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Common Europe Luxembourg
Introducing IBM eServer i5 & 

LPAR i5 "Up-to-Date" :
Logical Partitions on the IBM Power5
by Eddy PASTEGER

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Logical Partitions on the IBM Power5

Introduction

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Introduction

Objectives

- Understand the LPAR functionality as implemented on the IBM Power5 servers
- Understand planning considerations and system requirements

Warning

- This presentation is built on functionalities available on i5 models 5xx running i5/OS V5R3



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Logical Partitioning on the IBM Power5

Agenda

- Chapter 1. Architecture
- Chapter 2. Resources Management Concepts
- Chapter 3. LPAR-Capable i5 Models
- Chapter 4. Planning
- Chapter 5. Hardware Management Console
- Chapter 6. Virtual Partition Manager



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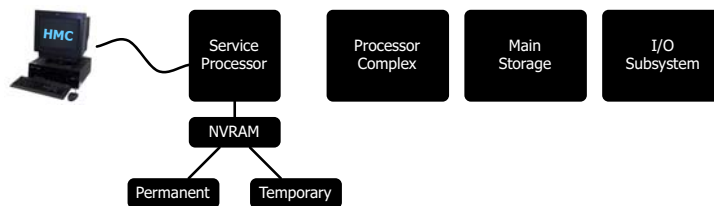
Logical Partitions on the IBM Power5

Architecture

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Architecture



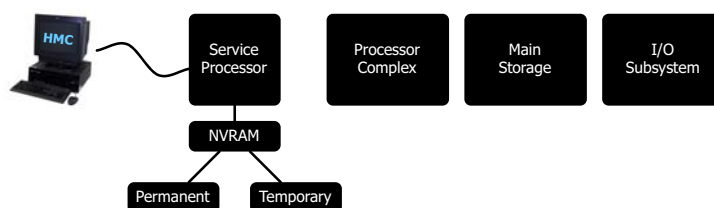
The Service Processor

- Standard built-in, independent component of every eServer i5 or p5
 - Own processor, memory and boot code
 - NVRAM stores the “firmware” and the LPAR configuration

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Architecture



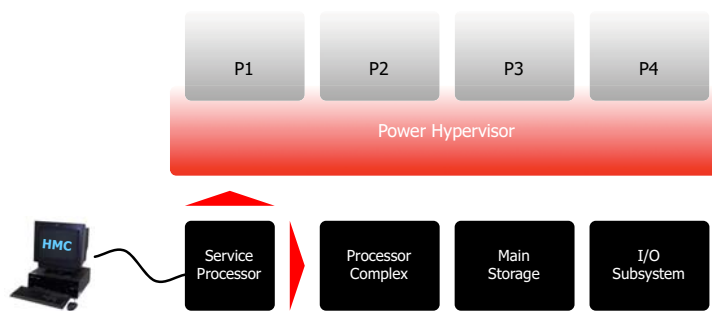
The Service Processor (aka SP)

- Once main power is connected ...
 - The SP activates its own “firmware” operating system
 - Control panel shows C1xx progress codes
 - Gathers vital product data (VPD) from the electronic components in the server
 - Runs diagnostic routines to verify its hardware and firmware
 - Control panel shows 01 and the green power LED is flashing
 - The server is in “SP Standby” mode
 - The server is ready to interface with HMC

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Architecture



The Service Processor (aka SP)

- Once you power on the system ...
 - The SP turns on the system power
 - All I/O towers via SPCN
 - Control panel shows C7xx progress codes
 - Runs diagnostic routines to verify system processors and system main storage
 - Verifies that it can communicate with environmental sensors and monitors in the system
 - Control panel shows 01 and the green power LED is on
 - The server is in "Hypervisor Standby" mode

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Architecture

The Power Hypervisor

- Previously part of the System Licensed Internal Code (SLIC)
 - Known as "Partition Licensed Internal Code (PLIC)"
 - PLIC is enhanced to be used with the eServer i5 hardware
- Power Hypervisor is independent from any operating system
 - There is no longer the concept of a "Primary Partition"
 - There is no longer the need to IPL the whole system to make partitions changes
 - There is no longer a single point of failure with a "Primary Partition"
- Also known as ...
 - Firmware
 - Server Firmware
 - Hypervisor
 - Power Hypervisor
 - pHyp
 - Underware



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Architecture

The Power Hypervisor Functions

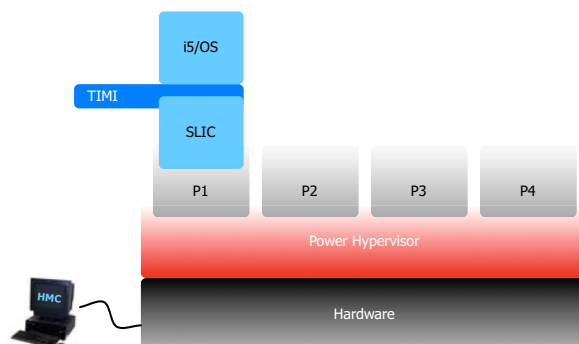
- Virtual processor support
 - Allocation of physical processor time to partition thru "virtual processors"
- Virtual memory management
 - Allocation of physical memory to partition thru "virtual memory"
- Virtual hardware support
 - Processors
 - OptiConnect
 - SCSI
 - Ethernet
 - Serial
- Security and isolation between partition
 - Partition allowed to access only to their allocated resources
 - Enforced by the Power Hypervisor
 - Reinitializes processors, resets registers, flushes caches
 - Clears memory
 - Reset I/O devices



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Architecture



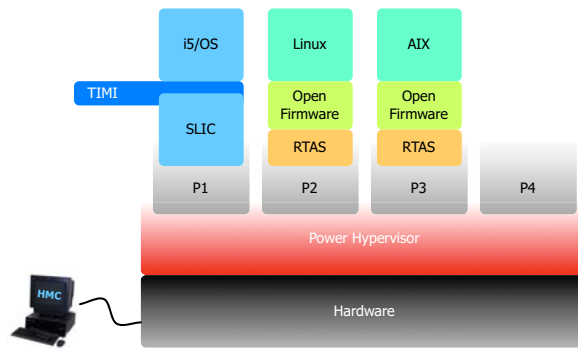
Starting an i5/OS partition

- Hypervisor will operate a "virtual service processor" to load and start SLIC
 - SLIC is changed to interface with the new Power Hypervisor
 - TIMI and all the layers above are still in place

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Architecture



Starting a LINUX or AIX partition

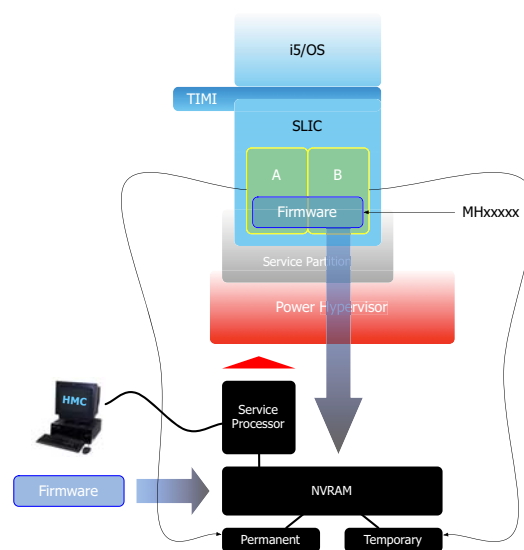
- Hypervisor will operate ...
 - Open Firmware contains boot-time drivers and the boot manager
 - RTAS is a service that passes platform-dependent system calls to the Hypervisor
- Other is characteristic to the guest operating system
 - E.g. Linux has a "monolithic" kernel, while AIX has a "microkernel-hybrid" structure

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Architecture

Hypervisor Code Maintenance



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Logical Partitions on the IBM Power5

Resources Management Concepts

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Resources Management Concepts

What is "logical partitioning" ?

- The ability to make a single server run as if it were many independent systems
- Each logical system is called a "Partition"
- Each partition operates as an independent system
- Each partition will receive a portion of the system resources :
 - Processor
 - Memory
 - I/O slots
 - Virtual I/O slots



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Logical Partitions on the IBM Power5

Resources Management Concepts
Processor

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Resources Management Concepts

Processor Concepts

- Dedicated vs. Shared Processors
- Virtual Processors
- Capped vs. Uncapped Processors
- Considerations about LPAR and SMT

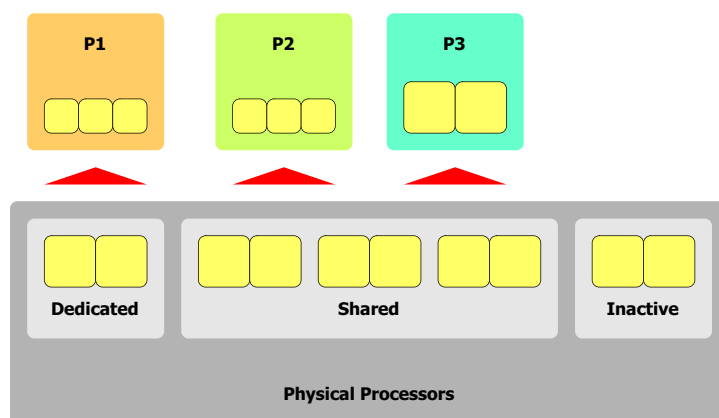


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Processor Concepts

Processor Concepts



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Processor Concepts

Dedicated Processors

- A "dedicated processor" refers to a whole processor that is dedicated to a single partition
- One or more processors can be dedicated to a partition
 - The most simple way to distribute processors among logical partitions
- Rules & requirements :
 - At least one dedicated processor
 - Granularity of movements : one processor
 - Processor moves are dynamic, without any IPL within the configured ranges
 - Unallocated processors are not used

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Processor Concepts

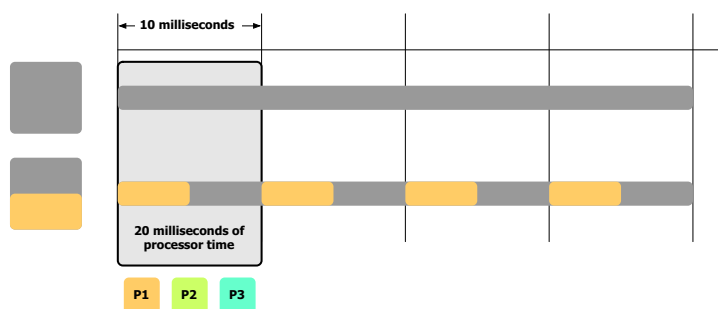
Shared Processors

- A "shared processor" allows to assign partial processors to a partition
- Physical processors lives in a "shared processor pool"
 - By default, any unassigned processor is a member of the shared processor pool



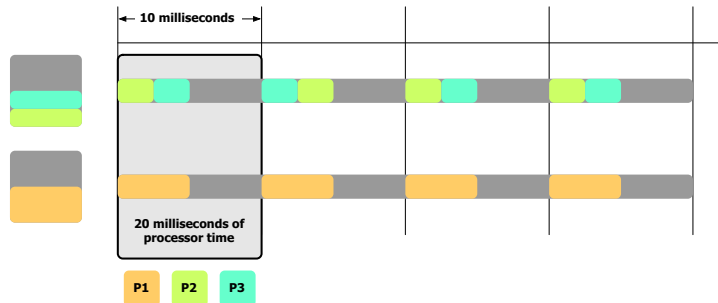
Processor Concepts

Shared Processors



Processor Concepts

Shared Processors



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Processor Concepts

Shared Processors

- Rules & requirements :
 - A processing unit (PU) represents the cycles of a single processor
 - At least 0.10 PU (1 millisecond)
 - Granularity of movements : 0.01 PU
 - Processor moves are dynamic, without any IPL within the configured ranges
 - Unallocated PU are not used



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Processor Concepts

Potential Shared Processors Penalty

- Increase the possibility that job's won't complete, and :
 - Have to be re-dispatched, and potentially have to reload cache
 - Increase the chance of a cache miss
- Reduce the chance for processor/memory affinity
- Increase the Power Hypervisor work :
 - Tracking each partition use of its allocated milliseconds



Processor Concepts

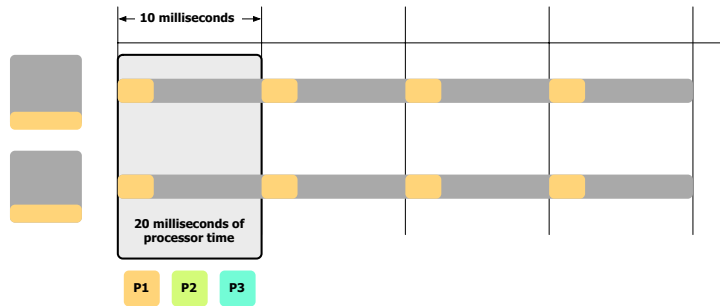
Virtual Processors

- The number of "virtual processors" represents :
 - The number of physical processors that the partition is able to use
 - The number of simultaneous jobs/threads execution
 - The number of processors that the operating system thinks he has to use



Processor Concepts

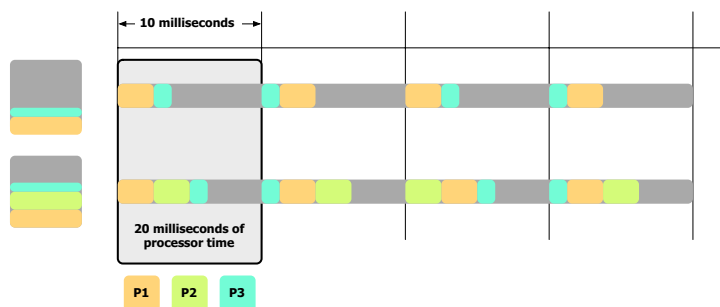
Virtual Processors



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Processor Concepts

Virtual Processors



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Processor Concepts

Virtual Processors

- Rules & requirements :
 - It is possible to allocate more virtual processors than there are in the shared processor pool
 - The actual number of processor in the shared processor pool is a “floating” number
 - A single physical processor can report in the system as a n-ways
 - You cannot allocate less than 0.10 PU per virtual processor
 - Example : requesting 0.20 PU to run on 4 VCPU means $0.20 / 4 = 0.05 < 0.10$!
 - Changes are dynamic, without any IPL within the configured ranges



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Processor Concepts

Uncapped Processors

- Uncapped allows to potentially utilizes unused processor capacity in the system
- Uncapped weight is used to determine how unused capacity is distributed :
 - P1 weight is 200
 - P2 weight is 100
 - P1 will receive 2/3 of the unused shared processor capacity
 - P2 will receive 1/3 of the unused shared processor capacity
 - If P1 does not need all 2/3 of capacity, then P2 could get more !



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Processor Concepts

Dedicated, Shared, Capped or Uncapped ?

- How to decide on using :
 - Dedicated or shared processors ?
 - If using shared processors, it is to be capped or uncapped ?
 - And ... how many virtual processors do I allocate ?
- The best performance may be achieved by using dedicated processors ...
 - However, dedicated processors cannot utilize excess capacity !
- Shared uncapped will allow use of excess capacity of the processor, but ...
 - Setting virtual processor number too low will limit uncapped usage
 - Setting virtual processor number too high will degrade performance
- What does IBM recommends ?
 - It depends ...
- What do I recommend ?
 - Keep things simple !

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Processor Concepts

Simple Recommendations

- On small configurations, use shared uncapped processor :
 - Allocate desired processing units according needs
 - Keep a little portion of unused processing units
 - Configure uncapped weight according partition importance
- Set virtual processor number to a "reasonable" value :
 - Set a value "close" to the number of allocated processing units
 - 0.4 PU running on 1 VCPU
 - 1.8 PU running on 2 VCPU
 - Take care of your workload pattern
 - 1.0 PU running on 1 or 2 VCPU ?
 - Single job, single thread applications will not take benefits when running on multiple VCPU
 - Multiple job, multiple thread applications will run more efficiently when running on multiple VCPU
 - Take care of SMT capabilities !
 - Do not exceed the number of physical processors

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Processor Concepts

About Simultaneous Multi-Threading (SMT)

- SMT is a technology that allows a single CPU to be seen logically as 2 logical CPU
 - Physical processor
 - Logical processors
- SMT allows 2 threads to run simultaneously on the same processor
 - Using different execution units, or "pipes"
- SMT optimizes the usage of the 7 execution units of a PowerPC processor
- Hypervisor only deals with physical processors
 - Each operating system can use the physical processor as its needs
 - SMT can be used or not ... according partition's operating system configuration
 - For i5/OS, refer to system value QPRCMLTTSK

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Logical Partitions on the IBM Power5

Resources Management Concepts

Main Storage

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Main Storage Concepts

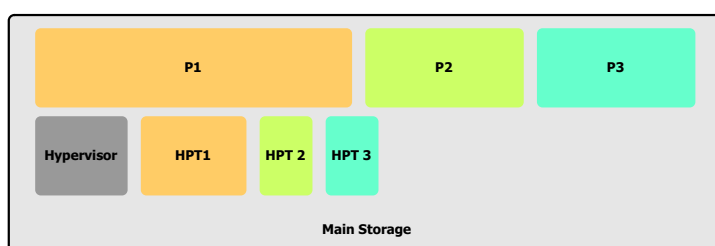
Memory Allocation Facts

- Power4 Hypervisor allowed memory manipulation at the single megabyte (1MB) level
- Memory in the Power5 machines cannot be manipulated that finely :
 - Memory must be assigned or moved in blocks
 - These blocks are called "Logical Memory Blocks (LMB)" or "Memory Regions"
- About those "Memory Regions" :
 - LMB are sized in multiples of 16 MB
 - Future implementations will allow use of 16, 32, 64, 128 or 256 MB blocks
 - LMB size is a system-wide parameter
 - LMB is the smallest amount of memory that can be manipulated

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Main Storage Concepts



Memory Allocation Facts

- Hypervisor uses memory to run the system !
- Hypervisor memory used expands and contracts based on many variables :
 - Number of partitions
 - Amount of I/O attached to the system
 - Amount of virtual I/O slots used in each partition
 - HSL OptiConnect and Virtual OptiConnect links
- Starting and/or stopping a partition affects hypervisor memory requirements
 - Hypervisor memory allocation made by 16 MB increments

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Main Storage Concepts

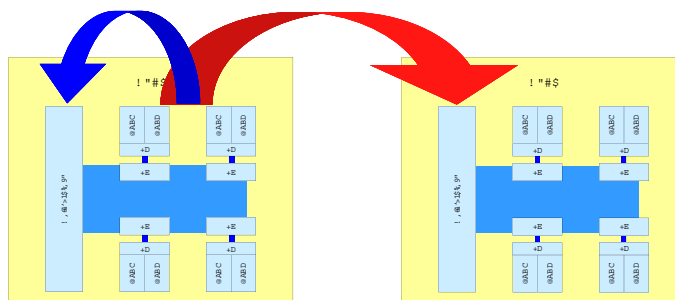
Memory Allocation Facts

- A "Hardware Page Table (HPT)" is needed to manage memory
- Power4 Hypervisor reserved HPT within partition memory
- Power5 Hypervisor allocates HPT separately from partition memory
- Size of the HPT depends of the maximum memory amount the partition can receive
- Basic calculation : maximum memory divided by 64, rounded up to next power of 2
 - A partition can allocates a maximum of 12 GB (12288 MB)
 - HPT size will be $12288 / 64 = 192$... next power of 2 is ... 256
 - HPT size will be 256 MB
- Recommendation
 - Take care of HPT when allocating memory to partitions !
 - Plan to allocate $12288 - 256 = 12032$ MB for the partition
 - Memory actually used will be 12288 MB
- Main Storage size MUST be carefully planned !

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Main Storage Concepts



Memory Allocation Facts

- Remember
 - A node is a packaged set of processors, caches (L1+L2+L3) and memory on a module
 - Remember about ... "home node", "local node" and "remote node" ?
 - Remember about ... "local memory access" and "remote memory access"
 - Remember about ... "memory affinity" ?

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Main Storage Concepts

Memory Allocation Facts

- Power4 Hypervisor allocated memory equally from all nodes
 - This leads to more "remote" memory access
- Power5 hypervisor tries to do better ...
 - Processors are assigned on the fewest nodes possible
 - Configured memory will be assigned keeping as much memory as possible on the same node
 - The HPT for the partition will be assigned on the same node
- How becomes memory affinity with dynamic processor/memory moves ?
 - The system will "do its best" ...
 - But there is no guarantee that the best configuration can be maintained
 - A full system restart (hypervisor) may be needed to return system in its optimal configuration !

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Logical Partitions on the IBM Power5

Resources Management Concepts
I/O Subsystem

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I/O Concepts

I/O Facts

- I/O allocations are done at slot level
 - A single slot can be allocated
- I/O structure must be understood for proper configuration !

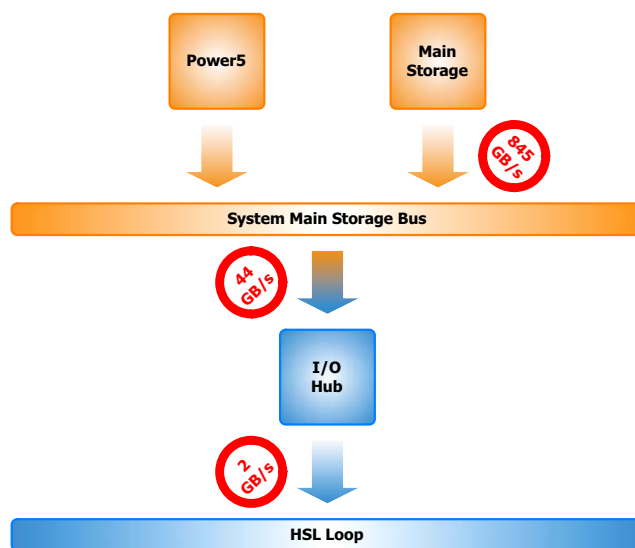


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I/O Concepts

Hierarchy of Microprocessors

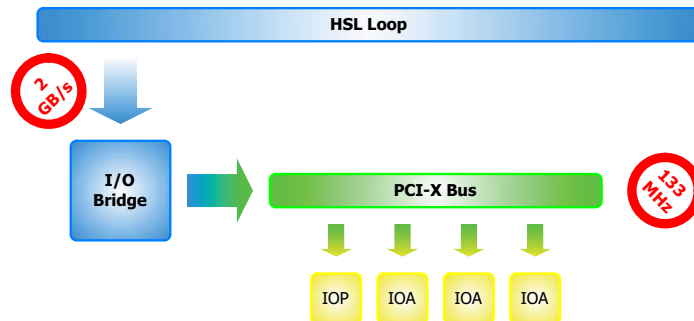


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I/O Concepts

Hierarchy of Microprocessors



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I/O Concepts

I/O Facts

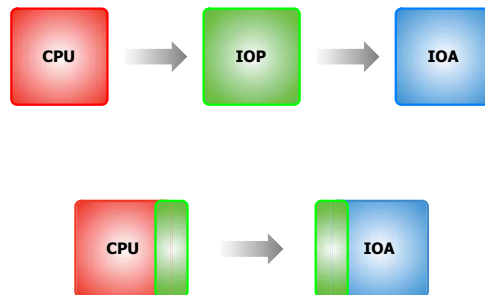
- I/O allocations are done at slot level
 - A single slot can be allocated
 - BUS/IOP/IOA requirements must be met !
- Allocate a slot as "desired"
 - If the resource is available at allocation, then grab it
 - Otherwise continue to activate anyway
- Allocate a slot as "required"
 - If the resource is available at allocation, then grab it
 - Otherwise do not continue the activation process

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I/O Concepts

IOP-Less IOAs



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I/O Concepts

I/O Facts

- Once allocated, some I/O resources need to be identified
 - Load-Source Unit resource
 - Tells the hypervisor which IOA drives the LSU
 - This is mandatory
 - Alternate-IPL resource
 - Tells the hypervisor which IOA drives the alternate IPL device
 - This is optional
 - Console resource
 - Tells the hypervisor which IOA drives the console resource
 - This can be the HMC, thru virtual I/O
 - This is mandatory
 - Operations Console resource
 - Tells the hypervisor which IOA will be used for ECS
 - This is optional
 - Alternate Console resource
 - Tells the hypervisor which IOA drives the alternate console resource
 - This is optional

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Logical Partitions on the IBM Power5

Resources Management Concepts

Virtual I/O

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Virtual I/O Concepts

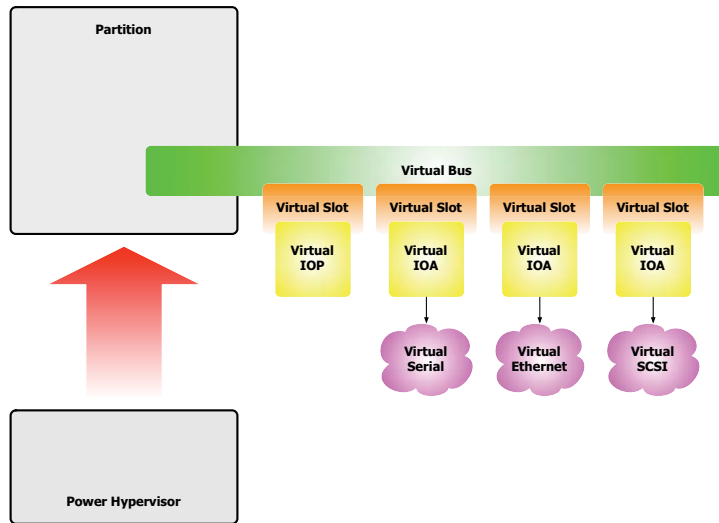
Virtual I/O Facts

- Each partition has virtual I/O slots
 - The number of slots is configurable
 - The more virtual slots you configure, the more the hypervisor will need memory !
 - Similar in concept to physical I/O adapter slot
 - Each slot can be populated with a virtual adapter instance
 - Serial, Network (Ethernet) or SCSI (Server or Client)
- Adapters are defined into partition configuration profile
 - For each slot, the configuration profile contains adapter type and parameters
 - Adapters are "created" by the hypervisor when the partition is activated

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Virtual I/O Concepts



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Virtual I/O Concepts

Virtual I/O Facts

- What is dynamic
 - As for physical I/O adapters, virtual I/O adapters can be dynamically added, changed or removed
 - Unlike physical I/O slots, virtual I/O slots cannot be moved from one partition to another
- What is not dynamic
 - Changing the number of slots requires a partition deactivation and reactivation



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Virtual I/O Concepts

Virtual Serial

- Virtual serial adapter provides point-to-point connection between
 - The partition and the HMC
 - The partition and another partition
- Purpose
 - Virtual console
 - Virtual terminal
- Parameters
 - Slot number
 - Adapter type : server or client
 - Connection information : who can connect ...
 - The HMC
 - Any remote partition
 - Selected remote partition



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Virtual I/O Concepts

Virtual Ethernet

- Virtual ethernet adapter provides connections between the partition and virtual networks
- Purpose
 - Provides high-speed connections between partitions
 - 1 Gbps ethernet
 - Provides secure connections between partitions
 - A virtual network cannot be "tapped" or "sniffed"
- Parameters
 - Slot number
 - Network number : up to 4096 virtual networks !
- Who can participate to a Virtual LAN ?
 - Any i5/OS partition
 - Any Linux partition
 - Any AIX 5L v5.3 partition

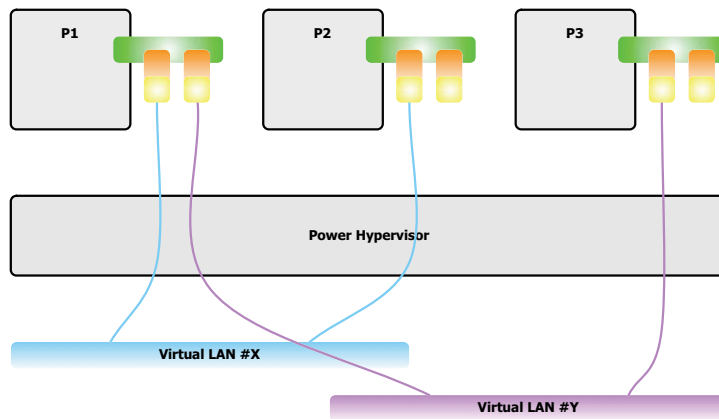


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Virtual I/O Concepts

Virtual Ethernet



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Virtual I/O Concepts

Virtual SCSI

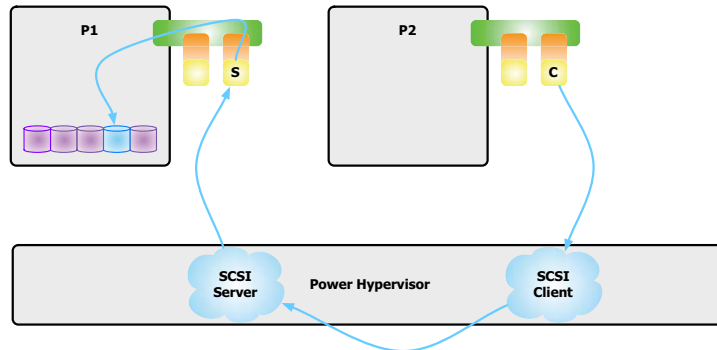
- Virtual SCSI adapter provides SCSI storage services connection between partitions
- Purpose
 - Storage virtualization
- Parameters
 - Slot number
 - Adapter type : server or client
 - Connection information for the server : who can connect ...
 - Any remote partition
 - Selected remote partition
 - Connection information for the client : where to connect ...
 - Which partition
 - Which slot
- Who can be SCSI server ?
 - Any i5/OS partition
- Who can be SCSI client
 - Any Linux partition
 - Any AIX 5L v5.3 partition

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Virtual I/O Concepts

Virtual SCSI



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Virtual I/O Concepts

Virtual OptiConnect

- What is OptiConnect ?
 - Stands for OPTImized CONNECTIon
 - Provides very high performance communications between systems
 - Works at HSL bus speed : 2 GB/s (20 Gbps) !
 - Also known as "HSL OptiConnect"
 - Requires hardware planning
 - Multiple CECs within the same HSL loop
 - Requires additional software
 - 5722SS1, Option XX, OptiConnect
- What is "virtual OptiConnect"
 - Virtualization of HSL OptiConnect facility between logical partitions
 - Requires additional software
 - 5722SS1, Option XX, OptiConnect
- OptiConnect and Virtual OptiConnect usages :
 - DDM
 - Clusters
 - Switchable IASPs

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Logical Partitions on the IBM Power5

Dynamic LPAR !

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Dynamic LPAR

What is called "Dynamic Logical Partitioning"

- The ability to add, move or remove resources without system disruption



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Dynamic LPAR

What can be changed dynamically !

- Processors
 - Within established minimum and maximum
 - Configuration maintained in the partition profile
 - Changes to minimum or maximum requires partition deactivation an reactivation
 - Granularity of moves
 - Dedicated processors : 1 processor
 - Shared processors : 0.01 processing unit (PU) per virtual processor !
 - Virtual processors : 1 virtual processor
- A processor move implies :
 - Deallocation of processor or processor time
 - Clear caches and registers
 - Allocation of processor or processor time
- Nearly immediate !

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Dynamic LPAR

What can be changed dynamically !

- Memory
 - Within established minimum and maximum
 - Configuration maintained in the partition profile
 - Changes to minimum or maximum requires partition deactivation an reactivation
 - Granularity of moves
 - The size of a Logical Memory Block (LMB) : 16 Megabytes
 - In the future, those Moves
- A memory move implies :
 - Deallocation of memory
 - From the *BASE pool
 - Memory pages must be written to disk before deallocation
 - Clear of memory
 - Allocation of memory to the new partition
 - To the *BASE pool
- Time required !
 - Up to 5 minutes !

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Dynamic LPAR

What can be changed dynamically !

- I/O Slots
 - Only "desired" slots can be moved !
 - Remember i5/OS still needs IOPs
 - An IOP without IOA is functional but not very useful
 - An IOA without IOP is nothing
 - BUS/IOP/IOA requirements must be kept !
 - Remember "IOP-less" IOAs
 - Ethernet adapters
 - Cryptographic processors
 - ... more in the future : the direction is to get away from the IOP !



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Dynamic LPAR

What can be changed dynamically !

- An I/O slot move implies :
 - Deactivation of the dependent device
 - VARY OFF !
 - Deallocation of the slot
 - IOP/IOA gets first the "inoperative", then "not detected" status
 - Reset of the IOP/IOA cache, memory, registers
 - Allocation of the slot to the destination partition
 - IOP IPL : download of its microcode, activation of the IOP
 - IOA initialization : download of its microcode, activation of the IOA
 - IOP/IOA gets the "operational" status ... some "failed" status may temporarily appears !
 - Activation of the dependent devices
 - VARY ON !
- Time required !
 - Up to 10 minutes !

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Dynamic LPAR

What can be changed dynamically !

- Virtual I/O Slots
 - Can only be filled or emptied
 - Cannot be moved from one partition to another
 - Only "desired" slots can be moved !
 - Configuration maintained in the partition profile
 - Changes to the desired/required status of a slot requires partition deactivation and reactivation
 - Changes to the number of virtual slots requires partition deactivation and reactivation
 - Granularity of moves
 - One slot



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Logical Partitions on the IBM Power5

LPAR-Capable Server Models

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IBM eServer i5/520

Model i5/520 - 1000 CPW

- Processor : 1-Way Power5, 1.50GHz, L1+L2 Cache
- Processing units available : 0.43
- Maximum partitions : 4

Model i5/520 - 2400 CPW

- Processor : 1-Way Power5, 1.50GHz, L1+L2 Cache
- Processing units available : 1.00
- Maximum partitions : 10

Model i5/520 - 3300 CPW

- Processor : 1-Way Power5, 1.65GHz, L1+L2+L3 Cache
- Processing units available : 1.00
- Maximum partitions : 10

Model i5/520 - 6000 CPW

- Processor : 2-Ways Power5, 1.65GHz, L1+L2+L3 Cache
- Processing units available : 2.00
- Maximum partitions : 20



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IBM eServer i5/550

Model i5/550 - CoD from 3300 to 12000 CPW

- Minimal Configuration
 - Processor : 2-Ways Power5, 1.65GHz, L1+L2+L3 Cache
 - ! one i5/OS license !
 - Processing units available : 2.0
 - Maximum partitions : 20
- Maximal Configuration
 - Processor : 4-Ways Power5, 1.65GHz, L1+L2+L3 Cache
 - Processing units available : 4.0
 - Maximum partitions : 40



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IBM eServer i5/570

Model i5/570 - CoD from 3300 to 44700 CPW

- Minimal Configuration
 - Processor : 1-Ways Power5, 1.65GHz, L1+L2+L3 Cache
 - Processing units available : 1.0
 - Maximum partitions : 10
- Maximal Configuration
 - Processor : 16-Ways Power5, 1.65GHz, L1+L2+L3 Cache
 - Processing units available : 16.0
 - Maximum partitions : 160



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IBM eServer i5/595

Model i5/595 - CoD from 24500 to 165000 CPW

- Minimal Configuration
 - Processor : 8-Ways Power5, 1.65GHz, L1+L2+L3 Cache
 - Processing units available : 8.0
 - Maximum partitions : 80
- Maximal Configuration
 - Processor : 64-Ways Power5, 1.65GHz, L1+L2+L3 Cache
 - Processing units available : 64.0
 - Maximum partitions : 254



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Logical Partitions on the IBM Power5

Planning

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Planning

Think ...

- Understand eServer i5 capabilities
 - Review previous chapters ...
 - System Builder !
- Understand Operating System requirements
 - i5/OS
 - Linux
 - AIX



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Planning

Requirements for i5/OS

- Are mandatory :
 - At least 0.10 processing unit
 - Commonly represents +/- 330 CPW
 - At least 256 MB of main storage
 - Just enough to load and start SLIC & i5/OS ... plan a few bit more to open a session !
 - One direct-attach (internal) disk unit (LSU)
 - Minimum size : 8.58 GB
 - One console
 - Can be a HMC thru virtual serial port
 - One alternate-IPL device
 - DVD or tape unit ... can be switchable or dedicated
 - One backup device
 - A tape unit ... can be switchable or dedicated
- Operating system :
 - i5/OS V5R3M0
 - DO NOT USE SLIC RSA !



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Planning

Requirements for i5/OS

- Plan also for :
 - LAN ports
 - WAN ports
 - Alternate console
 - SCSI ports
 - FC ports
 - VIRTUAL ports !
- Plan also for :
 - IXS/IXA
 - More storage needed ?
 - Same ASP, other ASP or IASP ?
 - Other partitions : Linux or AIX thru virtual I/O
 - More storage needed ?
 - Same ASP, other ASP or IASP ?



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Planning

About Linux and AIX ...

- CPW
 - Commercial Processing Workload
 - Representative for a commercial workload environment
 - Workload composed by CPU and I/O operations
- rPerf
 - Relative Performance
 - Derived from multiple "standard" benchmarks
 - TPC : Technical Publication Center
 - SPEC : System Performance Evaluation Center
 - Other IBM internal workloads
 - Does not simulate I/O operations



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Planning

About Linux and AIX ...

eServer model	Number of CPUs	GHz	rPerf	CPW
520	2	1.65	9.86	6000
550	2	1.65	9.86	6200
	4	1.65	19.66	12000
570	2	1.65	9.86	6350
	4	1.65	19.66	12000
	8	1.65	37.22	23500
	12	1.65	53.43	33400
	16	1.65	68.40	44700

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Planning

Requirements for Linux/AIX 5L v5.3

- Are mandatory :
 - At least 0.10 processing unit
 - Some memory ... depending on the applications you'll have to run !
 - One disk unit ...
 - Physical or ... virtual !
 - One console
 - Can be a HMC thru virtual serial port
 - One alternate boot device
 - CD or DVD ... physical or virtual !
 - One backup device
 - A tape unit ... can be switchable, dedicated or virtual !
- Operating system :
 - A PowerPC compatible, 64-bits kernel Linux edition :
 - Red Hat Enterprise Linux AS for POWER v4
 - Novell Suse Linux Enterprise Server for POWER v9
 - AIX 5L v5.3



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Planning

Requirements for Linux/AIX 5L v5.3

- Plan also for :
 - LAN ports
 - WAN ports
 - SCSI ports
 - FC ports
 - USB ports
 - IDE ports
 - VIRTUAL ports !



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Planning

Requirements for AIX 5L v5.2

- REMEMBER : this version of AIX does NOT SUPPORT "virtual things" !
 - Virtual processors cannot be used ...
 - Memory cannot be dynamically assigned ...
 - No virtual networks, nor virtual storage can be used
 - Virtual console can be used !
- Are mandatory :
 - At least 1 dedicated processor
 - Some memory ... depending on the applications you'll have to run !
 - One disk unit
 - One console
 - Can be a HMC thru virtual serial port
 - One alternate boot device
 - CD or DVD
 - One backup device
 - A tape unit ... can be switchable or dedicated



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Planning

Requirements for AIX 5L v5.2

- REMEMBER : this version of AIX does NOT SUPPORT virtual "things" !
 - Virtual processors cannot be used ...
 - Memory cannot be dynamically assigned ...
 - No virtual networks, nor virtual storage can be used
 - Virtual console can be used !
- Plan also for :
 - LAN ports
 - WAN ports
 - SCSI ports
 - FC ports
 - USB ports
 - IDE ports



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Planning

Know restrictions

- At this time, Linux/AIX partitions does not handle any IOA with an IOP placed in an upstream position on the same bus !
 - This means that you cannot share a bus between a Linux/AIX partition and an i5/OS partition
 - This means that you cannot switch a device between a Linux/AIX partition and an i5/OS partition
 - You can switch a device between i5/OS partitions
 - You can switch a device between AIX/Linux partitions



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Planning

Know restrictions

- Disk formats ...
 - i5/OS uses 540 bytes/sector format
 - Sector data + CRC + TAG bits !!!
 - Following units comes with i5/OS format :
 - #4319 : 35.16 GB
 - #4326 : 35.16 GB
 - #4327 : 70.56 GB
 - #4328 : 140.12 GB
 - AIX uses
 - 522 bytes/sector format for RAID-5 protected units
 - 512 bytes/sector format for all others
 - AIX won't recognize disks with 540 bytes/sector format
 - Those units will need a low-level formatting !



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Planning

... Think ...

- Make a capacity planning
 - Determine your needs
- Inventory existing system
 - Determine which component may/will be reused
- Build a new system
- Validate the new system
 - Use LPAR Validator Tool
 - Call IBM or a Business Partner
- Consider to upgrade existing system to supported OS version/release
 - Consider EVERY partition !
 - Upgrades to i5/OS V5R3 ...
 - V5R3 does NOT support models 150, 6xx, Sxx
 - V5R3 is the last release to support models 170, 250, 7xx
 - V5R3 is the last release to support SPD hardware
 - V5R1 planned end of support is September 2005



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Planning

... Think ...

- Order your new system
 - ...
- Upgrade existing system(s) to supported OS version/release
 - Consider EVERY partition !
- Write procedures for installation/upgrade
 - Disk moves or unload/reload ?!
 - Side-by-side !?



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Planning

... Then act !

- Backup existing system
 - Twice !
- Perform physical installation
 - Install every hardware piece at its planned position
 - Install and configure HMC
 - Setup wizard !
 - Power on the new system to "Hypervisor Stand-by" mode
 - Create LPAR definitions
- Start or reload
 - If disk were moved ... just start !
 - Else ... just reload !
- Validate your new system ... and ... enjoy it !



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Logical Partitions on the IBM Power5

Hardware Management Console

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Hardware Management Console

What is it ?

- Hardware dedicated to console functions
- Used to create and maintain a multiple-partitioned environment
 - Startup & shutdown partitions
 - Performing resource movements
- Displaying a virtual console
- Displaying a virtual operator panel
- Detecting, reporting and sorting change in hardware conditions
- Gathering and reporting system error events
- Activating CoD resources
- Supports i5/OS, Linux and AIX

Is it mandatory ?

- YES, for LPARed systems
- YES, for CoD systems
- Not required to operate partitions



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Hardware Management Console

Appliance based on xSeries technology

- Minimum configuration includes
 - Intel Pentium-4 processor
 - RAM : 1 GB
 - HDD : 40 GB
 - LAN : 2x 1000/100/10 Mbps ethernet
 - DVD-RAM : 1x
 - FDD : 1x
- "Cleaned" Linux with HMC application (GUI)

Connects to i5 and p5 servers

- Using dedicated HMC ports
- Up to 64 partitions on 16 servers

Packaging

- Desktop version : 7310-C03
- Rack version : 7310-CR3



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Logical Partitions on the IBM Power5

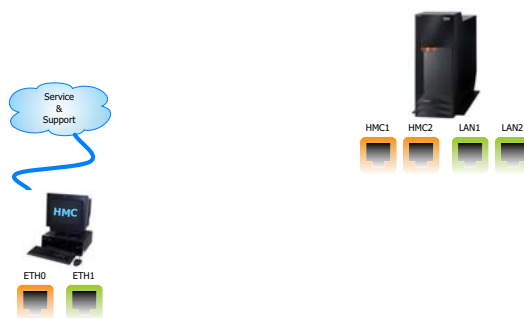
Hardware Management Console

Connecting HMC

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Hardware Management Console



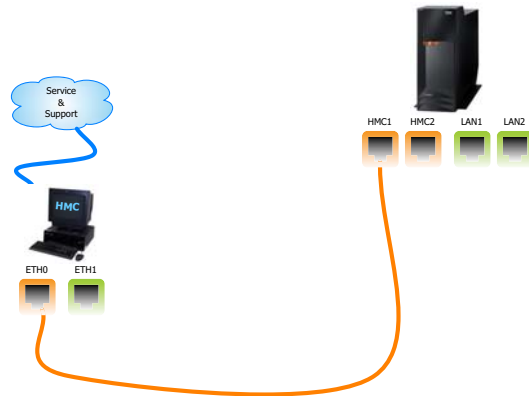
Ethernet Ports

- Private LAN
- Open LAN
- Auto-MDIX ports
 - Medium Dependent Interface Crossover

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Hardware Management Console

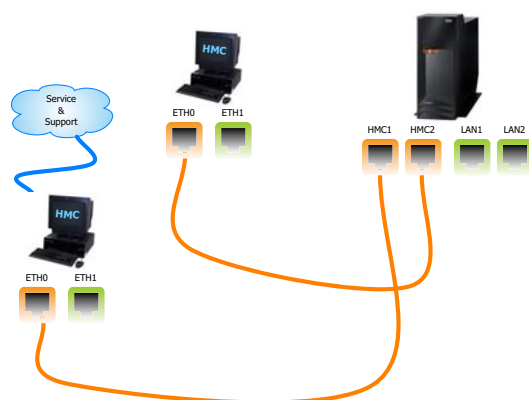


Simple HMC connection

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Hardware Management Console



Cloning HMC configuration

- System profiles and partition profiles are stored in SP's NVRAM
- When SP detects that a redundant HMC is connected :
 - SP copies NVRAM configuration to the new HMC

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Hardware Management Console

Redundant HMC configuration considerations

- Both HMCs can be used concurrently
 - Both are fully active and accessible at all times
- Both enabling you to perform management tasks at any time
 - SP provides a lock-mechanism to allow operations in a parallel environment
 - When one HMC issues an order, the other HMC is temporarily "locked-out"
- There is no "primary" or "backup" designation

But ...

- Other definitions are locally stored and must be set up separately on each HMC
 - User authorizations
 - Network settings
 - Service Settings
- HMC provides Service Focal Point and Service Agents functions
 - Enable service on only one HMC to avoid duplicate service calls
- Perform software maintenance separately on each HMC
 - Ensure HMC availability when updating code level
 - Meanwhile, update other HMC code to same level as soon as possible
- Consider save/restore critical data to duplicate configuration information

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Hardware Management Console

Private indirect networking

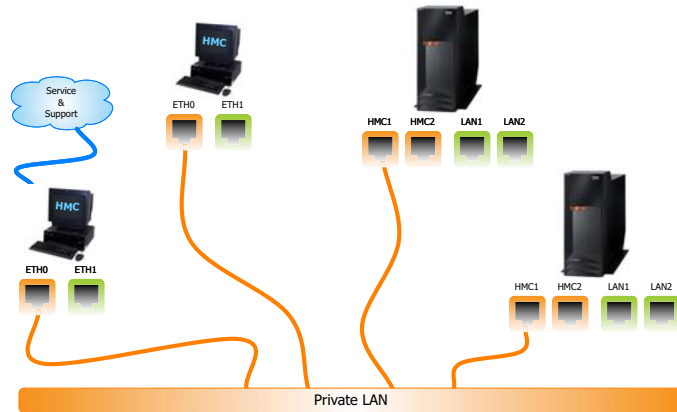


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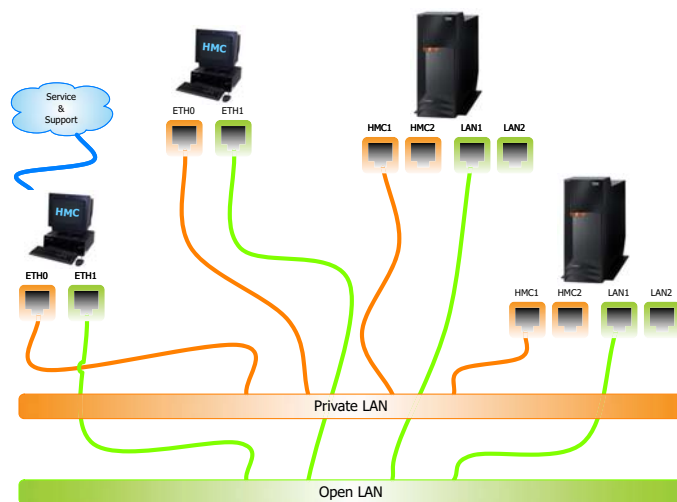
Private indirect networking



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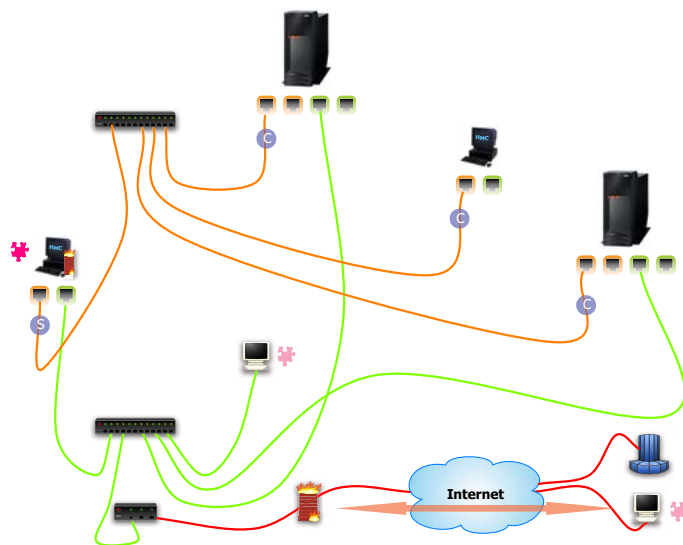
Private and open networking



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Working with HMC in open networks



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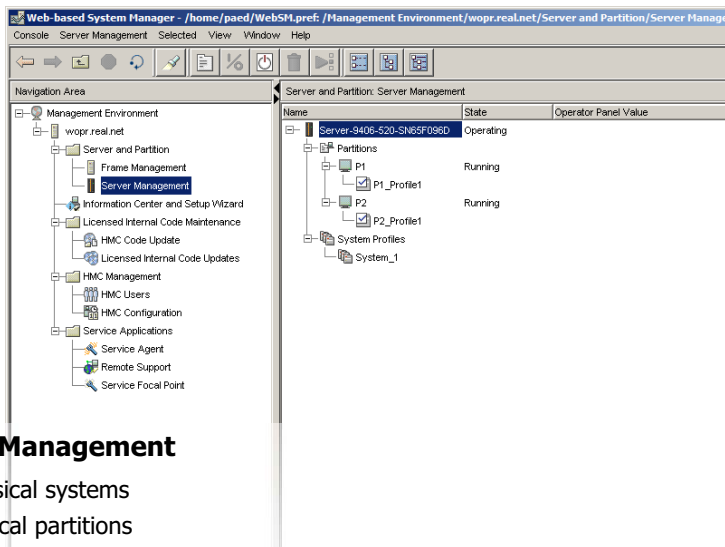
Logical Partitions on the IBM Power5

Hardware Management Console
HMC Functionalities

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Hardware Management Console



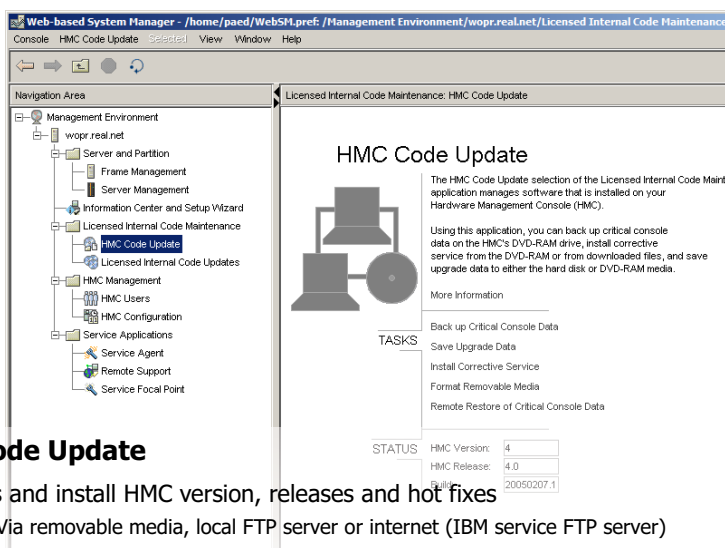
Server Management

- Physical systems
- Logical partitions
 - Partition profiles
- System profiles

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Hardware Management Console

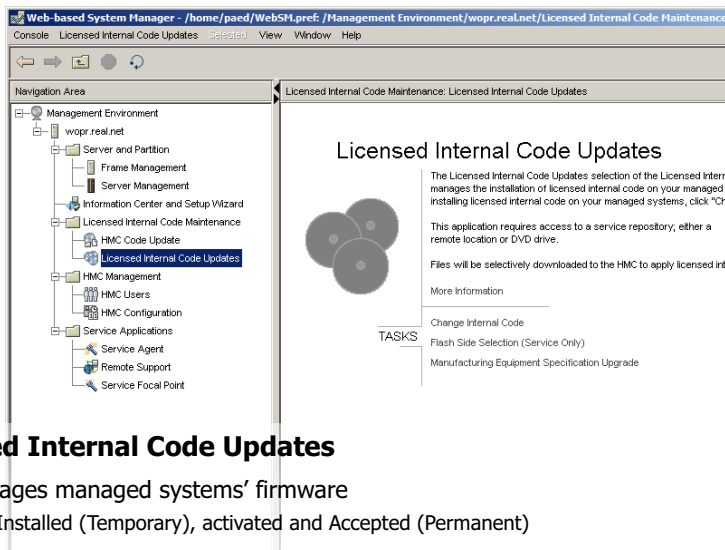


HMC Code Update

- Gets and install HMC version, releases and hot fixes
 - Via removable media, local FTP server or internet (IBM service FTP server)
- Backups
 - Critical console data vs. upgrade data

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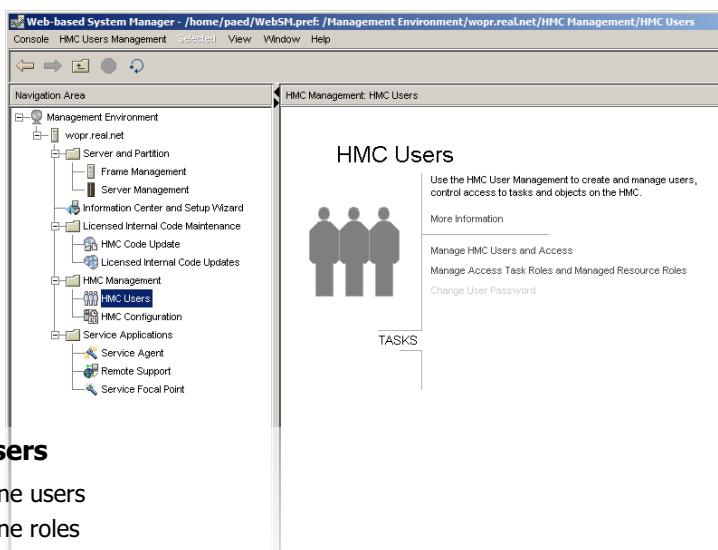
Licensed Internal Code Updates

- Manages managed systems' firmware
 - Installed (Temporary), activated and Accepted (Permanent)

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Hardware Management Console



HMC Users

- Define users
- Define roles

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Hardware Management Console

HMC Configuration

- All HMC parameters
 - Date, time, network, ...

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Hardware Management Console

Service Agent Configuration

- Notify problems
 - Kind of problems : "all" or "home-call"
 - To the user : via SMTP
 - To the service : via PSTN, VPN or another HMC

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Hardware Management Console

Remote Support

- Remote support includes setting up connectivity between the system and its service provider. The customer information is used to identify the system and its administrators to the service provider.
- These tasks also set up connectivity between the service provider and the system. Active remote support requests and remote connections may be viewed and managed.

TASKS

- More Information
- Customize Customer Information
- Customize Outbound Connectivity
- Customize Inbound Connectivity
- Manage Remote Support Requests
- Manage Remote Connections
- Customize Service Settings

Remote Support

- Connectivity : outbound and inbound
- Via SMTP or VPN

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Hardware Management Console

Service Focal Point

The Service Focal Point lets you view or work on errors logged against a system. In addition, you can invoke service functions on systems and parts not associated with a particular problem.

TASKS

- More Information
- Repair Serviceable Event
- Manage Serviceable Events
- Install/Add/Remove Hardware
- Exchange Parts
- Service Utilities
- Collect VPD Information

Service Focal Point

- Manage reported events and errors
- Concurrent maintenance
- Service utilities
 - Access to control panel service functions (e.g. Function 21 - Request DST)

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One **i500** thing ...

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Logical Partitions on the IBM Power5

Virtual Partition Manager

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Virtual Partition Manager

What is it ?

- VPM introduces a way to create and manage Linux partitions without the use of a HMC
- VPM allows small and medium configuration to add simple Linux workloads

Available on May 27th, 2005 (tomorrow) !



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Virtual Partition Manager

Planning for VPM ...

- An IPL is required to apply enablement PTF
 - MF34753, MF34956, MF34962
 - Those PTF should be permanently applied before SAVSYS
- Ensure that you have the last firmware level
 - Minimum level is SF230_113, via PTF MH00265
- Maximum 4 Linux partitions
- I/O for all Linux partitions must be managed by a single i5/OS instance
 - Only a single i5/OS instance can exist
- Linux must use virtual I/O to access disk, tape, DVD, ethernet
 - Direct-attach I/O cannot be installed in any Linux partition
- Maximum 4 virtual ethernet connections per Linux partition
- Linux partition creation and maintenance can only be performed thru DST/SST
 - iSeries Navigator does not support VPM
 - LPAR Toolkit does not support VPM
 - Likewise, there is no API nor SSH enablement capabilities

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Virtual Partition Manager

Planning for VPM ...

- Automatic processor balancing between i5/OS and Linux partition is supported
 - Thru uncapped shared processor
- Dynamic movements of resources (processor, memory and I/O) is not supported
 - Partition must be restarted for the changes to take effects
- Capacity on Demand (CoD) is not enabled thru DST/SST
 - Only permanently activated processors can be allocated
- Partition configuration cannot be saved
 - Hardcopy prints must be kept to re-create partitions
- Migration to HMC is not available
 - If a HMC is deployed in a future stage, Linux partitions must be re-created
 - Data stored thru virtual I/O on i5/OS is preserved
- Configurations screens are available only in english
 - No translation

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Virtual Partition Manager

Virtual Partition Manager vs. Hardware Management Console

	VPM	HMC
Operating systems supported	i5/OS and Linux	i5/OS, Linux and AIX
Maximum number of partitions	5 (1x i5/OS, 4x Linux)	254
Uncapped partition support	Yes	Yes
Dynamic resource movement	No	Yes
I/O support for Linux	Virtual	Virtual and Direct
Maximum number of ethernet connections	4	4096
Maximum virtual disk per partition	64 TB	64 TB

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Questions & Answers



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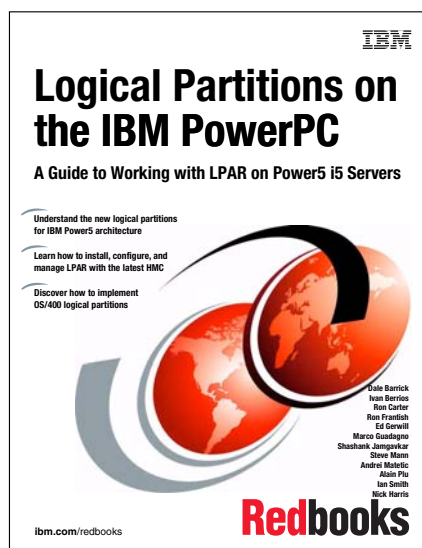
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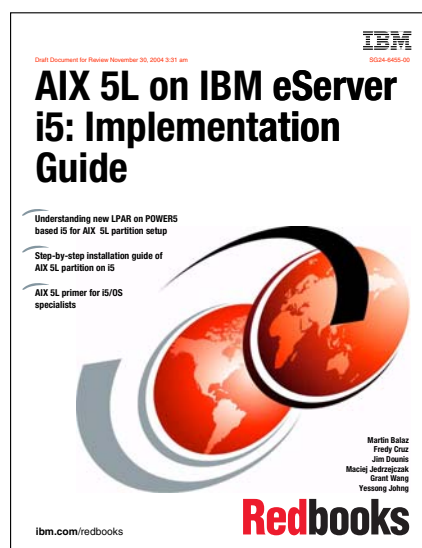
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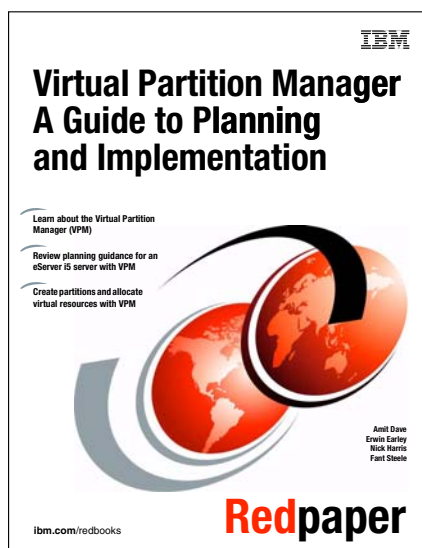
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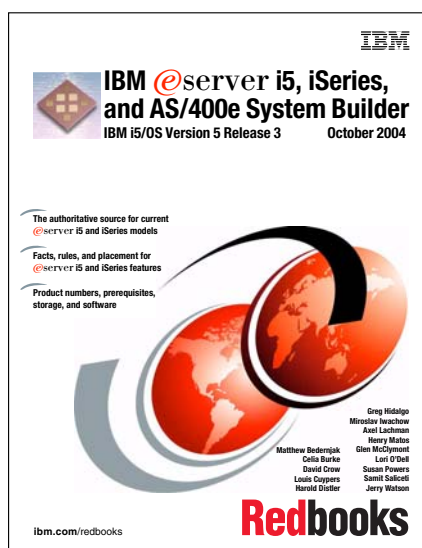
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