



Unit 1

Introduction to IBM Power systems, AIX and System Administration



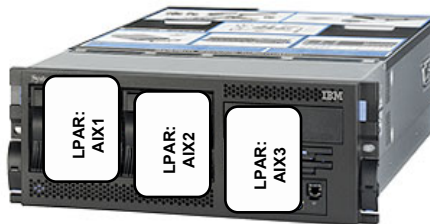
Unit objectives

After completing this unit, you should be able to:

- Define terminology and concepts of IBM Power system servers, virtualization, HMC, and AIX
- Understand a typical set-up of a Power environment
- Describe the roles of the system administrator
- Obtain root access with the su command

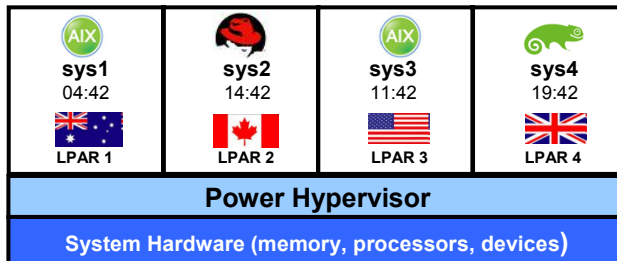
AIX overview

- IBM's proprietary operating system based on UNIX System V
 - Also has BSD compatible commands and programming interface extensions
- Advanced Interactive Executive (AIX) runs on proprietary hardware (H/W) called IBM Power Systems
 - Sixth generation of Power, based on Reduced Instruction Set Computer (RISC) technology
- Most Power Systems today run many instances of AIX in partitions known as Logical Partitions (LPAR)
 - This is H/W partitioning managed by the system firmware, *Power Hypervisor*



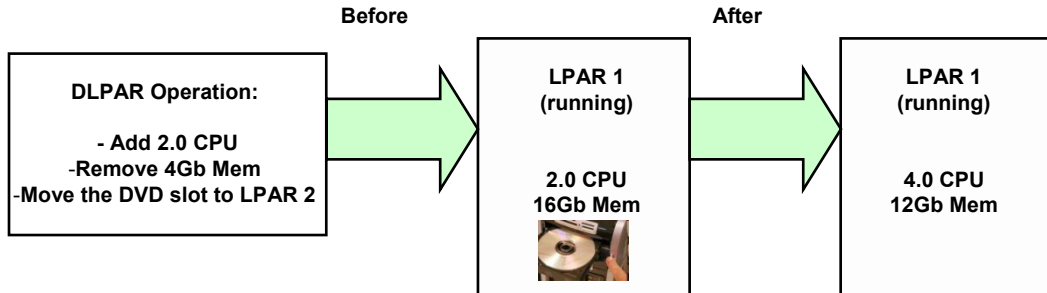
Logical partition (LPAR) overview

- An LPAR is the allocation of system resources to create logically separate systems within the same physical footprint.
- The resource allocation and isolation for a logical partition is implemented in firmware called Power Hypervisor.
 - Provides configuration flexibility
- Each partition has its own:
 - Operating system
 - Resources: processors, memory, devices (defined in a profile)
 - Resources can be changed dynamically using Dynamic LPAR (DLPAR)
- Partitions can consist of physical (real) or virtual devices
 - or a combination of both



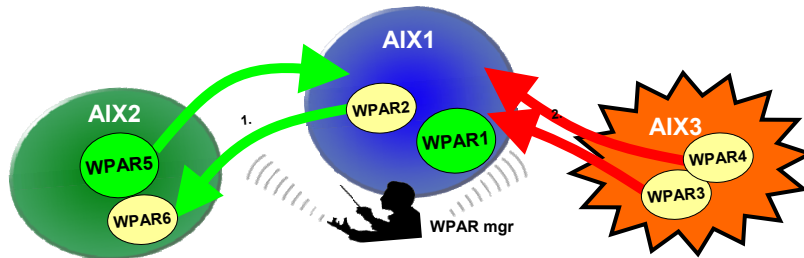
Dynamic logical partitioning (DLPAR)

- DLPAR is the ability to add, remove, and move resources without reactivation of a partition
 - Processor, memory, and I/O allocation changes
- Processors and memory quantities are bound by the minimum and maximum profile settings
- Applications may be DLPAR-aware



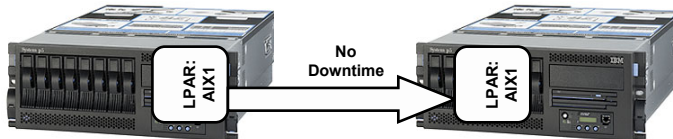
Workload partitions (WPAR)

- Software (S/W) partitioning is managed by AIX.
 - Available from AIX 6.1
- Many AIX OS images can reside within a master global AIX image.
- Live Application Mobility allows WPAR relocation to another box or LPAR.
- WPARs provide automatic workload balancing.
- WPAR technology is not H/W dependent.
 - Support is available on Power 4, 5, and 6.



Live partition mobility

- Live partition mobility allows running AIX partitions to be migrated from one physical server to another without downtime.
 - For Power 6 only, LPARs must not contain any physical devices.



- Partition Mobility provides systems management flexibility and is designed to improve system availability.
 - Can help avoid planned outages for hardware or firmware maintenance
 - Can help avoid unplanned downtime
 - If a server indicates a potential failure, you can move its partitions to another server before the failure occurs.
 - Enables optimized resource use by moving workloads from server to server

Evolution of AIX

**AIX Version 6.1 Technology Level 2
(GA 14, November, 2008)**

**IBM Support for new IBM UNIX® Systems
New Virtualization Support**

- Faster Live Application Mobility
 - (with WPAR Manager V1.2)
 - Inactive Application Mobility
 - Independent WPAR network routes
 - WPAR named interface support
 - IPv6 WPAR network support
 - MPIO support for physical and virtual paths
 - PowerVM™ n Port ID virtualization (NPIV)
 - PowerVM™ Shared Memory Partitioning
- OS Integration and Management**
- IPv6 RFC currency
 - BIND 9.4.1 support
 - IPv4 tunneling in IPv6 networks
 - nmon integrated into topas
 - topasrec performance data recording
 - topas monitoring support for PowerVM VIOS
 - mpstat and sar support
 - WPAR support
 - Concurrent kernel update enhancements
 - LVM support for SAN mirror pools
 - Systems Director Console enhancements

"From Strength to Strength"

AIX 6.1 TL 2	AIX Enterprise Edition	2008		
	AIX 6.1	2007	POWER6	
	AIX 5.3	2004	POWER 5	
	AIX 5.2	2002		
	AIX 5.1	2001	POWER 4	
		1998	POWER 3	
	AIX 4.3	1997	RS64	
	AIX 4.2	1996	P2SC	
	AIX 4.1	1994		
	AIX 3.2.5	1993	POWER 2	PowerPC '601'
		1992	RSC	
		1990	POWER	
	AIX 3.0	1989		
AIX 2.0	AIX 1.0	1986	the RT	
		1974	'the 801'	
		1960's	IBM develops 1st Hypervisor	

Overview of the POWER6 servers

IBM Power Systems



Power 520

- Entry/Low end
- Deskside or Rack (4U)
- 1,2, or 4 CPUs
- 1GB-64GB memory
- Max. Storage, Internal + Expansion I/O 132TB



Power 550

- Mid-range
- Deskside or Rack (4U)
- 2, 4, 6 or 8 CPUs
- 1GB-256GB memory
- Max. Storage, Internal + Expansion I/O 249TB



Power 560

- Mid-range
- Rack (4U) building block (to 8U)
- 4, 8 or 16 CPUs
- 8GB-384GB memory
- Max. Storage, Internal + Expansion I/O 599TB



Power 570

- Mid-range
- Rack (4U) building block (to 16U)
- 2, 4, 8, 16 or 32 CPUs
- 1GB-768GB memory
- Max. Storage, Internal + Expansion I/O 604TB



Power 575

- High Performance Computing cluster
- For highly-parallel, compute-intensive HPC workloads (up to 64 nodes per cluster)
- 24" System Frame, water cooled
- 32 CPUs per nodes
- 32GB-256GB memory per node
- Max Internal storage per node 292GB

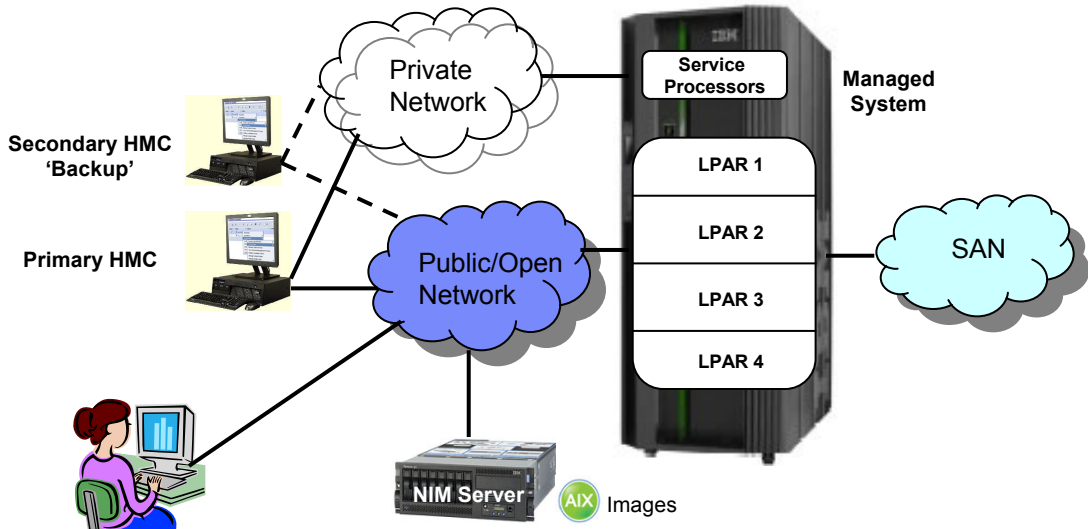


Power 595

- High-end
- 42U System Frame
- 8 to 64 CPUs
- 16GB-4TB memory
- Max. Storage, Internal + Expansion I/O 999TB

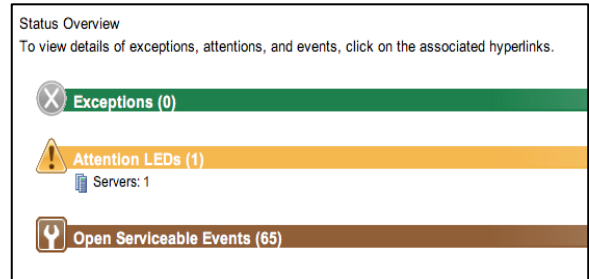
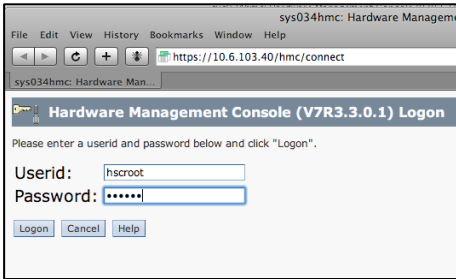
Typical Power / AIX system layout

- LPAR Configuration and Control is completed through the Hardware Management Console (HMC).
- The HMC connects to the Service Processors and the LPARs.
 - Best practice: Use a private network between the HMC and Service Processors.



The HMC (1 of 2)

- Intel based server (desktop or rack mount) running a web based application on a customized version of Linux
- Access is through https (GUI) and SSH (Command line)



- Collects status health information from the managed systems
- Mandatory on Power 570s and above
 - Power 550's and below can use Integrated Virtualization Manager (IVM)
- Can be configured to call home to IBM

The HMC (2 of 2)

IBM Power Systems

sys034hmc: Hardware Management Console Workpace (V7R3.3.0.1) - Mozilla Firefox

https://10.6.103.40/hmc/connects/mainUIFrameSet.jsp

Hardware Management Console

hscroot | Help | Logoff

Systems Management Servers > **sys034**

Select	Name	ID	Status	Processing Units	Memory (GB)	Active Profile	Environment	Reference Code
<input type="checkbox"/>	sys034_partition1	1	Running	1	0.625	dedicated_he	AIX or Linux	
<input type="checkbox"/>	sys034_partition2	2	Running	1	0.625	dedicated_he	AIX or Linux	
<input type="checkbox"/>	sys034_partition3	3	Running	1	0.625	dedicated_he	AIX or Linux	
<input type="checkbox"/>	sys034_partition4	4	Running	1	0.625	dedicated_he	AIX or Linux	

Total: 6 Entered: 6 Selected: 0

Tasks: sys034

- Properties
- Operations
- Configuration
- Connections
- Hardware Information
- Updates
- Serviceability
- Capacity On Demand (CoD)

Status: Attentions and Events

Managed Systems

Navigation area

LPARs running AIX

Task Pad

Proc & MEM resources

LPAR virtualization overview (1 of 2)

- An AIX client partition can :
 - Be virtual, have no real devices
 - Use fractions of CPUs (Micro-Partitioning)
- Virtualizing LPARs has many advantages
 - Flexibility in allocating resources
 - More efficient use of system resources through sharing
 - Consolidation (H/W, floor space, merge production and test environments)
 - Relocating partitions using Live Partition Mobility
- A key component of virtualization is the Virtual I/O Server (VIOS)
 - Implemented as special customized version of AIX
 - It is **not** AIX. It is PowerVM software!
 - Requires at minimum a *PowerVM standard* license
 - Included on some high-end systems

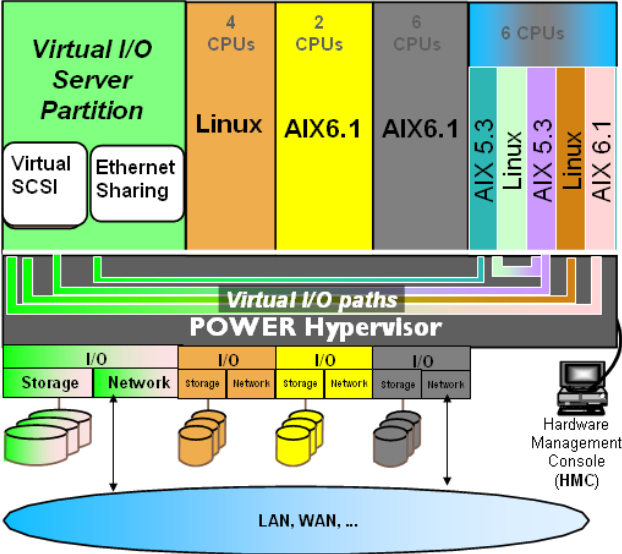
LPAR virtualization overview (2 of 2)

- The two key functions of virtualization are:
 - Virtual Ethernet is a standard feature of POWER5 and POWER6.
 - AIX can have up to 256 virtual adapters per LPAR.
 - Does not require a VIOS, unless a bridged connection to the outside world is required
 - Virtual SCSI is way of providing virtual disks to clients.
 - The backend storage can be Internal disk (SCSI/SAS) or SAN storage.
 - This is a feature of the VIOS.

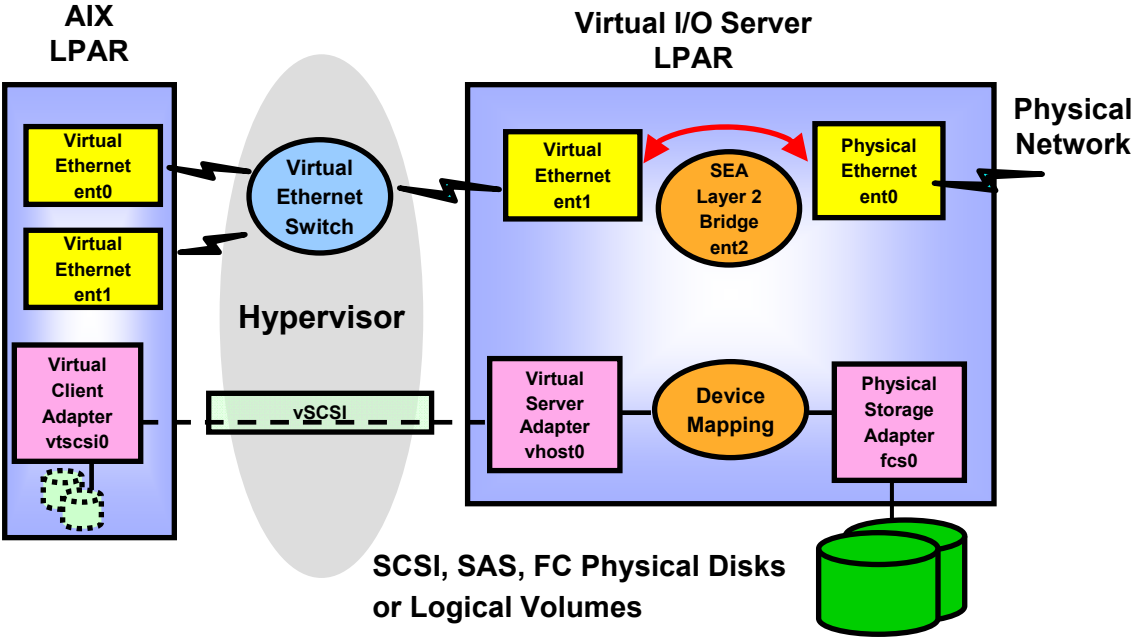
- **Note:** There are many other virtualization features which are covered in more depth in the LPAR & virtualization curriculum / roadmap.

Virtual I/O server (VIOS) overview

- The VIOS partition is allocated physical I/O slots containing real adapters.
 - These are used for the virtual adapters (SCSI or Ethernet) to share amongst the client partitions



Virtualization example



Role of the system administrator

- Pre-installation planning of:
 - Partitions
 - User accounts/groups
 - Storage allocation/paging space
 - Subsystems (printing, networks, and so forth)
 - Standard naming conventions
 - Determine system policies
 - Install and configure hardware
- Network configuration
- System Backups and disaster recovery
- Create/manage user accounts
- Define and manage subsystems
- Manage system resources (for example, disk space)
- Performance monitoring
- Capacity planning
- Application license management
- Documentation - system configuration, and keep it current!



Who can perform administration tasks?

- The **root** user
 - Exercise caution when logging in directly as **root**, especially remotely.
 - Keep the **root** password secure.
- Members of special groups such as **system**, or roles using the new AIX6 feature: RBAC
- The **su** command enables you to obtain access to the **root** user

```
$ id; pwd
uid=251(alex) gid=1(staff)
/home/alex
$ su root
root's Password:
# id; pwd
uid=0(root) gid=0(system)
/home/alex
# set |grep USER
USER=alex
```

or

```
$ id; pwd
uid=251(alex) gid=1(staff)
/home/alex
$ su - root
root's Password:
# id; pwd
uid=0(root) gid=0(system)
/
# set |grep USER
USER=root
```

Unit summary



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