

Chapter 4

Node Partitions (nPartitions) and Management Processor Overview

Introduction to nPartitions

Node Partitions (nPartitions) have dedicated hardware within an HP Integrity Server (Itanium-based) or HP 9000 Server (PA-RISC-based) that work independently from other nPartitions within the same server. This independence includes both hardware and software isolation from other nPartitions. Virtual Partitions (vPars) and Integrity Virtual Machines (HP VMs), covered in a separate chapters, have full software isolation from one another but not hardware isolation. nPartitions have both software *and* hardware isolation from one another. An nPartition can be divided into multiple vPars and HP VMs.

Integral to working on a cell-based system and performing nPartition-related work is the Management Processor (MP). The MP is covered throughout this chapter. I intentionally avoid treating the MP as a separate topic in a separate chapter because it is such an important means of accessing system resources for the system administrator. In addition, the tear-out card supplied with this book acts as a good quick reference for many MP commands that you'll issue on a regular basis.

The basic building block of an nPartition is the *cell*. Each cell has processors and memory that are assigned exclusively to that nPartition. I/O

chassis are also exclusively assigned to nPartitions. Multiple cells can be combined to produce large nPartitions.

nPartitions are supported on all cell-based systems and operate in a similar manner on all models. I use a few different models in this chapter's examples; however, the operation of nPartitions varies very little going from model to model, so most of the commands and principles apply regardless of the model on which you're using nPartitions. There are, however, differences in the hardware going from model to model and this information is important to know. The "Devices," chapter covers both devices and some of the hardware differences including the mapping of I/O slots. The nPartition commands are similar going from model to model because the modular nature of the nPartition components is nearly identical on cell-based systems.

Although the operation of nPartitions is nearly identical going from model to model, the number of supported nPartitions does indeed vary based on the cell capacity of a given model. Some models support only two nPartitions and others support many more. I focus on working with nPartitions in this chapter so you can use the topics covered on any cell-based system that supports nPartitions. In addition, the boot process is different on HP 9000 and HP Integrity Servers.

Because nPartitions are similar to independent servers on a network, with a unique hostname, IP address, and instance of HP-UX, you also need to know about topics such as boot options for nPartitions and others. There are many chapters and topics related to system-level administration in this book that apply to nPartitions as well because they act in much the same way as separate systems.

This chapter introduces working with nPartitions. Much is involved in managing nPartitions, so this chapter covers some of the more common nPartition-related work you might perform. For a complete guide to managing nPartitions print the document *HP System Partitions Guide: Administration for nPartitions*, which is available on docs.hp.com.

Cells and nPartitions

Because the cell is the basic building block of nPartitions, let's spend some time covering some of the basics of cells and nPartitions. An HP 9000 or Integrity server that is capable of supporting nPartitions is sometimes called a *server complex* or just *complex*. In this chapter, I sometimes use *complex* and other times use *system* when referring to the overall system. The following list covers some important background that you need to know to manage nPartitions:

Base Cells	All cells within an nPartition are base cells. When you create an nPartition, the cells to which you assign it are base cells.
Assigned Cells	Assigned cells are included in an nPartition and unassigned cells are not included. Similarly, an I/O chassis that is attached to a cell takes on the assigned or unassigned attribute of the cell.
Unassigned Cells	Cells that are unassigned are available resources that can be used to create new nPartitions or assigned to existing nPartitions.
Core Cells	Every nPartition must have a cell that is attached to an I/O chassis that has a core I/O card in it. You can have multiple core cells, meaning cells to which an I/O chassis is attached with a core I/O card in it, but only one of these is the <i>active</i> core cell. If you have multiple core cells in an nPartition and the primary core cell fails, then you have a backup core cell. Not all HP 9000s allow you to have multiple core cells.
Active Cells	Cells that are both assigned to an nPartition and have booted are active cells. There is the concept of <i>rendezvous</i> on HP servers. During the boot process an nPartition rendezvous takes place when all of the available cells in an nPartition <i>join</i> together. Those that rendezvous are active cells.
Inactive Cells	These are cells that are not assigned to an nPartition or have not yet rendezvoused to form a parti-

tion. Some cells are in a boot-is-blocked (BIB) state, which means that they will not rendezvous and are inactive. There are a variety of reasons that a cell is in a BIB state including: it is in an n state for the next boot; it boots too late to rendezvous; the cell fails a self-test; and the partition in which the cell exists is ready for reconfiguration.

Genesis nPartition The Genesis nPartition is a one-cell nPartition used to create all other nPartitions. It can be expanded to include any number of cells but is initially only one cell. This is done for you by HP when your nPartition-capable system is delivered, if you have requested it. You may create the genesis partition at any time and reconfigure your server with a new nPartition structure. The genesis nPartition is number 0. All cells in an nPartition must have the same clock speed and revision level. This partition is created only at the time of initial installation. Partition information in the Management Processor is destroyed when the genesis partition is created.

Partition Numbers Every nPartition has a unique number used by the commands and utilities to specify the nPartition.

Local Partition When working with one of the commands or utilities, the nPartition you are accessing is local and all others are remote.

Now that I've covered some of the basics of nPartitions and cells, let's a look at some of the tools and utilities used to manage them.

Many supported nPartition configurations on all HP 9000 and Integrity servers support nPartitions. To see a complete list of the supported nPartition configurations, see the aforementioned *HP System Partitions Guide: Administration for nPartitions* on docs.hp.com.

Ways of Managing nPartitions

nPartitions can be managed across a wide range of system operation. You can work with nPartitions at a very low level of the system, such as the Management Processor (MP,) or after HP-UX has booted with nPartitions commands, or the menu-driven Partition Manager (`/opt/parmgr/bin/parmgr`). The following list summarizes the many available options for managing nPartitions, beginning with the lowest level tools and progressing to the highest level tools:

- | | |
|----------------------|---|
| Management Processor | The Management Processor (MP) is a low level means to access the system. The Management Processor has its own unique set of commands, some of which I cover later. You gain access to the MP by using telnet , because it has two network connections on it, one called a <i>Customer</i> LAN and the other called a <i>Private</i> LAN. You would typically use the <i>Customer</i> LAN to access the Management Processor. The Management Processor is also known as the Guardian Service Processor (GSP) and Service Processor (SP) so you may see these names used for the Management Processor, all of which represent the same method of accessing the system. |
| Virtual Front Panel | The Virtual Front Panel (VFP) shows activity of one or more nPartitions and is invoked through the Management Processor. Although this is a subset of the overall Management Processor functionality, it is widely used and is therefore considered its own tool. |
| HP-UX Commands | There are a variety of commands which you can issue that allow you to get useful information, and to configure and modify nPartitions from HP-UX. I provide examples of some of these commands and list all of them in an upcoming section. |

Partition Manager	Partition Manager provides an interface (parmgr) through which you can interact with nPartitions. This interface can also be invoked from System Administration Manager (SAM).
Boot-Related Commands	There are several ways of interacting with nPartitions at the time of boot, including Extensible Firmware Interface (EFI) on HP Integrity Servers, Boot Control Handler (BCH), Initial System Loader (ISL), and other boot-related interfaces. I cover booting nPartitions in an upcoming section and describe these.

Working with nPartitions is all about navigation. You can easily forget at what level you're working when you start dealing with nPartitions. Are you at the console for the instance of HP-UX running in the nPartition? Are you at the nPartition level to see its status? What if you want to boot the nPartition? At what prompt should you be working? The navigation is especially confusing to new nPartition users so, let's look at working through the Management Processor menus before we work on any examples. Depending on the platform, HP uses the term Management Processor (MP), Guardian Service Processor (GSP), or Service Processor (SP). I use the term MP. The following figures show the *Consoles*, *Virtual Front Panel (VFP)*, and *Command Menu* selected from the *Main Menu* of the MP.

MP MAIN MENU

CO: Consoles
VFP: Virtual Front Panel
CM: Command Menu
CL: Console Logs
SL: Show chassis logs
HE: Help
X: Exit Connection

Consoles - Used to connect to the console of a partition to issue boot commands such as **hpux**, view the startup and shutdown messages, and log into HP-UX to issue commands.

Partitions available:

Part#	Name
-----	-----
0	Partition 0
1	Partition 1
Q	Quit

```

mpuser@Valhalla:~
Please select partition number: 1

Connecting to Console: Partition 1

(Use ^B to return to main menu.)

[A few lines of context from the console log:]
-----

SERvice menu                Displays service commands

DIsplay                    Redisplay the current menu
HElp [<menu>|<command>]    Display help for menu or command
REBOOT                     Restart Partition
RECONFIGRESET              Reset to allow Reconfig Complex Profi
-----
Main Menu: Enter command or menu >
-----
Main Menu: Enter command or menu >
Main Menu: Enter command or menu > bo pri
    
```

Figure 4-1 MP Consoles With Partition 1 Selected

MP MAIN MENU

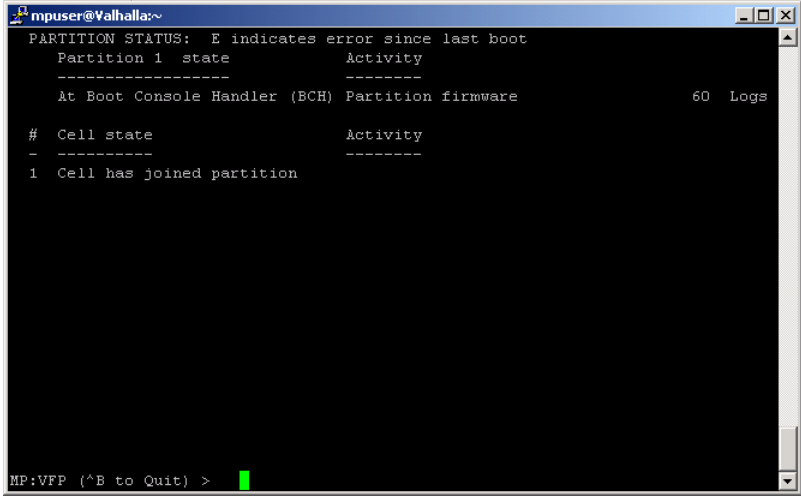
CO: Consoles
VFP: Virtual Front Panel
CM: Command Menu
CL: Console Logs
SL: Show chassis logs
HE: Help
X: Exit Connection

Virtual Front Panel - Used to connect to the VFP which provides information about the state of partition at any time. Information such as the state of boot and state of cells.

Partitions available:

Part#	Name
-----	-----
0	Partition 0
1	Partition 1
S	System Summary
Q	Quit

Please select partition number:



The screenshot shows a terminal window titled 'mpuser@Valhalla:~'. The output displays the following information:

```

PARTITION STATUS: E indicates error since last boot
Partition 1 state      Activity
-----
At Boot Console Handler (BCH) Partition firmware           60 Logs

# Cell state          Activity
- -----
1 Cell has joined partition

```

The prompt at the bottom is 'MP:VFP (^B to Quit) >' with a green cursor.

Figure 4-2 MP Virtual Front Panel (VFP) with Partition 1 Selected

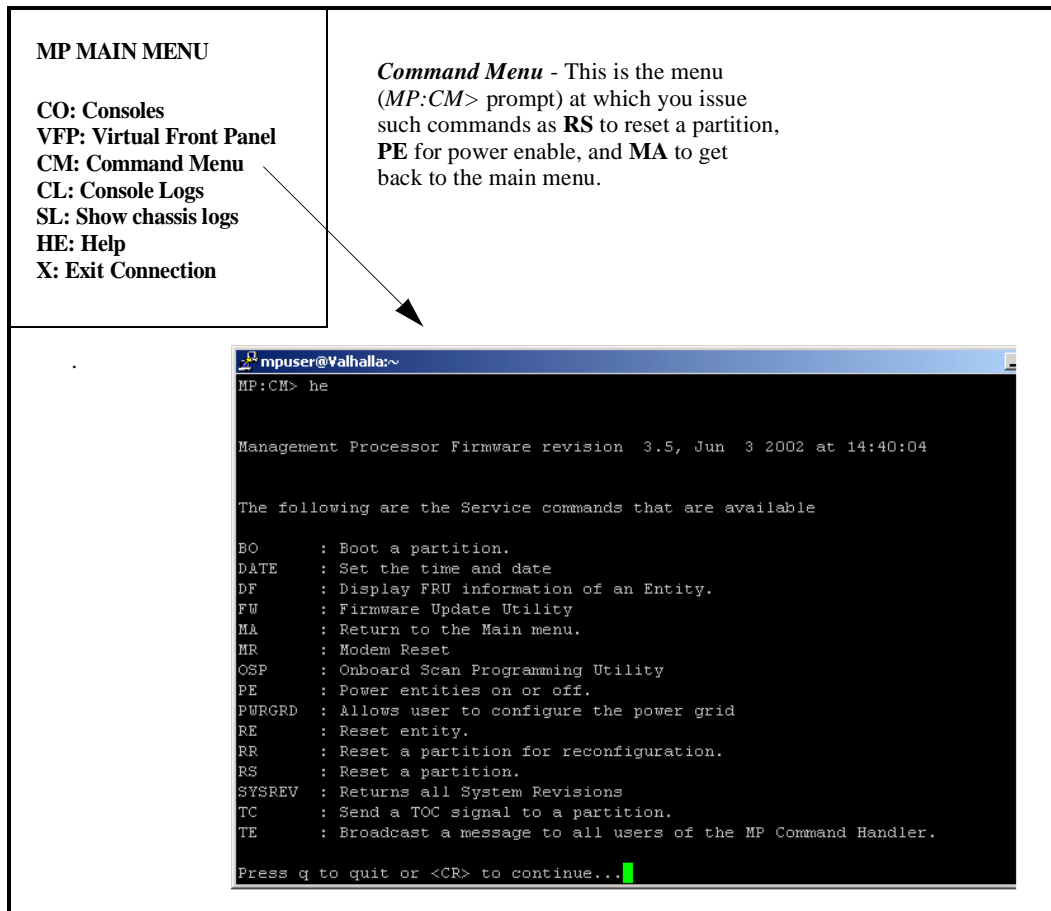


Figure 4-3 MP Command Menu

The *Command Menu (CM)* issues many commonly used commands, such as **rs** to reset a partition, **ps** to power on and off components including cell boards, cabinet, and I/O chassis, and **cp** to see to what partitions the cell boards are assigned. **he** summarizes the commands available to you. **ma** returns you to the main menu. The tear-out card in this book has a summary of MP commands.

The *Virtual Front Panel (VFP)* shows the status of the selected partition. At the time of boot, you can view stages that the partition goes through as it boots. These are not HP-UX boot stages; rather, they're stages related to system boot, such as firmware checks and other information that you'd view on the front panel of a system.

The *Consoles* menu allows you to get access to HP-UX consoles of all the hard partitions on your system. You select the partition to which you want to get access and you can log in to the instance of HP-UX running in the partition and issue HP-UX commands.

You can also see *Console logs* and *Chassis logs* through the *MP Main Menu* as well.

The Management Processor has the menus shown in the following table:

Table 4-1 Management Processor Menus

Menu	Description
CO: Consoles	Lists the available nPartitions, such as 0) Partition 0 1) Partition 1
VFP: Virtual Front Panel	Access to all partitions, including <i>System</i>
CM: Command Menu	Access to many Management Processor commands.
CL: Console Log Menu	Provides a way to view nPartition logs
SL: Chassis Log Menu	Provides a way to view chassis logs
HE: Help	Help for using Management Processor
X: Exit Connection	Exits Management Processor

As usual, the best way to learn about a topic is to work through some examples. The upcoming section covers some commonly issued commands for working with nPartitions, starting with the *Command Menu*, then using HP-UX commands at the *Console* interface.

Command Menu (CM) From the MP Main Menu

The *Command Menu* (MP: *CM*> prompt) is used for many nPartition-related functions, such as creating the first partition in a system, called the genesis partition, with the **cc** command. You can also view the status of existing partitions and components in the system with a variety of commands. In the following examples, I show a list of available *CM* commands and then issue some of them on a running system. These commands were issued on a 16-cell board HP Integrity Server, but the commands are similar on all systems. At the end of the section, I provide the steps for creating a genesis partition with the **cc** command. To get to the *Main Menu* with the *MP* prompt, you issue **^B** (*Cntrl B*). From the *Main Menu*, you select **cm**, then issue **he** to produce a list of Command Menu commands, and then issue **ma** to return to the *MP* prompt as shown in the following listing:

```
MP MAIN MENU:
  CO: Consoles
  VFP: Virtual Front Panel
  CM: Command Menu
  CL: Console Logs
  SL: Show Event Logs
  FW: Firmware Update
  HE: Help
  X: Exit Connection

MP> cm                                <-- Select Command Menu
      Enter HE to get a list of available commands
      (Use ^B to return to main menu.)

MP:CM> he                              <-- Issue help

Management Processor (MP) - FW Revision 14.12, Aug 17 2003 at 11:07:31
Utility Subsystem FW Revision Level: 14.12

The following are the service commands that are available
BO      : Boot a partition.
DF      : Display FRU information of an Entity.
MA      : Return to the Main menu.
MR      : Modem Reset
PCIOLAD : Activate/Deactivate a PCI card.
PE      : Power entities on or off.
RE      : Reset entity.
RR      : Reset a partition for reconfiguration.
```

```

RS      : Reset a partition.
TC      : Send a TOC signal to a partition.
TE      : Broadcast a message to all users of the MP Command Handler.
VM      : Margin the voltage in a cabinet
WHO     : Display a list of MP connected users

```

The following are the status commands that are available

```

CP      : Display partition cell assignments
HE      : Display the list of available commands
IO      : Display IO chassis/cell connectivity
LS      : Display LAN connected console status
MS      : Display the status of the Modem
PS      : Display detailed power and hardware configuration status.
SYSREV  : Display revisions of all firmware entities in the complex.

```

The following are the system and access config commands that are available

```

AR      : Configure the Automatic System Restart
CA      : Configure Asynchronous and Modem parameters
CC      : Initiate a Complex Configuration
CP      : Display partition cell assignments
DATE    : Set the time and date
DC      : Reset parameters to default configuration
DI      : Disconnect Remote or LAN Console
ID      : Change certain stable complex configuration profile fields
IO      : Display IO chassis/cell connectivity
IT      : Modify command interface inactivity timeout
LC      : Configure LAN connections
LS      : Display LAN connected console status

```

The following are the system and access config commands that are available

```

PARPERM : Enable/Disable Partition Reconfiguration
PD      : Modify default Partition for this login session.
RL      : Rekey Complex Profile Lock
SA      : Display and Set MP Remote Access
SO      : Configure Security Options and Access Control
XD      : MP Diagnostics and Reset

```

```
MP:CM> ma <-- Return to the Main Menu
```

```
MP MAIN MENU:
```

```

CO: Consoles
VFP: Virtual Front Panel
CM: Command Menu
CL: Console Logs
SL: Show Event Logs
FW: Firmware Update
HE: Help
X: Exit Connection

```

```
[hp2-hp1-hp5-n067] MP>
```

As you can see from this list, you can issue many categories of Command Menu commands.

Two of the first commands that you would typically issue are **ls** (to see the configuration of the MP LAN) and **lc** (to configure the MP LAN) as shown in the following example:

```
MP:CM> ls                                     <-- View MP LAN configuration with ls

Current configuration of MP LAN interface
MAC address   : 00:30:6e:05:c9:6a
IP address    : 192.168.0.22   (0xc0a80016)
Hostname      : rp8400b
Subnet mask   : 255.255.255.0 (0xffffffff00)
Gateway       : 192.168.0.1   (0xc0a80001)
Status        : UP and RUNNING
AutoNegotiate : Enabled
Data Rate     : 100 Mb/s
Duplex        : Half
Error Count   : 0
Last Error    : none

MP:CM> lc                                     <-- Change MP LAN configuration with lc

This command modifies the LAN parameters.

Current configuration of MP LAN interface
MAC address   : 00:30:6e:05:c9:6a
IP address    : 192.168.0.22   (0xc0a80016)
Hostname      : rp8400b
Subnet mask   : 255.255.255.0 (0xffffffff00)
Gateway       : 192.168.0.1   (0xc0a80001)
Status        : UP and RUNNING
AutoNegotiate : Enabled
Data Rate     : 100 Mb/s
Duplex        : Half
Error Count   : 0
Last Error    : none

Do you want to modify the configuration for the customer LAN? (Y/[N]) n
MP:CM>
```

ls displays the status of the MP LAN and, although I choose not to do so, **lc** allows you to modify the parameters related to the MP LAN. (As a side note, the default IP address of the MP is 127.0.0.1.) I had earlier configured the MP LAN interface to have an address on my local network. At the time that you first issue this command to configure the MP LAN, you probably have a console connected directly to the console port on the MP on your system. After the MP LAN is configured, you can connect over the LAN using *telnet* to access your MP LAN.

Because the MP is accessible from a network, it is possible that multiple users may be accessing a “window,” such as a console, at the same time.

You are instructed to gain control with *^Ecf*, that is, *Ctrl E c f*. The *Ctrl* key is pressed along with a capital E and then lower case c and f are pressed without the *Ctrl* key.

Next, I display partition cell assignments with **cp**:

```
MP:CM> cp <-- Display cell assignments with cp
```

Cabinet	0	1
Slot	01234567	01234567
Partition 0	XXXX....
Partition 1XXXX
Partition 2	XXXX....
Partition 3XXXX

This example shows that there are 16 cell boards in this system, evenly distributed among the four nPartitions.

To get detailed information on the hardware of the system, you issue the **ps** command and select **b** for the cabinet as shown in the following example:

```
MP:CM> ps <-- Display power and hardware with ps
```

This command displays detailed power and hardware configuration status.

The following MP bus devices were found:

Cab. #	MP	UGUY		Cells							Core IOs																
		CLU	PM	0	1	2	3	4	5	6	7	IO Bay 0			IO Bay 1			IO Bay 2			IO Bay 3						
												IO Chas.			IO Chas.			IO Chas.			IO Chas.						
												0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3
0	*	*	*	*	*	*	*	*	*	*	*	*				*											
1		*	*	*	*	*	*	*	*	*	*	*				*											

You may display detailed power and hardware status for the following items:

- B - Cabinet (UGUY)
- C - Cell
- G - MP
- I - Core IO

Select Device: **b** <-- Display cabinet information

Enter cabinet number: **0** <-- For cabinet 0

HW status for SD64A compute cabinet #0: NO FAILURE DETECTED
 Power switch: on; Power: enabled, good; Door: closed
 Fan speed: normal; Temperature state: normal
 Redundancy state: fans and blowers redundant, BPSs redundant

Main BP	IO Backplanes
Power	IO Bay 0 IO Bay 1

	Main BP	Boards 0 1 2	Cells 0 1 2 3 4 5 6 7	Chassis 0 1 2 3	Chassis 0 1 2 3
Populated	*	* * *	* * * * * * * *	*	*
Power Enabled	*	* * *	* * * * * * * *	*	*
Powered On	*	* * *	* * * * * * * *	*	*
Power Fault					
Attention LED					

	BPS 0 1 2 3 4 5	Cabinet Blowers 0 1 2 3	IO Fans 0 1 2 3 4
Populated	* * * * *	* * * *	* * * * *
Failed			

Voltage margin: nominal; Clock margin: nominal

UGUY LEDs: CLU Status PM Status CLU POST
 _____ * _____

Flex connections	Connected	Parity error	Connected to cabinet	Location (Upper/Lower)
XBC [7-0]	YYYYYYYY	NNNNNNNN	11111111	N/A
RC [7-0]	NNNNNNNN	NNNNNNNN	00000000	LLLLLLLL

PM firmware rev 14.4, time stamp: FRI APR 25 14:33:38 2003
 CLU firmware rev 14.4, time stamp: WED JUL 09 14:57:57 2003

MP:CM>

This output produces a wealth of information about the system. For example, there are two cabinets and four I/O chassis in this Integrity Superdome system. The **ps** command provides a good rundown on your system hardware. To return to the *Main Menu*, issue the **ma** command.

I issue these commands on a running system configured with four nPartitions. To create the first partition, called the *genesis* partition, issue the **cc** command from *CM*. Before creating the genesis partition, save all nPartition-related information with **parstatus -V -ppartition** in order to have all the information that you need to rebuild nPartitions. The genesis partition is created only at the time of initial installation and information related to other nPartitions in the MP is destroyed when the genesis partition is created. After you determine the components that you want to be part of the genesis partition, issue the **cc** command from the *CM* prompt and select the *g* option for genesis. You then have the genesis partition created and you can boot the instance of HP-UX that will run on it.

Next, I cover issued HP-UX nPartitions commands using the *Consoles* area of *MP Main Menu*.