ESCALA

Planning for Partitioned

System Operations

AIX

REFERENCE
86 A2 05EG 00

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Software

November 2002

BULL CEDOC
357 AVENUE PATTON
B.P.20845
49008 ANGERS CEDEX 01
FRANCE

REFERENCE
86 A2 05EG 00

Printed in France

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About This Book

This book provides information to planners, system administrators, and operators about how to plan for installing and using a partitioned server. It also discusses some issues associated with the planning and implementing of partitioning.

A discussion of permanent capacity on demand helps you understand how to order additional hardware for your system, and have this hardware available whenever you need it to supplement your server.

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Related Publications

The following publications contain related information:

- The documentation shipped with your managed system contains detailed planning, installation, and option information.
- The managed system's user's guide contains user information for the managed system that might be partitioned.
- The *AIX 5L Version 5.2 AIX Installation in a Partitioned Environment* guide, order number 86 A2 08EG, contains information about installing, managing, and maintaining the AIX 5L operating system in a partitioned environment.
- The *Site Preparation for Rack Systems*, order number 86 A1 30PX, contains information to help you plan the installation of your machine.
- The *Hardware Management Console Installation and Operations Guide*, order number 86 A1 83EF, contains information to help you plan the installation of your machine.

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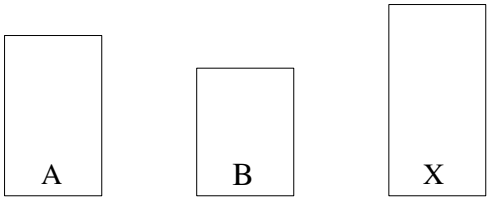
Chapter 1. Partitioning Overview

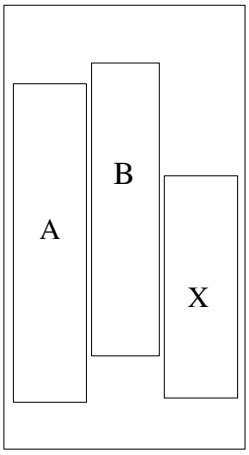
This chapter provides an overview of partitioning and some of the features that allow you to change partitions dynamically. Your planning needs will vary depending on your individual requirements. As your requirements change, careful planning helps you to be ready to change your system configuration.

Operating in a Partitioned Environment

Before partitioning, each system operated independently. The following figure represents three systems that could support three separate tasks and three sets of users.



Partitioning enables system administrators to configure a single computer into several independent systems. Each of these independent systems, also referred to as *partitions*, can run applications in its own independent environment. This independent environment contains its own operating system, its own set of system processors, its own memory, and its own I/O adapters and devices. Even though it runs on the same physical hardware with other operating systems, after it is configured, a partition is booted and used as an independent system. The following figure represents a server that is divided into three partitions.

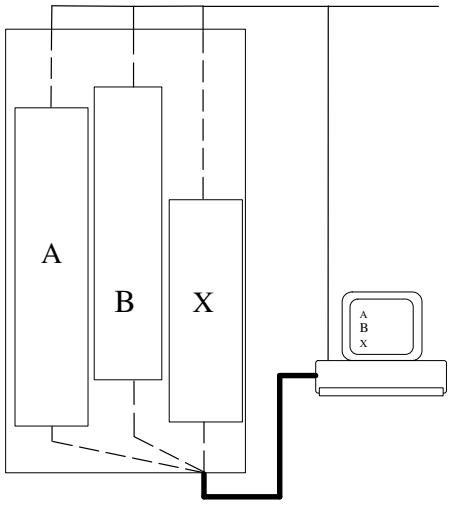


You can choose to operate your managed system as a single server, or you can choose to run multiple partitions. Partition management is performed using the hardware management console (HMC). Each system that is running partitions and managed by the HMC is referred to as a *managed system*. A managed system is capable of being configured to use logical partitions (LPARs) or a full system partition. If your computing needs are considered to be technical, real–time, or high–performance computing, a special type of partitioning called *affinity logical partitioning* is recommended.

A system that is configured to use logical partitions can run the following:

- Multiple logical partitions (LPAR or affinity logical partitions)
- A full system partition

The HMC (shown attached to three partitions in the following illustration) provides the interface that allows you to choose the partition environment that best fits your needs.



Logical Partitioning

Logical partitioning (LPAR) does not limit the number of hardware resources that are contained in a partition. A partition could have any number of the available processors assigned to it, limited only by the total number of processors. Similarly, a partition could have any amount of memory, limited only by the total amount of memory available. An I/O adapter is physically installed in one of many slots in the system. However, with LPAR, any I/O adapter in any I/O drawer can be assigned to any partition. Each partition on a server is defined by a profile. Profiles for logical partitions are created and managed using the HMC.

The operating system that is running in a partition is completely independent of any other operating system that is running in another partition. Operating system levels in each partition do not need to be the same, nor do the application levels. For example, you can install the Linux operating system in one partition and the AIX operating system in another partition.

By using partitions, you can test new programs in one partition, while developing the same program on another partition, all at the same time and using the same system. This ”same system” partitioning method is more cost–effective than using all of the system resources on one large partition. Using partitions eliminates the need for dedicated systems for test or other purposes.

Dynamic Logical Partitioning (DLPAR) allows you to implement changes to your partitions at any time without affecting a partition’s operation. LPAR should be used when the tasks you are performing are other than technical computing, real–time computing, or high–performance computing (see Affinity Logical Partitioning on page 1-3).

Dynamic Logical Partitioning

Dynamically changing a partition enables a partition's resources to be changed while the partition is up and running. The operating system that is running in the partition can configure and use additional hardware without being rebooted. In a DLPAR environment, the processors, memory, or input/output adapters can be added, moved, or removed after the partition is up and running.

Systems that are capable of performing dynamic logical partitioning can support the following tasks:

- Processor Tasks
  - Adding processors to a partition
  - Moving processors from one partition to another
  - Removing processors from a partition
- Memory Tasks
  - Adding memory to a partition
  - Moving memory from one partition to another
  - Removing memory from a partition
- Input/Output Tasks
  - Adding a PCI adapter
  - Moving a PCI adapter
  - Removing a PCI adapter

Affinity Logical Partitioning

An affinity logical partition is a special type of logical partition that has its processors and memory resources located physically close to one another. Processors needed for a partition can be grouped to use the closest physical memory available. Hardware resources for affinity partitioning are defined using the HMC. When creating an affinity partition, the HMC automatically determines which processors and memory are grouped and allows you to choose which type of grouping you want. The HMC then creates a profile for each affinity partition and a system profile that contains the affinity partitions for the managed system.

Affinity partitioning is best suited for use in technical computing, real–time computing, and high–performance computing. A system that is set up to use affinity logical partitions can dynamically move I/O devices. To change the quantity of processors or memory assigned to an affinity logical partition, the partition must be rebooted. A more detailed description of these tasks is found in Planning for Dynamic Logical Partitioning Updates on page 0.

Note: If your system is enabled for capacity upgrade on demand, affinity logical partitioning is not available.

Full System Partition

A special partition called the full system partition assigns all of your managed system's resources to one large partition. The full system partition is similar to the traditional, nonpartitioned method of operating a system. Because all resources are assigned to this partition, no other partitions can be started when the full system partition is running. Likewise, the full system partition cannot be started while other partitions are running.

The HMC allows you to switch from the full system partition to logical partitions. The actual setup of the operating system in a partition might require some careful planning to ensure that no conflicts exist between the two environments.

Benefits of Partitioning

Partitioning provides greater flexibility when deploying multiple workloads on a server, providing better management, improved availability, and more efficient use of resources. Some systems allow you to purchase and install hardware, and then to dynamically configure that hardware to meet your operating needs. The following are some examples of how partitioning can benefit your computer operations:

- **Consolidate servers:** A server with sufficient processing capacity that is capable of being partitioned can address the need for server consolidation by logically subdividing the server into a number of separate, smaller systems. In this way, application–isolation needs can be met in a consolidated environment, with the additional benefits of reduced floor space, a single point of management, and easier redistribution of resources as workloads change.
- **Merge production and test environments:** Partitioning enables separate partitions to be allocated for production and test systems, eliminating the need to purchase additional hardware and software. When testing has been completed, the resources allocated to the test partition can be returned to the production partition or elsewhere as required. As new projects are developed, they can be built and tested on the same hardware on which they will eventually be deployed.
- **Consolidate multiple versions of the same operating system:** A single system can have different versions of the operating system installed to accommodate multiple application requirements. Furthermore, a partition can be created to test applications under new versions of the operating system prior to upgrading the production environments. Instead of having a separate server for this function, a minimum set of resources can be temporarily used to create a new partition where the tests are performed. When the partition is no longer needed, its resources can be incorporated back into the other partitions.
- **Scalability balancing:** Partitioning allows you to create resource configurations appropriate to the scaling characteristics of a particular application, without hardware–upgrade restrictions.
- **Consolidate applications requiring different time zone settings:** Partitioning enables multiple regional workloads to be consolidated onto a single server. The different workloads can run in different partitions, with different operating systems, as well as with different time and date settings. For example, workloads for operations based in San Francisco and New York can run in different partitions on a single server. The evening batch workload, maintenance, or upgrade for the New York operation does not affect those of the San Francisco operation.
- **Flexible configuration:** Partitioning gives you the ability to change configurations easily to adapt to changing workload patterns and fluctuating computing–capacity requirements.

Processor on Demand

The processor on demand feature can help you manage a partitioned system. A processor on demand feature is ordered and installed as additional hardware that is not part of the system until you want to add it. The cost of using a processor on demand feature is deferred until you activate the hardware. After processor on demand hardware is activated on a system, it can then be added to logical partitions, as needed, to handle additional requirements.

Chapter 2. Planning for Logical Partitioning

Planning for logical partitioning requires the consideration of numerous factors and may take some time. If possible, planning for partitioning of a system should be performed prior to having the system installed in your location. If the planning work is careful and complete, the installation and configuration of the system will take less time.

Planning for installing partitions on a system is a two–phase process:

- Initial Phase

  Perform this planning phase when you are considering how much system capacity is required, in the form of processors, memory, and I/O, that you need for all your partitions. During this phase you begin your system design by identifying your requirements and completing worksheets to record your requirements. If, for example, the new system will duplicate the function of several existing systems, you probably will need a partition for each system. Each partition requires processors, memory, and I/O that is close to the capacity of the existing systems. When this phase is completed, you have your requirements documented on worksheets that you can use as a record of your requirements.

- Final phase

  Perform this planning phase after you have determined the general partition requirements. In this phase, details for each partition are developed and recorded. Information needed to set up and run partitions on your system when it is installed is finalized during this phase. Various worksheets are completed during this phase. After this phase is complete and the system is installed, you can then use your worksheets and the hardware management console to implement your system design.

Initial Phase

During this phase, you use a partition profile to identify fundamental requirements for each partition that you will implement on your system. The following list summarizes the steps for the initial phase:

1. Complete the Basic LPAR Planning Checklist on page 2-2.
2. Complete part of the Partition Properties Worksheet on page A-1.

Final Phase

In the final phase of partition planning, you complete worksheets with the details for each of your planned partitions. When the following worksheet tasks are completed, you are ready to configure your system's partitions:

1. Complete the Detailed LPAR Planning Checklist on page 2-3.
2. Complete the the remainder of the Partition Properties Worksheet on page A-1.
3. Complete the I/O Drawer Resource Worksheet on page A-3 (optional).
4. Complete the System Profile Worksheet on page A-4.

Basic LPAR Planning Checklist

Use this checklist during system design, before the hardware is ordered. These activities help ensure that you have a good understanding of LPAR, to perform high–level system design and planning, and to ensure adequate machine resources are available to meet your needs. Begin the planning process with the steps outlined in the following table.

When you have completed this checklist, you can compare the requirements you have recorded, to your system order, to ensure that your requirements are being met:

Completed?	Your Expectations
	Determine your goals for partitioning your workloads. If you are planning to install a partitioned system to divide workloads, analyze how your workloads can be divided so that your partitions can be configured to have adequate capacity for the workload. For example, if you are planning to consolidate a number of systems, each system represents a *workload*. If you are setting up a test environment and a production environment, consider each environment as a separate workload. You can then analyze your own workload and plan for a logical partition for each workload. As you define each workload for a partition, name the partition, and record its name on your copy of the Partition Properties Worksheet on page A-1. If you want to isolate compatible workloads within a partition, you can use the Workload Manager (WLM) tool. For more information about the AIX Workload Manager, see *AIX System Management Concepts: Operating System and Devices*.
Completed?	**Hardware Configuration**
	Logical partition (LPAR) requirements have been determined for each workload that is desired for development, test, production, or failover environments. Record the partition requirements in your copy of the Partition Properties Worksheet on page A-1. When performing this activity, carefully calculate the minimum resource requirements for each partition to ensure that the partition provides adequate performance.
	Processor, memory, and I/O adapter requirements have been determined for each partition and recorded on your copies of the Partition Properties Worksheet on page A-1. Be sure to order all of the hardware in the partition properties worksheet. Consider processors, memory, internal disks, network, and other I/O adapters.
	A minimum of one network adapter has been included on the partition properties worksheet for each partition for administrative and user access. These adapters also can be used when configuring the HMC to be able to monitor each partition's status. Consider availability requirements when deciding how many network adapters to configure in a partitioned system. Update the Partition Properties Worksheet on page A-1 as you define network adapters for each partition.

	Disk capacity and performance requirements have been determined for each partition for operating system and application purposes and has been included on the Partition Properties Worksheet on page A-1. This should include redundant disks and disk adapters for availability as needed. **Note:** A disk 4–pack that is connected to a single controller can be owned and accessed by a single partition.
	If you want a redundant HMC for availability, ensure that planning is done for this requirement and that the order includes the additional HMC. If you are installing the new system in an environment that already has an HMC, decide whether to use the existing one, or to order an additional HMC. The HMC can be set up to be dedicated to the new system, shared by multiple systems, or connected in a redundant configuration so that two HMCs mirror each other.

Completed?	Software Configuration
	On your copy of the Partition Properties Worksheet on page A-1, for each partition, record the application software to be run, the level of AIX, and whether it is running the 32–bit or 64–bit kernel (if known). The 32–bit and 64–bit multi–processor kernels are automatically installed. The uniprocessor kernel is not supported on LPAR enabled systems. If you want to use the AIX Workload Manager and learn more about its features, see *AIX System Management Concepts: Operating System and Devices*.

Detailed LPAR Planning Checklist

Complete these activities after the system is ordered, and before partition deployment. The following table can be used as a checklist so that you can track your progress.

Completed?	Documentation and Information
	Obtain documentation relevant to partitioned systems, including , order number , and , order number .
Completed?	**Hardware Configuration**
	Complete detailed I/O planning for each LPAR by completing a copy of the I/O Drawer Resource Worksheet on page A-3 for each I/O drawer (if the system unit drawer has I/O slots, complete a worksheet for the system unit drawer also). On the worksheet, record the drawer and slot assignments for each LPAR. Be sure to consider application availability requirements when planning your adapter usage. You may want to dynamically move some adapters to different LPARs as your requirements change. and in the BkSym.PCIAdapter, order number .
Completed?	**Software Configuration**
	Perform detailed software–configuration planning for each partition, and record the information on your copy of the Partition Properties Worksheet on page A-1. For planning requirements, refer to operating system and application documentation.

	Plan for availability requirements for each partition, and record the information on your copy of the Partition Properties Worksheet on page A-1. At this point you can plan your maximum and minimum resource requirements for each partition. Be sure to set the maximum values for resources in a partition higher than the desired value so that if you need to add resources dynamcially, the partition will allow the added resources. Also, be sure to set the minimum values for each partition so that resources are available from partitions if a dynamic move is required.
	Verify that all software licensing terms for all software are understood and implemented. See the terms and conditions of your application license agreements.
	Plan for any use of system profiles and record the information on your copy of the System Profile Worksheet on page A-4.
Completed?	**Installation and Update**
	Understand AIX installation choices and implications for ongoing maintenance (NIM versus CD). NIM (Network Installation Management) is the recommended method. See , order number .
	Define and record your system profile using a copy of the System Profile Worksheet on page A-4. Define profiles for booting into SMS menus, and with media (CD) as required. When you are defining your system profile, ensure that you identify the minimum set of partitions that must be activated to handle the workload and still provide adequate performance.
	When your system is installed and available, install each partition using the selected method. For instructions to help you set up your partitions and system profiles, refer to the , order number .
	To enable integrated management, Service Focal Point, and inventory collection, ensure that the network path is available between the HMC and each partition.

Completed?	**System Management**
	Ensure that remote management alternatives are understood (Web–based System Manager and command line from Microsoft Windows or AIX) and appropriate equipment is in place.
	Create a plan for backing up rootvg (root volume group) and non–rootvg in a partitioned environment.
	Understand how to handle AIX dump devices in partitioned environment.
	Define authorized users, with roles, for HMC and partition management.

Instructions for LPAR Planning Worksheet

This section contains samples of worksheets that have been completed for a typical managed system. Use these examples when completing worksheets for your system configuration planning. These worksheets are necessary when your system is installed and you are configuring your partitions for the first time.

Using the LPAR Planning Worksheets

The LPAR planning process proceeds through several phases, and the planning worksheets can be used to record design and implementation choices through those phases.

During the initial LPAR design phase, high–level choices about LPAR resource usage should be made to ensure an adequate machine configuration. Determine the number of desired LPARs, along with the usage of each. For each LPAR, record the number of processors, the amount of memory, and the I/O requirements to configure. To ensure adequate hardware redundancy, consider and record availability requirements. Total system memory size must leave adequate memory for operating system use.

Use the following table to determine the total number of partitions you can operate at one time, considering the total amount of memory available on your server.

Ensure that the total minimum resources for all partitions that you intend to run simultaneously does not exceed the total available system resources. You can also use the following table to verify that adequate operating system memory is available.

Total Memory (in GB)	**Approximate Memory Overhead (memory required by firmware (in GB)**	**Approximate Usable Partition Memory (in GB)**	Maximum Number of Partitions: AIX or Linux, any version **Partitions <= 16GB and Partitions > 16GB (see Notes 1 and 2)**	Maximum Number of Partitions: AIX 5.1 **Partitions <= 16GB and Partitions > 16GB (see Notes 1 and 3)**	Maximum Number of Partitions: AIX 5.2 (or higher) or Linux **All partition sizes (see Notes 1, 4, and 5)**
4GB	.75 to 1GB	3 to 3.25	3 and 0	13 and 0	13
8GB	.75 to 1GB	7 to 7.25	6 and 0	16 and 0	16
16GB	.75 to 1GB	15 to 15.25GB	14 and 0	16 and 0	16
24GB	1 to 1.25GB	22.75 to 23GB	16 and 0	16 and 0	16
32GB	1 to 1.25GB	30.75 to 31GB	16 and 0	16 and 0	16
48GB	1.25 to 1.75GB	46.25 to 46.75GB	16 and 1	16 and 1	16
64GB	1.5 to 2GB	62 to 62.5GB	16 and 2	16 and 2	16
96GB	2 to 2.5GB	93.5 to 94GB	16 and 4	16 and 4	16
128GB	2.5 to 3.5GB	124.5 to 125.5GB	16 and 6	16 and 6	16

192GB	3.5 to 4.5GB	187.5 to 188.5GB	16 and 10	16 and 10	16
256GB	5 to 6GB	250 to 251GB	16 and 14	16 and 14	16

Notes:

1. All partition maximum numbers are subject to availability of sufficient processor, memory, and I/O resources to support that number of partitions. For example, a system with only 8 processors can support a maximum of 8 partitions.
2. These rules apply to systems running partitions with any version of AIX or Linux, if the firmware and HMC release levels are earlier than the 10/2002 release level.
3. These rules apply to systems running partitions with AIX Version 5.1, if the firmware and HMC release levels are at the 10/2002 release level (or later). Do not select the HMC partition profile option for **Small Real Mode Address Region** for AIX 5.1 partitions. These numbers reflect the maximum when running only AIX 5.1 partitions, but AIX 5.1 and AIX 5.2 partitions can be mixed, and can allow for additional partitions to be run (up to the maximum of 16).
4. These rules apply to systems running partitions with AIX Version 5.2 (or later) or Linux, if the firmware and HMC release levels are at the 10/2002 release level (or later). Select the HMC partition profile option **Small Real Mode Address Region** for these partitions.
5. AIX 5.2, when run with the **Small Real Mode Address Region** profile option, requires that the maximum memory setting is no greater than 64 times the minimum memory setting. For example, if the minimum memory setting is 256 MB, then the maximum memory setting cannot be greater than 16 GB. Otherwise, AIX does not start.

To ensure that the system and partition profiles are created correctly as you complete the detailed partition planning checklist, carefully complete the Partition Properties Worksheet on page A-1. Additional dedicated partition profiles for special use (for example, to boot to SMS menus, or to boot with and without a CD–ROM drive) should be identified.

For example, if you know that a specific resource, such as a CD–ROM or a data disk is required to perform a set of user defined tasks, a dedicated partition profile can be created with these resources explicitly listed as ”required” for the partition to boot. This technique can help you to avoid booting a partition only to find that specific resources are not available. Dedicated partition profiles are useful for ISA devices that cannot be dynamically reconfigured.

Complete details about operating–system levels and application–software levels should be recorded in this phase.

Advanced considerations, such as using multiple system profiles, should also be considered during the detailed planning phase.

Instructions for Partition Properties Worksheet

On your copy of the Partition Properties Worksheet on page A-1, complete the following fields. See the Example of Partition Properties Worksheet on page 2-7 for help when completing your worksheet. Using the following table as a guide, work through the entries to complete the worksheet for each partition you have planned to set up on your system:

Worksheet Field	Description
Partition Number	Arbitrary, used as link to the same partition on the I/O properties worksheet.
Partition Name	Unique name for this partition (up to 31 characters).
Processor Count	Record the minimum number of processors required for this partition.

Memory Size	Record the minimum amount of memory required for this partition. Memory allocation total should leave enough room for the various system overheads in memory usage.
Network Adapter	Each partition should have a network adapter. Initially record the type (for example, Ethernet). As planning progresses, record the adapter part number.
Disk Drives	Record the partition disk requirements including rootvg, data, use of internal 4–pack, mirroring, and so on.
Comment	If you are migrating from an existing system into a partition, indicate the type of system and general configuration (such as processors or memory).
Partition Host Name	Record host name for partition. This name must be resolvable by some method (such as DNS, /etc/hosts, NIS).
Networking Configuration	For each adapter, record the IP address, netmask information, and so on.
Application Stack Software Levels	Record levels of all applications to run in the partition. You can use this information to ensure application availability, and any operating system or application prerequisites.
Application License Requirements	Record license requirements from application license agreements. Use this information to define a partition profile that complies with the license agreements for your applications. If an application has specific licensing issues, such as the maxumum number of processors allowed in a multiprocessor environment, the maximum resource can be set in the partition profile keep the partition within the license terms.
Availability Requirements	Record desired availability requirements for this partition. This information can be used to plan for appropriate hardware and software redundancy to ensure availability. You might need redundant I/O for communication availability or you might decide to configure your partitions in a high–availability configuration (HA).

Example of Partition Properties Worksheet

Duplicate the worksheets from Partition Properties Worksheet on page A-1, and complete a worksheet for each partition. Examples of completed partition–properties worksheets follow:

Partition Number	**Partition Name**	**Processor Minimum/ Desired/ Maximum Count**	**Memory Size Minimum/ Desired/ Maximum (in GB)**	**Required Network Adapter**	**Disk Drives**	**Comments**
1	WebServer	4/6/6	1/2/4	2x 10/100 Ethernet	2x36	
2	AppServer 1	4/8/10	1/4/6	10/100 Ethernet	2x36	
3	AppServer 2	4/6/8	4/4/4	10/100 Ethernet	2x36	
4	Database	2/2/2	2/4/6	10/100 Ethernet	2x36	
5	Development	2/4/4	1/1/2	10/100 Ethernet	2x36	

...						
16						
Totals		16/26/30	9/15/22			
Total Installed		24	16			

When the partitions in the previous example are activated, there are not enough processors for each partition to use the desired value. Depending on the order in which the partitions are activated, one partition might have to be activated with fewer than the desired number of processors.

The memory values for Minimum/Desired/Maximum should leave enough room for the various system overheads of memory usage. See the memory requirements table on page 2-5.

Partition Number	**Partition Host Name**	**Networking Configuration**	**Application Stack Software Levels**	**Availability Requirements**	**Application License Requirements**	**Comments (New deployment or migration environment?)**
1	ws1.dot.com	108.25.25.2	Networking Configuration	Redundant SCSI	Up to 6 processors	Second system will be added for HACMP
2	ap1.dot.com	108.25.25.5	4GB	Redundant SCSI		HACMP
3	AppServ2.dot.com	108.25.25.11	4GB	HA		HACMP
4	db1.dot.com	108.25.25.13	4GB	HA	2 processors max.	HACMP
5	dev1.dot.com	108.25.25.15	1GB			
...						
16						

Instructions for I/O Drawer Resource Worksheet

Duplicate the worksheet from the I/O Drawer Resource Worksheet on page A-3 for each installed I/O drawer (if the system unit has I/O slots or integrated I/O, complete a separate worksheet for the system unit as well). Record the drawer location code, adapter type for each slot, and also the partition assignment. Remember that full disk 4–packs that are connected to a single controller cannot be shared between partitions. Also, it is important for each partition to have a network adapter.

Example of I/O Drawer Resource Worksheet

I/O Drawer Location and Serial Number	Adapter Slot Physical Location	Adapter Type	Partition Assignment	Comments
U1.9	P1/Z1	Integrated SCSI	1	Hdisk0, hdisk1
	P1/Z2	Integrated SCSI	1	Hdisk2, hdisk3
	P1–I1	Fibre Channel	1	
	P1–I2	Ethernet	1	ent0
	P1–I3			
	P1–I4			
	P1–I5	Fibre Channel	1	
	P1–I6			
	P1–I7			
	P1–I8	SCSI	1	
	P1–I9			
	P1–I10	SCSI	1, 2, 3, 4	CD–ROM
	Px/Z1	Integrated SCSI	2	Hdisk0, hdisk1
	Px/Z2	Integrated SCSI	2	Hdisk2, hdisk3
	Px–I1	Fibre Channel	2	
	Px–I2			
	Px–I3			
	Px–I4			
	Px–I5	Fibre Channel	2	
	Px–I6			
	Px–I7			
	Px–I8	Ethernet	2	ent0
	Px–I9			
	Px–I10			

Instructions for System Profile Worksheet

Duplicate the System Profile Worksheet on page A-4 to record information about any system profiles you want to create. A system profile allows you to activate or deactivate a set of partitions as needed. You can setup your system with system profiles that you might want to activate at different times of the day. For example, system profiles can be used to allocate different resources to your partitions based on workload peaks. If you want to deactivate a set of partitions and activate a different set of partitions, you would define your system profiles to match your requirements.

Remember that the memory allocation totals in the third column should leave enough room for the various system overheads of memory usage. For more information about system memory overheads, see the memory requirements table on page 2-5.

Example of I/O a System Profile Worksheet

Partition Name	**Number of Desired Processors**	
Partition 1	4	
Partition 2	4	
Partition 3	4	
Partition 4	2	
Partition 5	2	
...		
Partition 16		
Totals:	16	
Total Installed:	16	

Chapter 3. Planning for Dynamic Logical Partitioning Updates

The dynamic LPAR (DLPAR) feature allows partitions to be changed while they are up and running. This chapter provides an overview of procedures related to DLPAR operations and outlines planning steps that you should consider before performing a DLPAR operation.

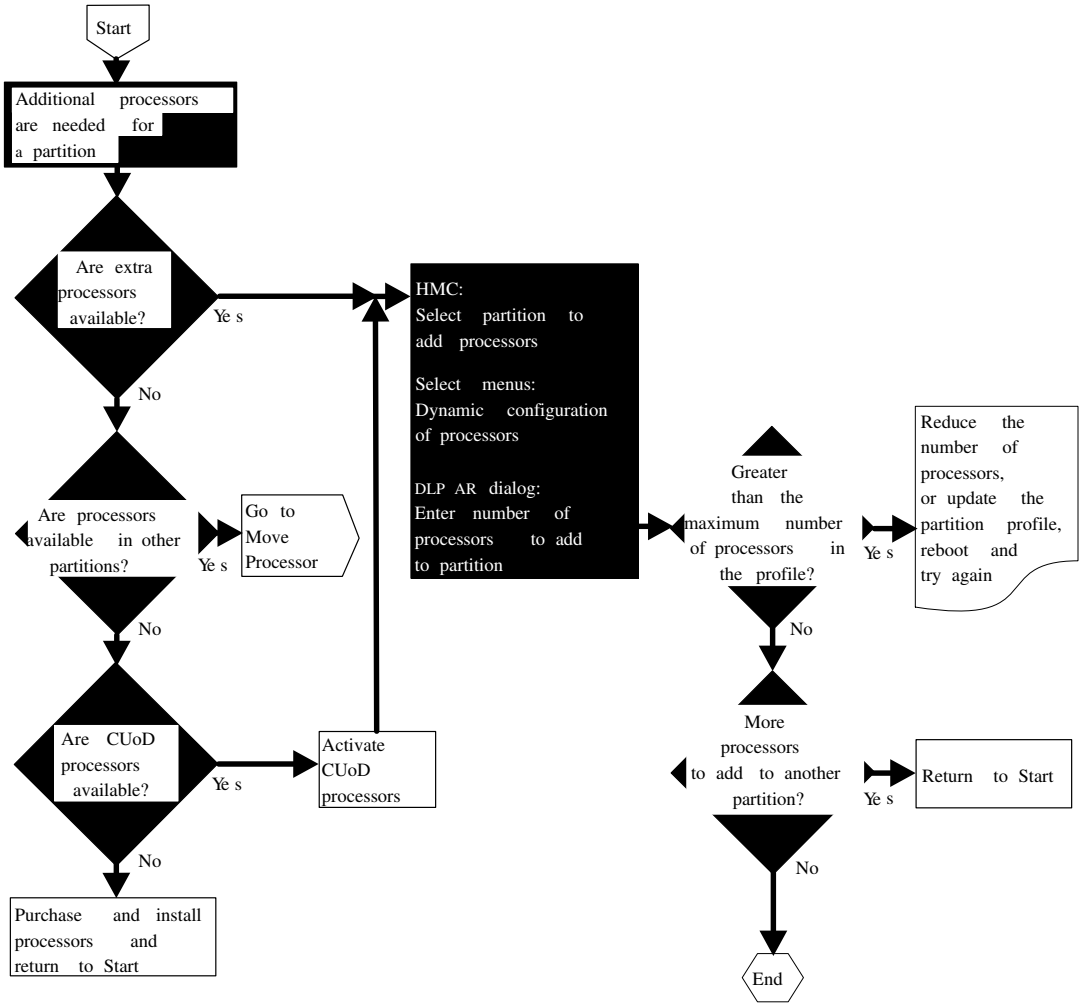
This chapter describes the considerations for adding resources to a partition, moving resources between partitions, and removing resources from partitions. Flowcharts are used to show the general process for each action. The gray highlighting in the flowcharts indicates planning considerations. The black highlighting indicates tasks that are performed using the HMC.

Adding a Processor

The following flowchart shows the basic steps needed to add processors to a partition that is already operational. Before adding processors to a partition, review the following planning considerations and the flowchart.

There are some considerations for each step of this process. Generally, the following questions correlate to a decision step in the flowchart:

- **Are additional processors needed for a partition?** Before adding a processor, ensure that it is necessary. A new application in a partition might require more processors, or there may be performance benefits with additional processors. Refer to your application documentation for recommendations, and also see the *Performance Management Guide* in the AIX documentation library.
- **Are extra processors available?** To answer this question, use the HMC to check the system for available processors. If there are no available processors in your system, you can move a processor from another partition, see Moving a Processor Between Partitions on page 3-3.
- **Are processors available in other partitions?** If other partitions are not busy when you need to move a processor to supplement a partition, you can move the processor from one partition to another. If this is an option you want to use now, go to Moving a Processor Between Partitions on page 3-3. If there are no available processors in your system, you can either use a processor from another partition or add hardware to your system. If your system has Processors on Demand (POD) features installed, you might decide to enable additional processors now, and then add them to partitions as needed.
- **Are POD features available?** If your system has inactive POD features installed, you can activate additional processors, and then add them to partitions as needed. .
- **Does the new number exceed the maximum number of processors in the profile?** When moving processors into a partition, the system allows only as many processors to be added to a partition as are allowed by the maximum set in the partition profile. If you plan to add processors to a partition and the partition is already at its maximum, you must change the partition profile to increase the maximum and then reboot the partition.
- **Do you have more processors to add to another partition?** If you are in the process of moving processors, repeat the process for any additional processor moves you may need to do.
- **Are there any licensing requirements you need to consider?** Check your partition profile worksheets to see if you have noted any licensing requirements when you performed the procedures in Using the LPAR Planning Worksheets on page 2-5.

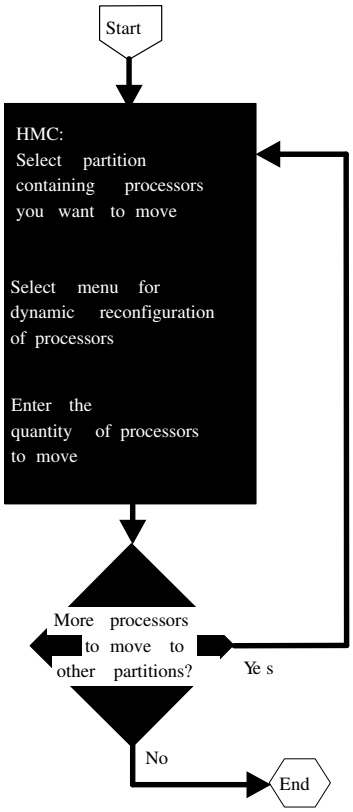

Start
Additional processors are needed for a partition
Are extra processors available?
Yes
No
Are processors available in other partitions?
Yes
Go to Move Processor
No
Are CUoD processors available?
Yes
Activate CUoD processors
No
Purchase and install processors and return to Start
HMC:
Select partition to add processors
Select menus:
Dynamic configuration of processors
DLP AR dialog:
Enter number of processors to add to partition
Greater than the maximum number of processors in the profile?
Yes
Reduce the number of processors, or update the partition profile, reboot and try again
No
More processors to add to another partition?
Yes
Return to Start
No
End

Moving a Processor Between Partitions

The following flowchart shows the basic steps needed to move processors from one operational partition to another operational partition. Before moving a processor from one partition to another, make sure that the partition from which you are moving the processor does not need that processor for performance requirements. Use the *Performance Tuning Guide* in the AIX documentation to help identify a partition that can spare processors.

Consider the following point for each step of the process before performing the task of moving a processor:

- **Do you have more processors to move to another partition?** You can move processors into or out of partitions as long as you do not exceed the minimum or maximum values for the partition. Ensure that you can add processors to the target partition (maximum value not exceeded) and that the moving of a processor into a partition does not violate any software license requirements. If you need to move more processors, repeat the process.



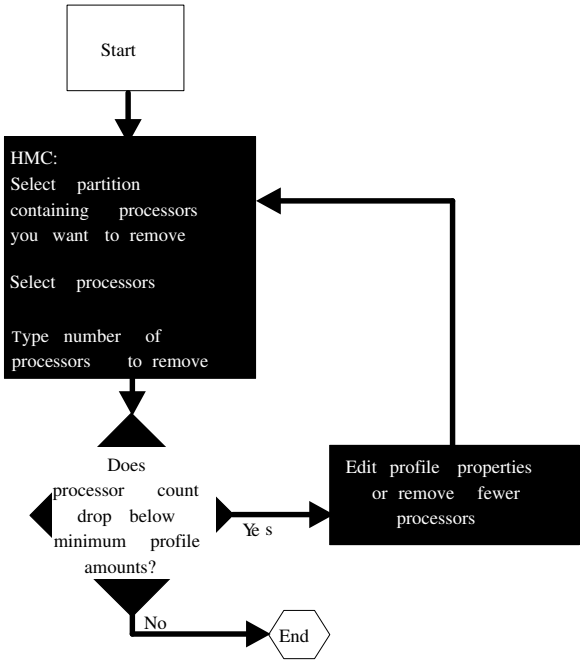
Removing a Processor

Removing a processor from a partition allows you to make processors available to be used by another partition. Before you remove a processor from a partition, prioritize your partitions and try to remove the processor from your lowest–priority partition that has available processors. Prioritizing your partitions helps you minimize the impact to the source partition.

If all of the processors have bound applications, then it might not be possible to remove a processor. Whenever you perform dynamic remove operations, remember that it might be easier to remove a processor from another partition than to reconfigure applications.

The following flowchart shows the basic steps needed to remove processors from an operational partition. Before performing the operation to remove processors, see the following flowchart and planning considerations. Use the *Performance Tuning Guide* in the AIX documentation to help identify a partition that can spare a processor.

- **Is the processor count less than the partition profile minimum?** If you attempt to remove processors from a partition, and the total number of processors that would remain is fewer than the minimum number specified in the partition's profile, the operation will not complete. If this occurs, you must remove a processor from a different partition or reset the partition's minimum value for processors.

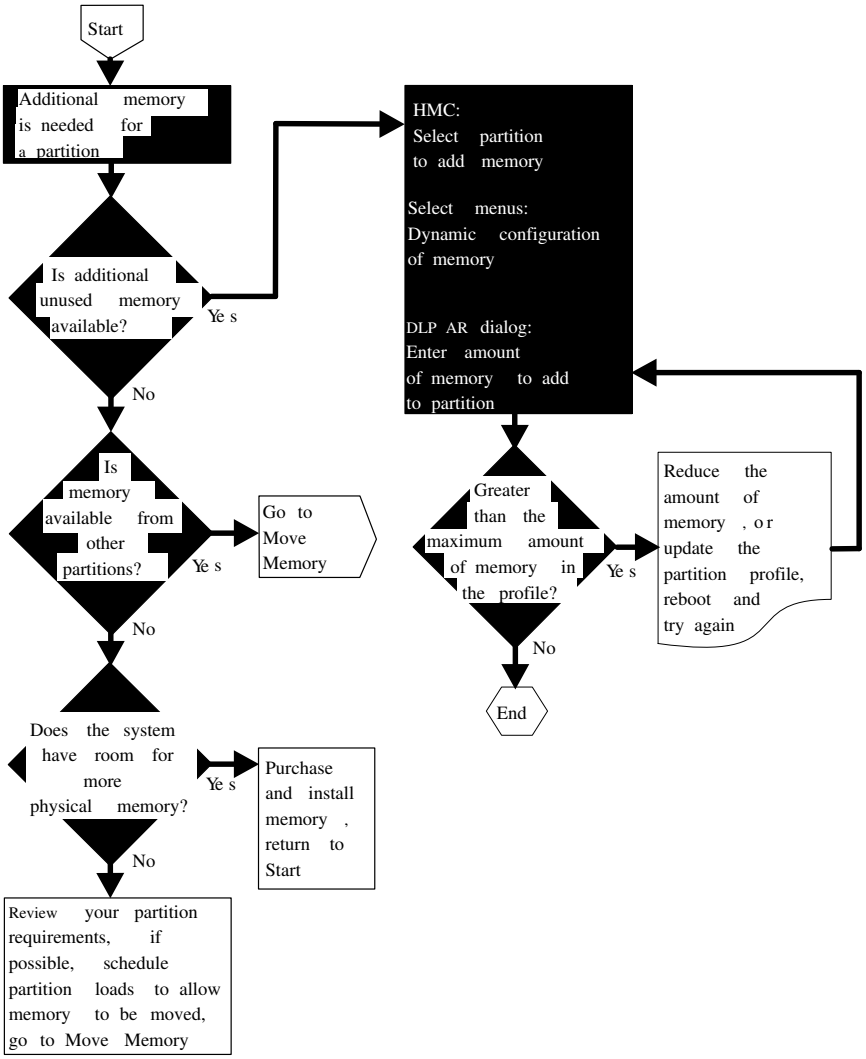


Adding Memory

The following flowchart shows the basic steps needed to add memory to a partition that is already operational. Before adding memory to a partition, review the flowchart and the planning considerations.

Consider the following points for each step of the process before performing the task of dynamically adding memory to a partition:

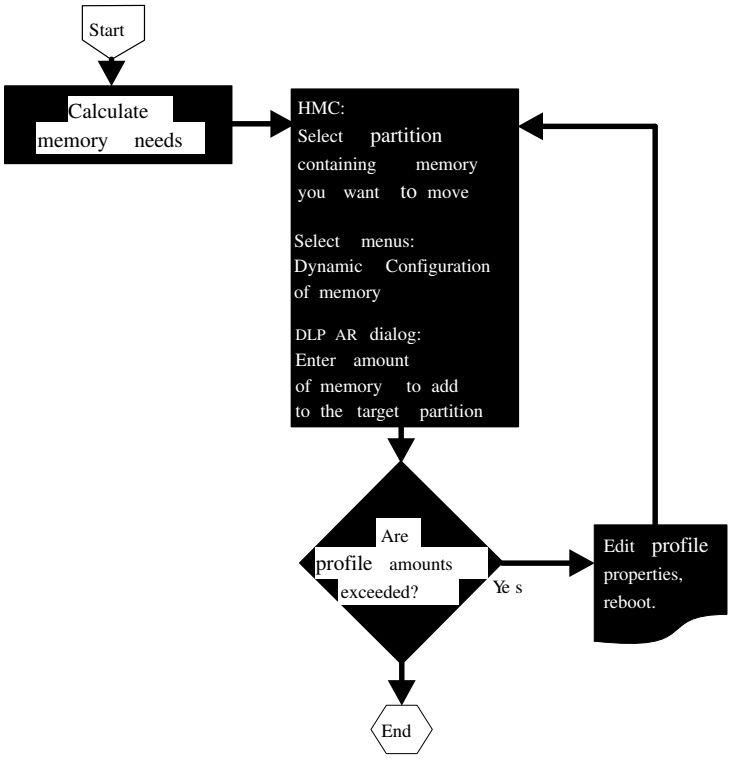
- **Is additional unused memory available?** To answer this question, use the HMC to check the system for available memory. Determine if memory is available for use in an existing partition. A new application on a partition might require more memory, or there might be performance benefits to increasing the amount of memory that is available to a partition. Refer to your application documentation for recommendations. Refer to the *Performance Tuning Guide* in the AIX documentation to help determine if the partition is doing excessive paging.
- **Does the new memory amount exceed the maximum amount of memory in the profile?** Plan ahead to add memory as needed. When moving memory into a partition, the system allows only as much memory to be added to a partition as is allowed by the profile maximum. If you plan to add memory to a partition and the partition is already at or near its maximum, change the partition profile to increase the maximum and then reboot.
- **Does the new memory size require larger paging space?** Check the applications for paging–space requirements. If necessary, use the operating system to change the paging–space parameters. When planning the memory values for the partition, plan the paging space using the following formula. The maximum amount of paging space that is required in the worst case, assuming that the partition is configured with the maximum amount of memory that is allowed by the partition profile. To this amount, add the difference between the maximum and the minimum. To avoid rebooting the partition to change the maximum memory amount, determine the maximum amount of memory needed during your planning for the partition.
- **Is memory available from other partitions?** If you find that there is not enough available memory for the target partition, you may be able to get memory from other partitions. If a partition is not being used or if a partition has more memory than is needed, make the memory available to other partitions as required.
- **Does the system have room for more physical memory?** If you cannot locate enough memory on your system to fulfill all your partition requirements, contact your sales representative to order additional memory.
- **Do you have more memory to add to another partition?** You can move memory into or out of partitions at any time. If you are in the process of moving memory, repeat the process for any additional memory moves you might need to perform.


Start
Additional memory is needed for a partition
Is additional unused memory available?
Yes
No
HMC:
Select partition to add memory
Select menus:
Dynamic configuration of memory
DLP AR dialog:
Enter amount of memory to add to partition
Greater than the maximum amount of memory in the profile?
Yes
Reduce the amount of memory, or update the partition profile, reboot and try again
No
End
Is memory available from other partitions?
Yes
Go to Move Memory
No
Does the system have room for more physical memory?
Yes
Purchase and install memory, return to Start
No
Review your partition requirements, if possible, schedule partition loads to allow memory to be moved, go to Move Memory

Moving Memory

The following flowchart shows the basic steps needed to move memory from one operational partition to another operational partition. Before performing the operation to move memory, review the following planning considerations and flowchart.

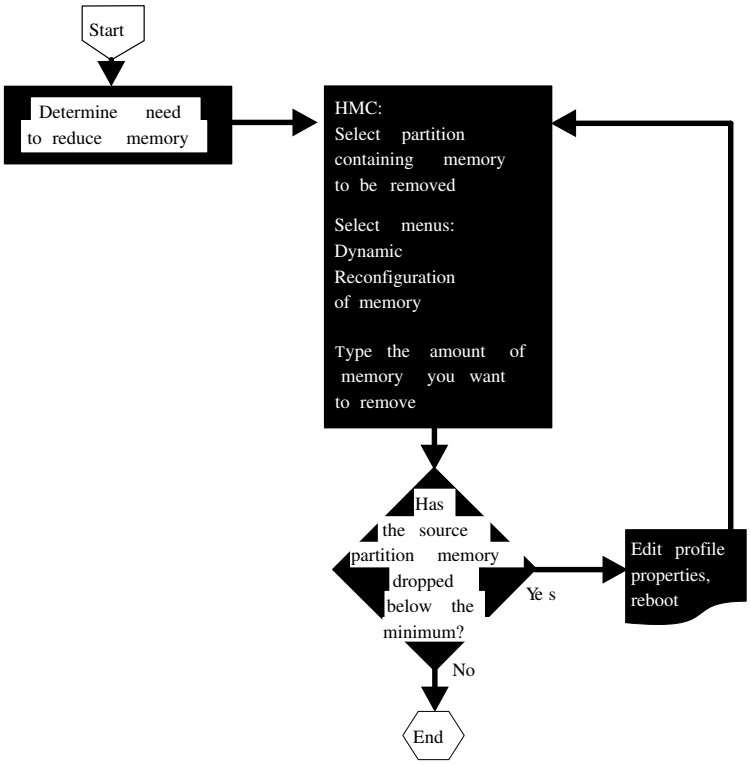
- **Is memory available in the source partition?** Use the HMC to check other partitions to determine if there is enough memory available in those partitions for use in the partition where you need the extra memory. A new application on a partition might require more memory, or there may be performance benefits to increasing the memory that is available to a partition. Refer to your application documentation for recommendations.
- **Are minimum or maximum profile amounts exceeded?** Plan ahead to move memory as needed. Do not allow the moved memory to cause the target partition to exceed the profile maximum for memory. In addition, the source partition's minimum memory amount cannot fall below the minimum memory amount that is assigned.
- **Does the new memory size require larger paging space?** Check your applications for paging–space requirements. If necessary, use the operating system to change the paging–space parameters. For more information about paging space, see Adding Memory on page 3-5.



Removing Memory

The following flowchart shows the basic steps needed to remove memory from an operational partition. Removing memory from partitions is a convenient way to have the memory needed to start new partitions. Before performing the operation to remove memory, consider the impacts to the partitions from which you remove memory.

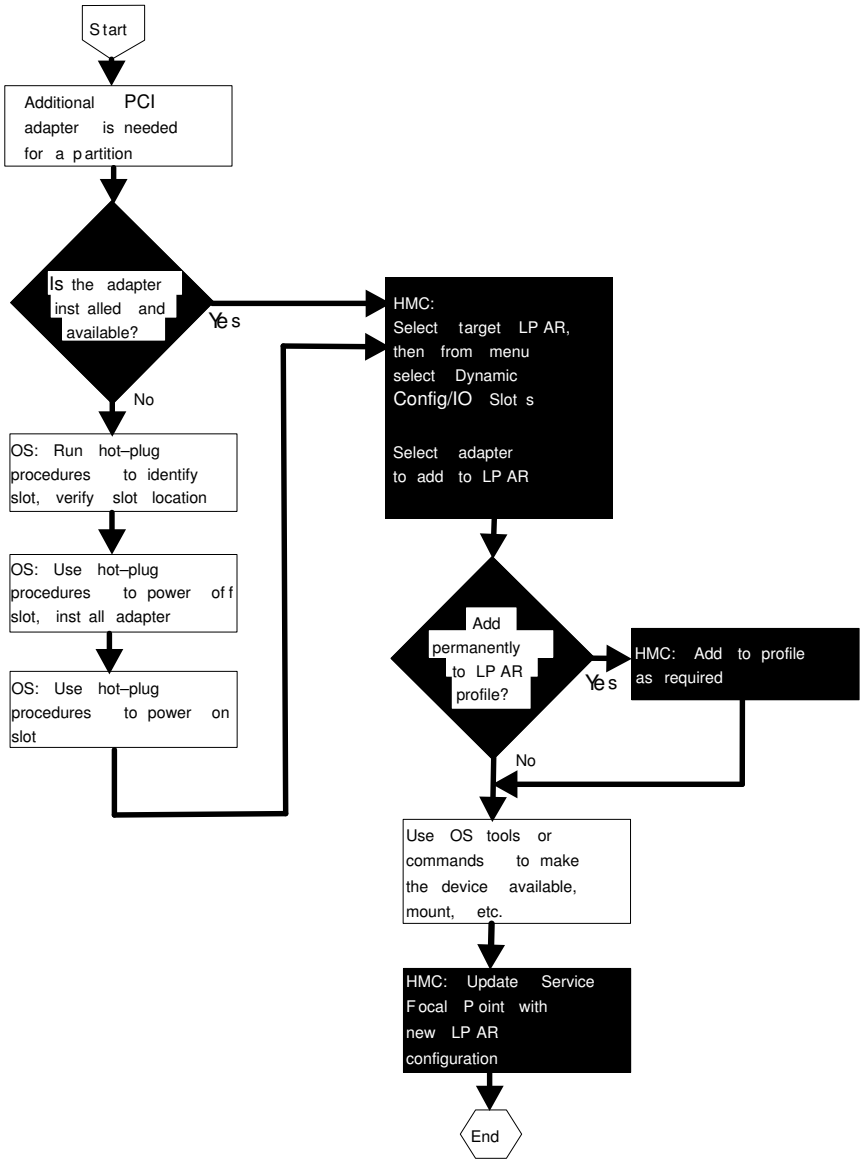
- **Is memory available from a partition?** Use the HMC to check other partitions to determine if there is enough memory available in those partitions for use in the partition where you need the extra memory. A new application on a partition might require more memory, or there may be performance benefits to increasing the memory that is available to another partition. Refer to your application documentation for recommendations.
- **Is the memory amount less than the partition profile minimum?** Plan ahead to move memory as needed. The remove memory operation will fail if the source partition's memory amount falls below the minimum memory amount that is assigned.



Adding an Adapter

The following flowchart shows the basic steps needed to dynamically add an adapter to a partition that is already operational. If the adapter is a hot–plug capable adapter, the adapter can be installed in the system and then added to a partition. Before adding an adapter to a partition, review the flowchart and the planning considerations.

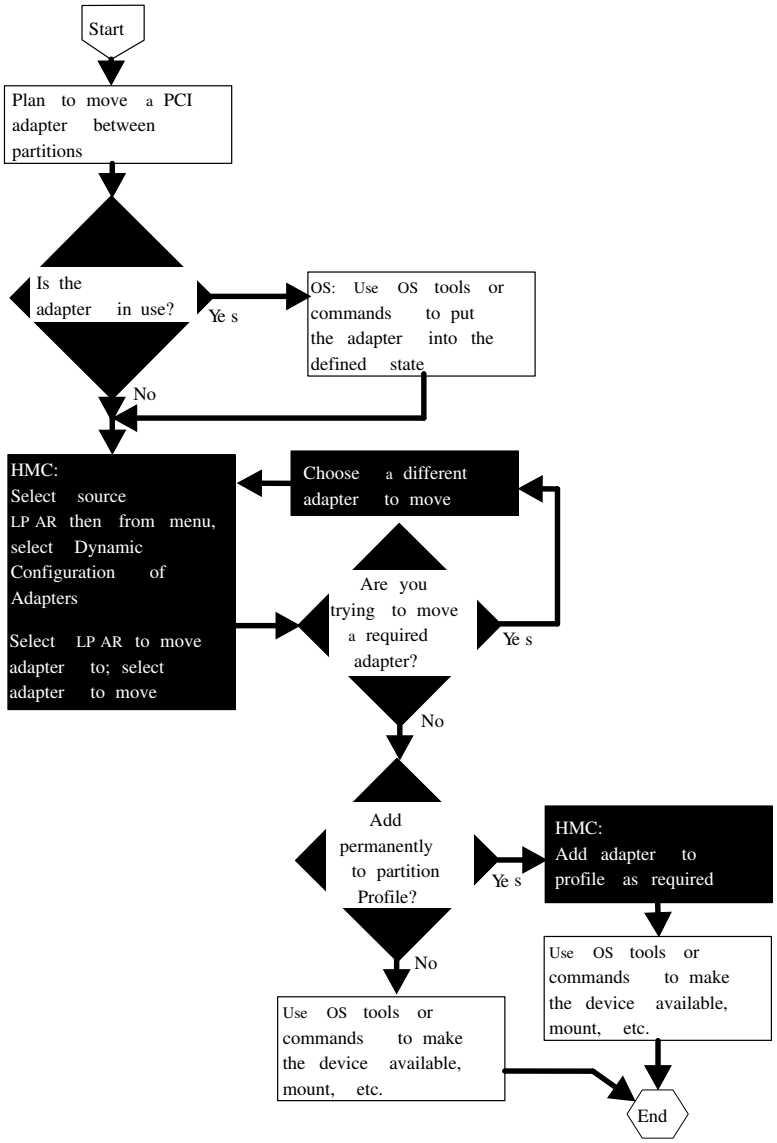
- **Is the adapter already installed?** If the adapter is not installed in the system, install the adapter hardware now and then perform the steps to add it to a partition.
- **Do you want to permanently add the adapter to the partition profile?** If the adapter is to be permanently used by a partition, update the partition profile to include the new adapter.



Moving an Adapter

The following flowchart shows the basic steps needed to move an adapter from one operational partition to another operational partition. Before performing the operation to move an adapter, review the flowchart and the planning considerations.

- **Is the adapter in use?** Before moving an I/O adapter from one partition to another, ensure that the adapter is available in the source partition from which you are moving the adapter. Use the operating system tools to make the adapters available.
- **Must the adapter be physically moved?** As adapters are assigned to different partitions, you might want to move an adapter to a different I/O slot. If you decide to physically move a hot–plug adapter, the PCI adapter hot–plug procedures that are available in the installation or user's documentation for your system, allow this to be done without rebooting partitions.
- **Are you trying to move a required adapter?** Some of the adapters installed for use in a partition are required to be in the partition. Before deciding to move an adapter that is required by a partition, check to ensure that the adapter can be moved.
- **Do you want to permanently add the adapter to a partition profile?** If the adapter is to be permanently used by a partition, update the partition profile to include the new adapter.



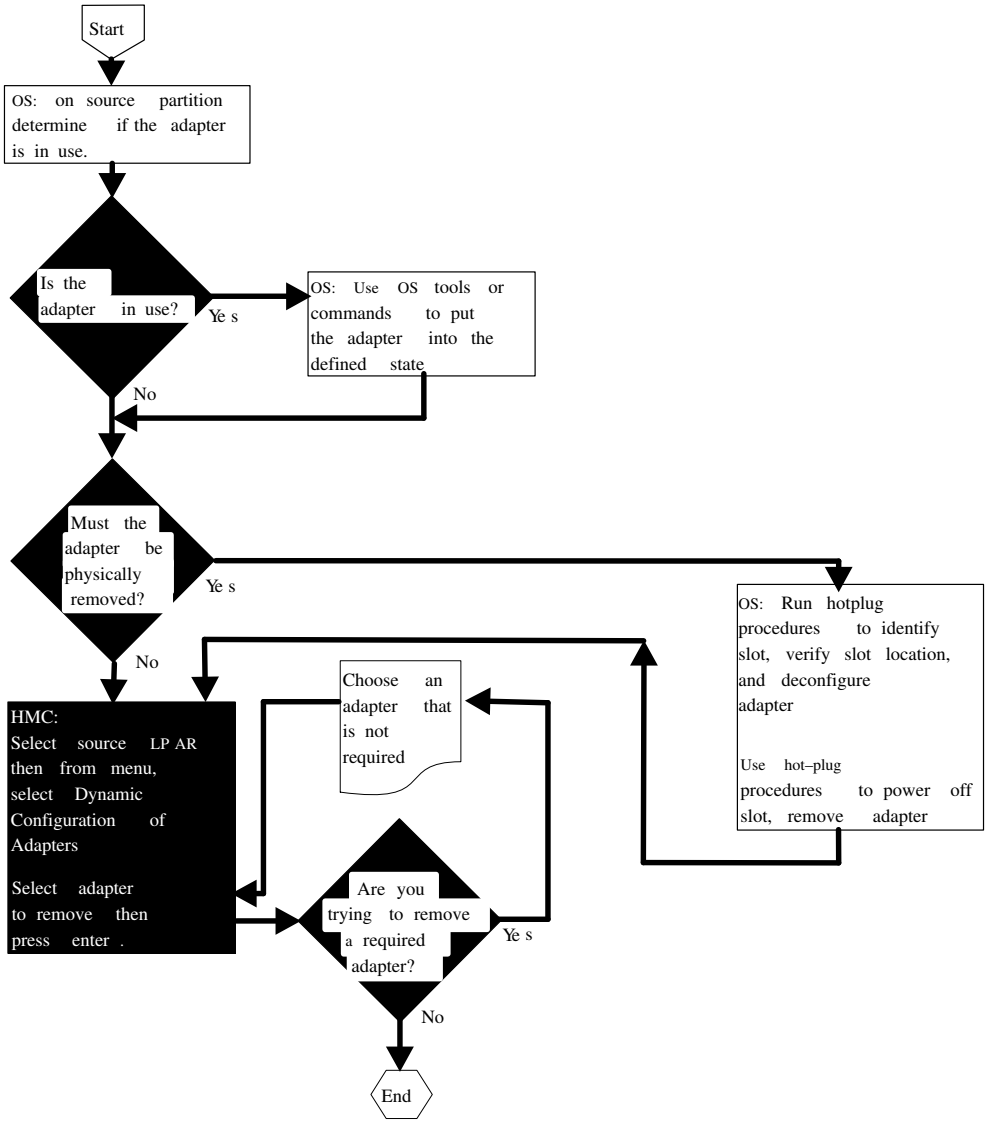
Removing a PCI Adapter

The following flowchart shows the basic steps needed to remove a PCI adapter from an operational partition. You might want to remove an adapter from a partition because:

- You are preparing to start a partition that needs a certain adapter.
- You are upgrading your system.

Before performing the task of removing an adapter, review the flowchart and the planning considerations.

- **Is the adapter in use?** Before removing I/O adapters, ensure that the adapter is available. If necessary, use the operating system tools to change the adapter state to defined.
- **Must the adapter be physically moved?** As adapters are assigned to different partitions, you might want to move an adapter to a different I/O slot. If you decide to physically move a hot–plug adapter, the PCI adapter hot–plug procedures that are available in the installation or user's documentation for your system allow this to be done without rebooting partitions.
- **Are you trying to move a required adapter?** Some of the adapters installed for use in a partition are required for that partition. Before deciding to remove an adapter that is required by a partition, verify that the adapter can be removed.



Managing Devices

When you need to add, move, or remove a device such as a SCSI device, you will need to perform those actions for these devices using the PCI slot that contains the adapter to which the devices are connected. For example, to move the CD–ROM device that is attached to a SCSI adapter in a partition, you will need to move the adapter slot for the SCSI adapter from one partition to another. If the CD–ROM is attached to an integrated component (typically at least one SCSI adapter is integrated on a system board or I/O board) the slot that represents the integrated adapter is likewise moved.

Appendix A. Worksheets for Partition Configuration Planning

This appendix contains worksheets that you can use when planning for partition configuration. Make copies of these worksheets, and be sure to complete the worksheets for each partition that you plan to create.

Partition Properties Worksheet

Complete both of the the following worksheets for each partition that you plan to set up on your system:

1 of 2

Partition Number	Partition Name	Processor Minimum/ Desired/ Maximum	Memory Size Minimum/ Desired/ Maximum (in GB)	Required Network Adapter	Disk Drives	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
Totals (see note 1 below)						
Total Installed						

Notes:

1. The total memory size should leave enough room for various system overheads of memory usage. See the memory requirements table on page 2-5

Partition Number	**Partition Host Name**	**Networking Configuration**	**Application Stack Software Levels**	**Availability Requirements**	**Comments (new deployment or migration environment?)**
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

I/O Drawer Resource Worksheet

I/O drawers can be installed in different locations. Make a copy of the following worksheet for each I/O drawer in your managed system configuration based on the location code for that drawer. Use the worksheet copy to keep a record of slot usage for each adapter installed in each drawer.

I/O Drawer Location and Serial Number	Adapter Slot Physical Location	Adapter Type	Partition Assignment	Comments
U__.__	P1/Z1			
	P1/Z2			
	P1–I1			
	P1–I2			
	P1–I3			
	P1–I4			
	P1–I5			
	P1–I6			
	P1–I7			
	P1–I8			
	P1–I9			
	P1–I10			
	Px/Z1			
	Px/Z2			
	Px–I1			
	Px–I2			
	Px–I3			
	Px–I4			
	Px–I5			
	Px–I6			
	Px–I7			
	Px–I8			
	Px–I9			
	Px–I10			

System Profile Worksheet

Make a copy of this worksheet to keep track of the resources in the system profiles you create. Create a new worksheet for each additional system profile.

Partition Name	**Number of Desired Processors**	
Partition 1		
Partition 2		
Partition 3		
Partition 3		
Partition 4		
Partition 5		
Partition 6		
Partition 7		
Partition 8		
Partition 9		
Partition 10		
Partition 11		
Partition 12		
Partition 13		
Partition 14		
Partition 15		
Partition 16		
Totals:		
Total Installed:		

Note: The desired memory size amount should leave enough room for the various system overheads of memory usage, see the memory requirements table on page 2-5.

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