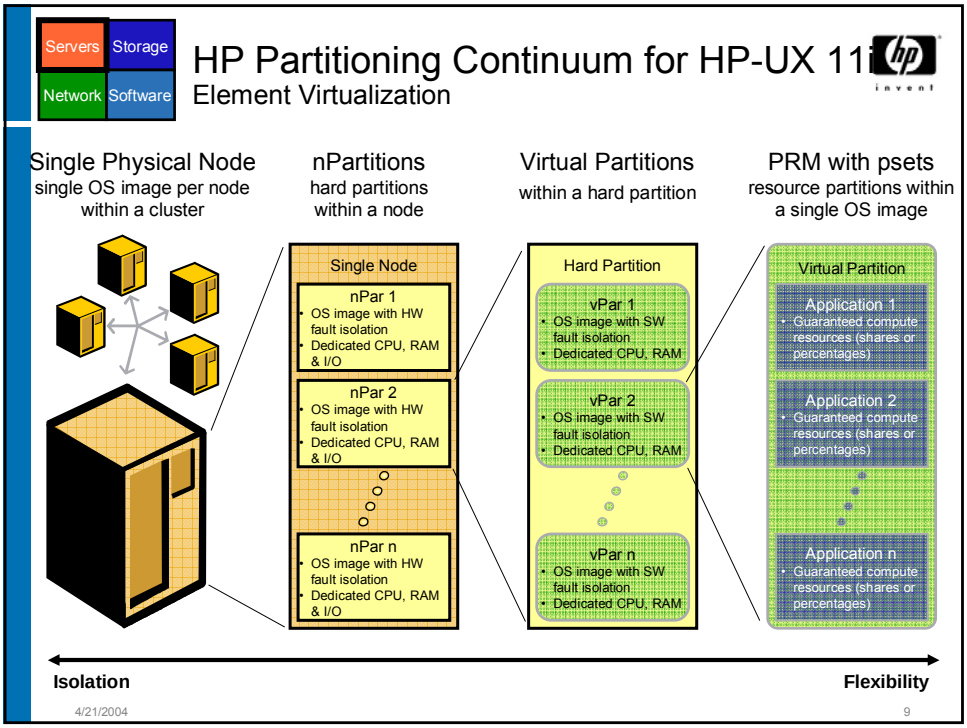
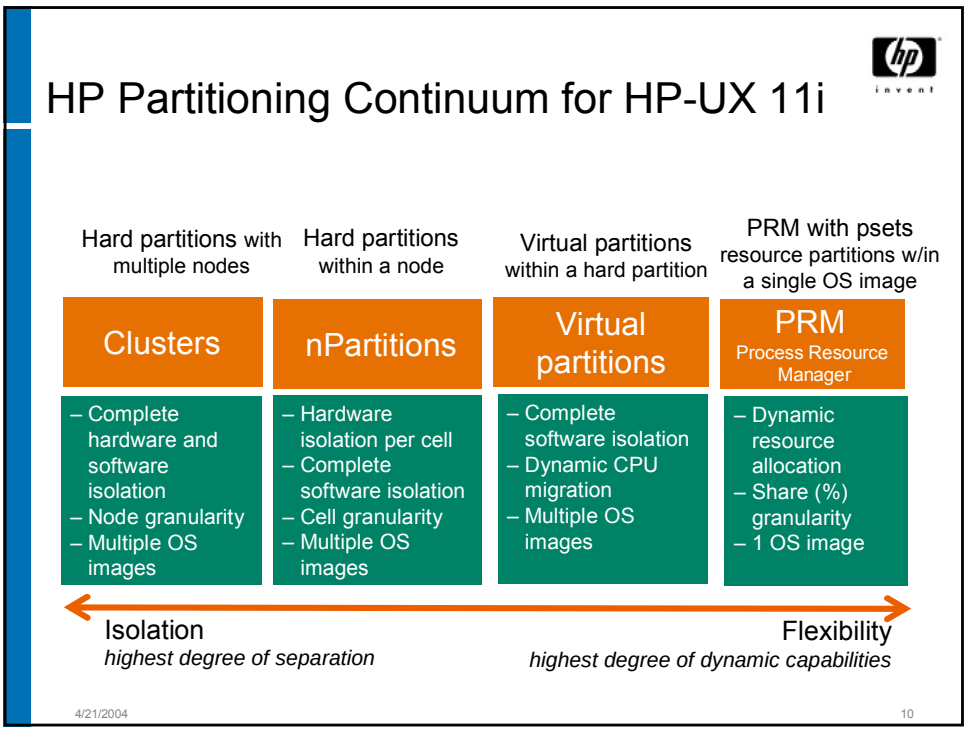

Servers
Storage
Network
Software
HP Partitioning Continuum for HP-UX 11i
Element Virtualization
Single Physical Node
single OS image per node within a cluster
nPartitions
hard partitions within a node
Virtual Partitions
within a hard partition
PRM with psets
resource partitions within a single OS image
Single Node
nPar 1
OS image with HW fault isolation
Dedicated CPU, RAM & I/O
nPar 2
OS image with HW fault isolation
Dedicated CPU, RAM & I/O
nPar n
OS image with HW fault isolation
Dedicated CPU, RAM & I/O
Hard Partition
vPar 1
OS image with SW fault isolation
Dedicated CPU, RAM
vPar 2
OS image with SW fault isolation
Dedicated CPU, RAM
vPar n
OS image with SW fault isolation
Dedicated CPU, RAM
Virtual Partition
Application 1
Guaranteed compute resources (shares or percentages)
Application 2
Guaranteed compute resources (shares or percentages)
Application n
Guaranteed compute resources (shares or percentages)
Isolation
Flexibility
4/21/2004
9


HP Partitioning Continuum for HP-UX 11i
Hard partitions with multiple nodes
Hard partitions within a node
Virtual partitions within a hard partition
PRM with psets resource partitions w/in a single OS image
Clusters
nPartitions
Virtual partitions
PRM
Process Resource Manager
– Complete hardware and software isolation
– Node granularity
– Multiple OS images
– Hardware isolation per cell
– Complete software isolation
– Cell granularity
– Multiple OS images
– Complete software isolation
– Dynamic CPU migration
– Multiple OS images
– Dynamic resource allocation
– Share (%) granularity
– 1 OS image
Isolation
highest degree of separation
Flexibility
highest degree of dynamic capabilities
4/21/2004
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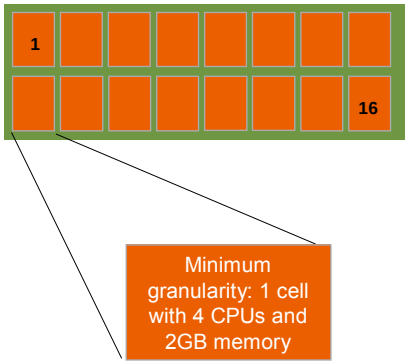
Hard Partitions: “nPartitions”

multiple applications
on the same server
with hardware isolation



- Increased system utilization
  - Superdome with up to16 nPartitions
- Increased Flexibility: Multi OS
  - multi OS support: HP-UX, Linux, Windows
  - multi OS version support
  - multiple patch level support
- Increased Uptime
  - hardware (electrical) and software isolation across nPartitions
  - Serviceguard between hard partitions on the same server or to another HP-UX server.
- Available on Superdome, rp8400, rp7410

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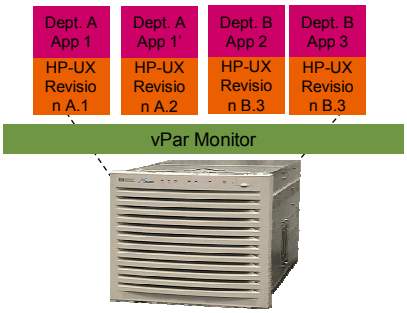
HP-UX Virtual Partitions (vPars)

- Flexibility:
  - Multiple independent OSs
  - Dynamic CPU migration
  - 1 CPU granularity
  - Integrates with nPartitions and iCOD
  - Allows app-specific O/S tuning
  - Resources not tied to physical configurations
- Isolation:
  - Of OS, applications, resources
  - Individual reconfiguration & reboot
- Easy deployment:
  - Ignite-UX is vPar-aware
- Easy management:
  - Automatic, SLO-based workload management ACROSS vPars (WLM cross-vPar integration)
- Platform support (as of version A.02.02):
  - rp5405, rp5470/L3000, rp7400/N4000, rp7410, rp8400, Superdome



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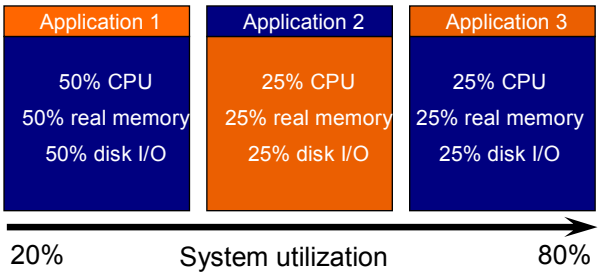
HP Process Resource Manager (PRM)
Predictable service level management

Resource partitions within a single OS image



PRM allows you to drive up system utilization by running more applications per server: the result is a better ROI

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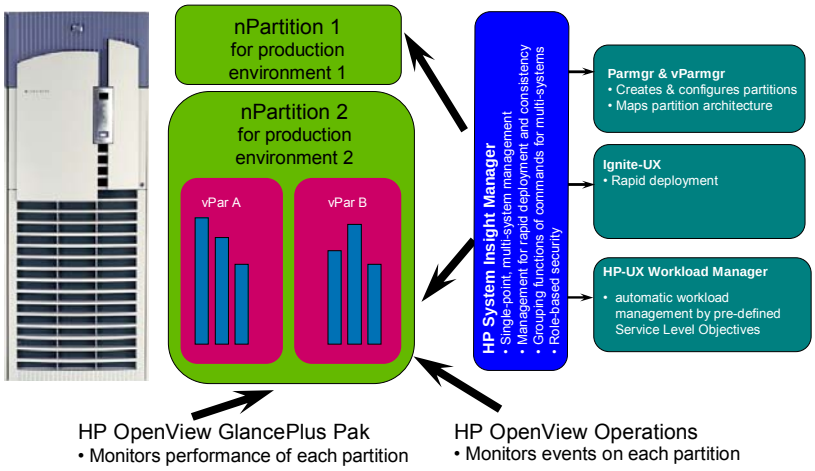
Managing the HP Partitioning Continuum for HP-UX

The power of HP Systems Insight Manager and HP OpenView



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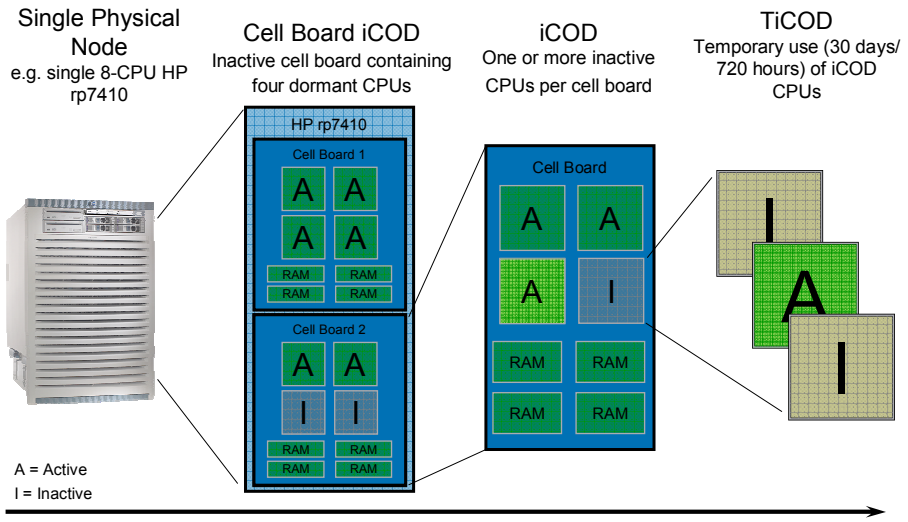
HP Instant Capacity On Demand (iCOD) - Element virtualization



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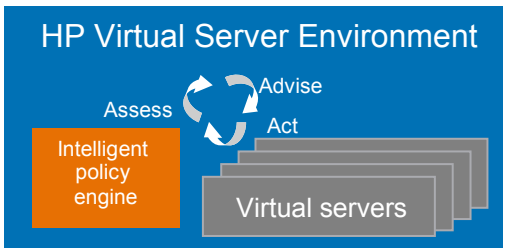
Integrated Virtualization:
HP Virtual Server Environment for HP-UX 11i



Expands and shrinks virtual servers in real time based on business priorities

- Better RoIT through optimized resource utilization
- Increased business agility through the capability to allocate resources on the fly
- Ensuring service levels through continuous real time assessment, advice, and action

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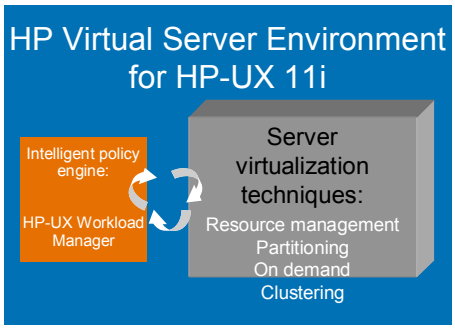
HP Virtual Server Environment for HP-UX 11i: Optimize utilization while ensuring service levels



- Automates the virtualized environment
- Goal-based or policy-based resource management
- Exclusive integration:
  - CPU resource allocation
    - –within and across partitions
    - –in between multiple apps in a single OS image
  - Automatic reallocation of resources upon Serviceguard package activation
- Application transparent
- Application-specific toolkits

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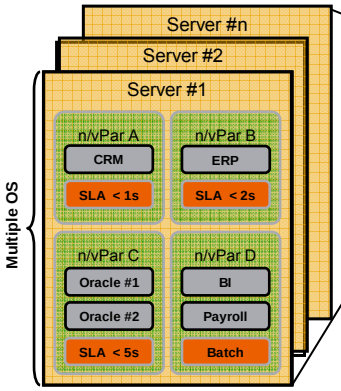
HP Virtual Server Environment (VSE) for HP-UX 11i – December 2003 news



Intelligent Policy Engine
- Service Levels defined and enforced
- Works within and across servers

VSE actions to meet SLAs:
- Optimize resource allocation (CPU, memory, etc.) within a partition
- Move CPU resources from one partition to another
- Optimize usage of iCOD resources iCOD
- Move application to another server

- **HP-UX Workload Manager (WLM) 2.2**
  Increased dynamic resource optimization across nPartitions
- **HP Virtual Server Environment Quick Start Solution**
  Pre-tested optimization with BEA WebLogic Server and Oracle 9i database
- **HP Extended Cluster for RAC**
  Disaster tolerance with continuous application availability

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HP-UX Workload Manager (WLM)

Examples of Service Level Objectives (SLOs)

Application A	Application B	Application C
Response time SLO	Response time SLO	Job duration SLO
Transactions will complete in less than 2 seconds.	Transaction will complete in less than 3 seconds	Batch job will finish in less than 1 hour.
Priority 1	Priority 2	Priority 3

HP-UX WLM automatically reconfigures CPU resources to satisfy SLOs in priority order

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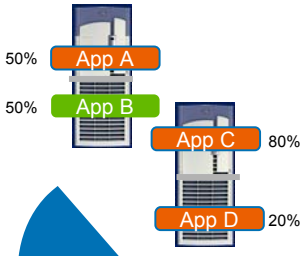
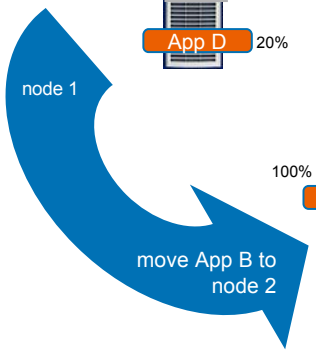
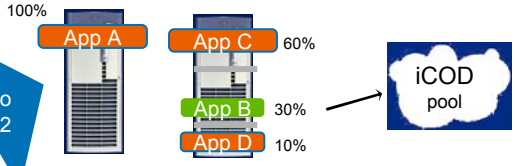
HP Virtual Server Environment in action: Optimized utilization in a clustered environment







- Serviceguard package transfers from one node or partition to another – for maintenance or in case of failure
- HP-UX Workload Manager automatically reallocates resources
- Based on HP-UX 11i Mission Critical Operating Environment

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HP-UX Workload Manager and On Demand Integration

- **HP-UX WLM & Pay-Per-Use**
  - Active PPU
    - WLM automatically activates PPU CPUs
    - WLM automatically de-activates PPU CPUs
  - Percent PPU
    - WLM caps usage rates
- **HP-UX WLM & TiCOD**
  - activate TiCOD CPUs
  - deactivate TiCOD CPUs
  - reserve unaware today
    - WLM does not know how much TiCOD time is remaining
- **HP-UX WLM & iCOD**
  - WLM will advise if iCOD CPUs should be activated
    - WLM optionally can automatically activate iCOD CPUs if iCOD v5 or older
  - WLM can automatically transfer iCOD CPU licenses between nPars within a system

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Customer Example: HP Virtual Server Environment in action

- Before: 5 rp5470 servers
  - SAP HR production
  - SAP Financials production
  - 3 development and test servers
- Problem
  - Production servers at full utilization
  - Additional reports and detailed reports could not be run due to lack of available resources.
  - Month end processing took too long.
  - Development and testing servers were under utilized.
  - Need to support new version of SAP with higher resource requirements.

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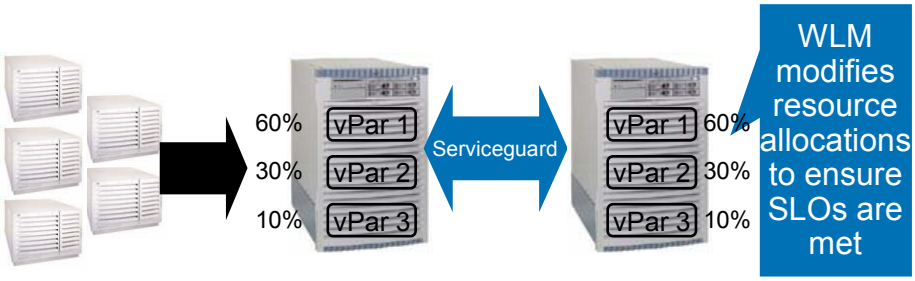
Customer Example: HP Virtual Server Environment in action

- Solution: 2 x rp8400 with 3 vPars each
  - Serviceguard to ensure high availability
  - Workload Manager to move resources between development and production environments to ensure SLOs.
    - HP-UX WLM installation and configuration took 1.5 hours for all 6 vPars.
  - New version of SAP installed.
  - New and detailed reports can be run, end of month processing finishing on time.



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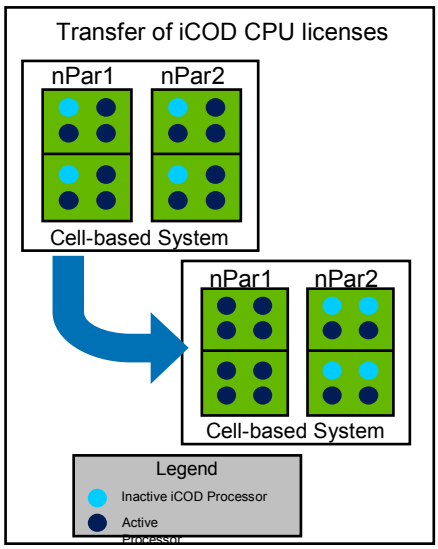
HP-UX Workload Manager 2.2: Increased dynamic capabilities



- Dynamic resource allocation across nPartitions to meet service levels
  - transfer iCOD CPU licenses across nPar
  - maintain electrical isolation with flexibility
- Improved Serviceguard integration
  - whole CPUs to be assigned to Serviceguard packages after a failover
- Improved GUI
- 90 day trial version for HP-UX Workload Manager 2.2
- Available in March '04 for HP 9000 and HP Integrity servers

HP: Only goal-based policy engine for Unix

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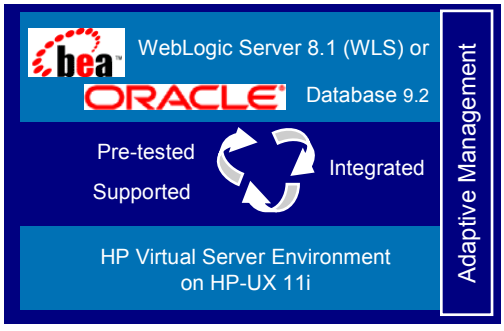
HP Virtual Server Environment Quick Start Solution: Optimized for BEA and Oracle

Pre-tested, integrated, and supported infrastructure solution for application server and database consolidation



- Up to 60 % time-to-production reduction
- Customizable
- Fully supported by HP Customer Support
- In production with customers today
- Based on the reliability of HP-UX 11i

Virtualization, consolidation, and management best practices together

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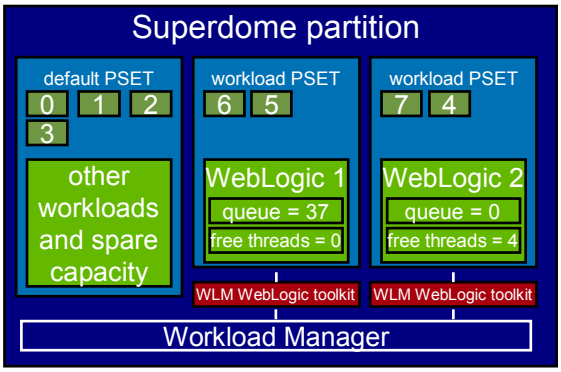
HP VSE Quick Start Solution customer example: Consolidating BEA WebLogic Server

Large Financial Services Company

- 29,000 employees in 40 countries
- 82-year history
- Earned nearly $1.8 billion in 2001



Solution

- Processor Sets (pSets) provide the optimal performance and throughput for WebLogic-based applications
- Workload Manager will dynamically resize processor sets for optimal performance

Results

- Improved utilization while maintaining service levels
- 40 % time-to-production reduction

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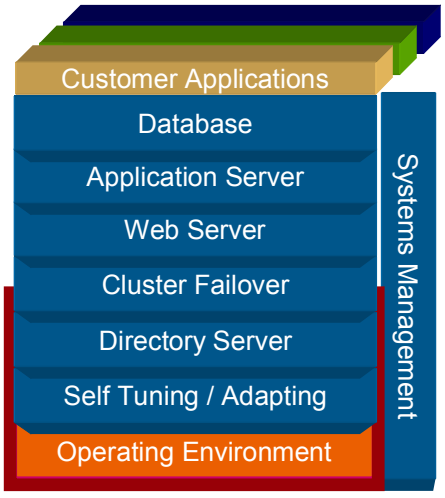
HP VSE Quick Start Solution "Best of Breed" infrastructure solution



- HP OpenView Operations Agent
- HP OpenView Performance Agent
- HP OpenView Smart Plug-ins
- Oracle 9i Database 9.2
- BEA WebLogic Application Server 8.1
- iPlanet Web Servers
- HP-UX 11i Operating Environment:
  - Apache
  - HP Serviceguard
  - Netscape Directory Server
  - HP-UX Workload Manager (WLM)
  - HP Process Resource Manager (PRM)
  - HP Auto Port Aggregation
  - HP-UX 11i (v1 & v2)

Availability Q104 for HP 9000 & HP Integrity servers – delivered via HP Services

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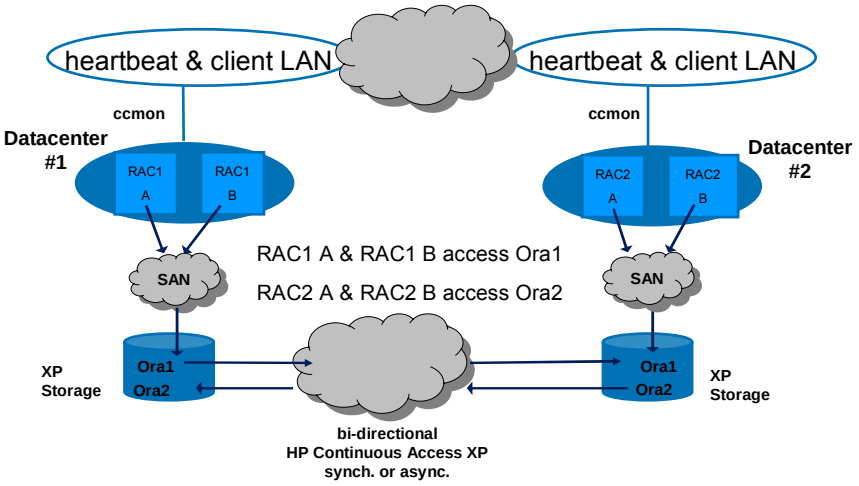
HP Continentalclusters with SGeRAC

Disaster tolerance with failover at unlimited distances



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HP Continentalclusters with SGeRAC

Disaster tolerance with failover at unlimited distances

- High Availability and Disaster Tolerance for virtual environments
  - SGeRAC for Oracle 9iRAC maintains high availability within a data center
  - Continentalclusters provides disaster tolerance between data centers
- Replicated data
  - Synchronous or asynchronous replication with HP Continuous Access software to balance performance and return to operations objectives
- Bi-directional failover capabilities
  - Either data center is capable of supporting the other in the event of a disaster
- Integral part of the HP Virtual Server Environment to ensure service levels in case of maintenance and failure scenarios
- HP is the leading vendor for Oracle RAC solutions
- Available now

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Customer Example – HP Continentalclusters with SGeRAC

European government agency - Deployed

Business need

- Tracking criminals 24 x 7
- Maintain application availability, DB consistency and accessibility
- Continual operations in the event of a disaster

Configuration

- Oracle RAC running in the datacenters for high availability
- Continentalclusters for disaster tolerance capabilities between data centers located 25 kms apart
- Continuous Access data replication is provided synchronously with the ability to failover in either direction

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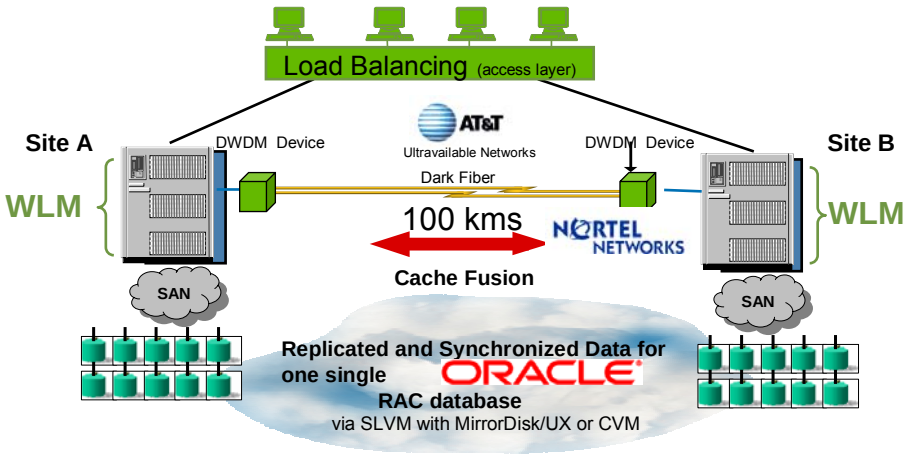
HP Serviceguard extension for Oracle RAC

Disaster tolerance with continuous application availability



Active/active environment with transparent access to applications and data!

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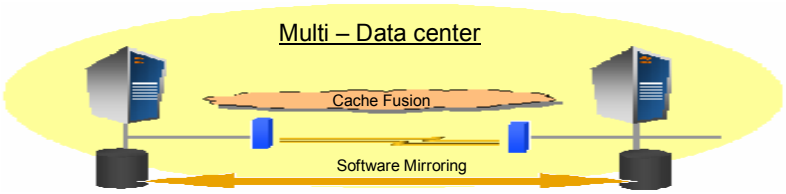
HP Serviceguard extension for Oracle RAC
Disaster tolerance with continuous application availability

An integrated virtualized solution for dynamic business environments

- Continuous application availability
  - Designed to survive the loss of a data center
- Self adapting environment based on business demand
  - Complete resource utilization managed across data centers, server partitions and storage area networks
- Simplified Management
  - Infrastructure is self managed based on service level objectives
  - Single virtual database, replicated and synchronized
- Tested and certified with partners
  - Oracle, AT&T and Nortel



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Customer Example – HP Serviceguard extension for Oracle RAC

- European Financial Institution – Beta testing
- Requirements
  - Custom application, BEA WLS on a Oracle RAC database
  - No loss of acknowledged transaction or messages
  - Service to be available within 10 seconds after loss of service
  - Service to be available within 30 minutes of a country failure
  - Availability of service to participants, 99.995%
- Configuration
  - Total of 4 data centers, 2 per country
  - Each pair of data centers running active-active mode
  - Single database with synchronous replication between datacenters per country
  - Asynchronous replication between countries

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HP Virtual Server Environment in action
Customer scenarios

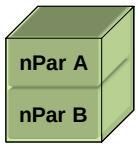
A

Optimizing cluster utilization within a data center

B

Optimize utilization across data centers for disaster tolerance

C



Consolidating multiple production environments on the same server

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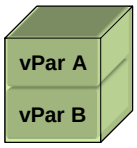
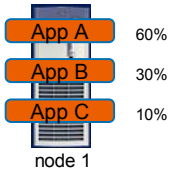


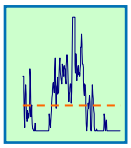
Consolidating of test/ dev and production on the same server

E



Consolidation through application stacking within the same OS image

F



- Instantaneously available resources for a growing environment - iCOD
- addressing high fluctuation - PPU

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HP Virtual Server Environment for HP-UX 11i

- ✓ Broadest, integrated virtualization capabilities with Virtual Server Environment for HP-UX
- ✓ HP offers the only goal-based workload management capability in the UNIX market - the intelligent policy engine for VSE
- ✓ First to market with fully virtualized high-availability solution for Oracle 9iRAC across data centers (SGeRAC)
- ✓ Extending server virtualization into middleware and database layer with HP VSE Quick Start Solution for BEA & Oracle

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Backup Slides

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HP On Demand Solutions portfolio

instant capacity delivering immediate access to additional capacity	metered capacity paying for IT assets based on actual IT usage "dial-up and dial-down"	managed capacity redirecting resources to other core competencies
• iCOD for ProLiant servers • iCOD for Blades • For HP 9000 and HP Integrity Servers – iCOD – Temporary iCOD (TiCOD) – Cell Board iCOD (CiCOD) • iCOD for NonStop • iCOD for AlphaServer systems (Tru64 or OpenVMS) • Pay per Forecast for HP products	• PPU for HP 9000 and HP Integrity Servers • PPU for StorageWorks XP • PPU for Imaging and Printing	• Access on Demand • Managed Storage Solution • Messaging on Demand – Microsoft Exchange 2000 on Demand – Tiered Messaging on Demand

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iCOD for HP 9000 and Integrity Servers How does it work?

- Customer pays a one-time right to access fee per iCOD (inactive) processor
- No activation commitment
- Once extra processing capacity is required, the customer will purchase the enablement for the processor at the discounted list price for that processor
- Outbound only email connectivity is required for HP 9000 servers
- No email connectivity is required for HP Integrity iCOD processors
- For iCOD on Integrity, codeword is the only way and is available today

Value
- No premium pricing
- Instant processing power with a single command
- Capability to load balance partitions at no additional cost- dynamically move iCOD processors within a server
- iCOD processor automatically replaces failed CPU
- More flexibility over competition

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Temporary Capacity iCOD
How to sell it to your customer

- HP-UX 11i required; Email is required
- Works with processors, does not include cell board & memory
- Customer orders standard iCOD processors and pays right to access fee
- Customer then purchases a 30-CPU day right to temporarily activate 1 or more iCOD CPU's

Value
- Enables the customer to temporarily activate a processor(s) for a set period of time
- No permanent activation fee is required – utilize an existing CPU at very low cost
- Accommodates those customers with predictable or planned processor demands

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Cell Board iCOD
How does it work?

- Available now on HP 9000 Servers rp7410 & rp8400, rp7620, rp8620
- Available now on HP Integrity Servers Superdome, rx7620, rx8620
- HP 9000 Superdome with PA-8800
- HP-UX only
- Customer pays a one-time right to access fee per iCOD (inactive) cell board (cpu's and memory)
- Activation includes all memory and cpu's in increments of one at a time
- EMail connectivity is required for this program on HP 9000 Servers
- Email connectivity is not required for HP Integrity Servers

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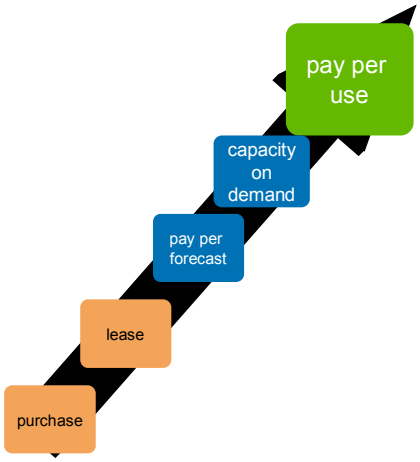
HP's Metered Capacity / Pay-Per-Use program



Alternative acquisition model!

When demand is increasing but somewhat predictable.

- Reserve capacity is installed in HP Servers at customer site and is ready for activation
- Better ROI: delay or avoid paying for reserve capacity until needed
- Highly available: reserve capacity in event of processor failure
- React instantly:dynamically scale up or down as business needs require

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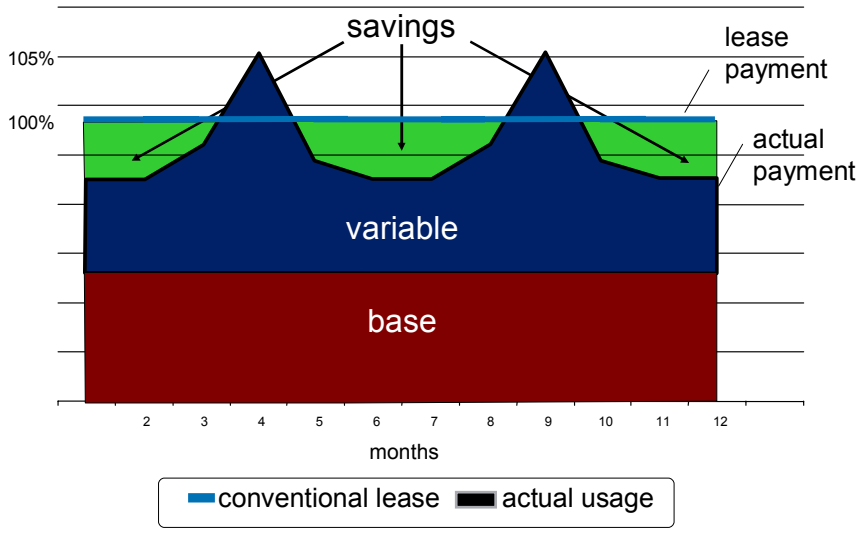
Capitalizing on fluctuating demand



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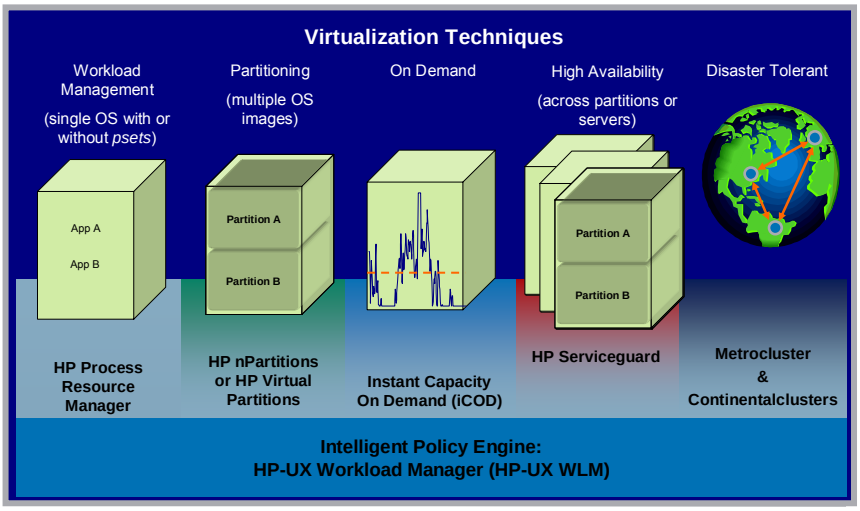
HP Virtual Server Environment for HP-UX 11i Virtualization Techniques



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HP server element virtualization offerings

	Clustering	Partitioning: hard; soft partitions	Workload management	Instant Capacity on Demand (iCOD)	Deployment
HP-UX	HP Serviceguard, HPTC/ ClusterPack	HP nPartitions; HP Virtual Partitions	HP-UX Worklaod Manager, HP Process Resource Manager, pSets	Yes	Ignite-UX
Windows	Microsoft Cluster Server	HP nPartitions; VMware, Microsoft Virtual Server	HP ProLiant Essentials WLM Pack (RPM), Microsoft WSRM	Yes - HP ProLiant and Blades	HP ProLiant Essentials Rapid Deployment Pack (RDP)
Linux	HP Serviceguard for Linux, HP XC Clusters	HP nPartitions; VMware	Linux 2.6	No	HP ProLiant Essentials Rapid Deployment Pack (RDP)
NonStop	HP NonStop ServerNet Clusters	Shared nothing processor/memory	Dynamic load balancing, mixed workload	Yes	Transparent (self-healing) operations; Online reconfiguration
OpenVMS	HP OpenVMS clusters	AlphaServer hard partitions; OpenVMS Galaxy	Galaxy Configuration Manager	Future	Factory Installed Software (FIS) Ignite starting with OpenVMS V8.2
Tru64 UNIX	HP TruCluster Server	AlphaServer hard partitions; none	pSets, Class Scheduler, TruCluster Server WL balancing	Yes	Yes

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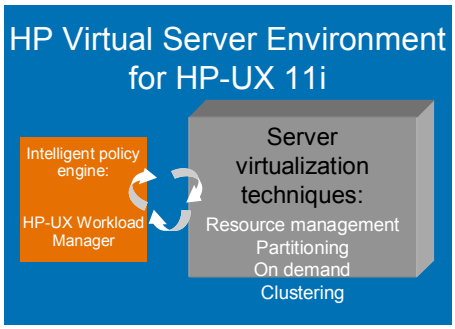
HP Virtual Server Environment for HP-UX 11i



- Broadest, integrated virtualization capabilities
- Only goal-based workload management capability in the UNIX market
- Extending server virtualization into middleware and database layer with HP VSE Quick Start Solution for BEA and Oracle

Optimize utilization while ensuring service levels

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