Setting up your IBM eServer OpenPower server
A Fastpath for setting up a managed and unmanaged server

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Introduction

The recently announced IBM® eServer® OpenPower™ server offers developers and users an enterprise server tuned to run Linux®. And with one- to four-way processor offerings, these servers have the potential to be run in both enterprise and developer environments.

While Linux is no stranger to the server world, the OpenPower product line is certainly new to most people and differs significantly from any other server product line. OpenPower servers share many of the principles and attributes of their eServer pSeries® brethren, which could present a challenge for users who are new to this type of hardware. With features like logical partitioning (LPAR), dynamic logical partitioning (DLPAR), shared-processing, and virtual I/O, the configuration and setup scenarios are virtually never-ending[1]. This document describes a fastpath approach for the following basic set up scenarios:
- Setting up an OpenPower server in unmanaged mode
- Setting up an OpenPower server in managed mode

Before you begin

This document is intended for an audience who is familiar with Linux and for those who are somewhat familiar with the IBM pSeries hardware. In an effort to make this document a quick setup guide, the author has had to make a number of assumptions. This document does not cover usage of SMS and how to install Linux distributions. Furthermore, there are numerous ways to set up an enterprise server such as the OpenPower 720, for example. This document does not cover all of the different variations on setup but merely provides what the author considers to be the most direct method for getting Linux installed and running. In addition, while this document does discuss and delve slightly into partitioning, it does not discuss it in-depth by any means.

Before reading this document, you should be familiar with the following terms:

- **Unmanaged** – a server that does not have an HMC and has not been partitioned. Its tty output is displayed over a graphics card connected to a monitor or through a serial console.
- **Managed** – a server with one or more partitions. A server that is or will be partitioned requires an HMC.
- **Flexible Service Processor (FSP) –** The FSP is the firmware that controls resources, service activities, and enforces system capabilities.
- **Hardware Management Console (HMC)** – an Intel-based PC running specialized software that when connected to a server allows you to partition and do various service-oriented activities as well as virtual serial sessions with the partitions.

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1   For more information on these functions, see the white paper *Linux on IBM POWER5-based systems: An Overview for Developers at http://www-1.ibm.com/servers/enable/linux/pdfs/lop5overview.pdf*

Fastpath setup for unmanaged mode

If you have no plans or need to partition your OpenPower server, then you likely have no need for an HMC; not even for a tty console. You can use the built-in USB interfaces for keyboard and mouse input, and a monitor attached to a PCI graphics card for a console. You can even run X-windows in this fashion. If a graphics card is not available or is unnecessary, you may use a serial console session from another device, such as a laptop, for a main console.

Once you have the server cabled properly and have powered it on, the FSP will boot and output System Resource Codes (SRCs) to the control panel. The control panel is a small LCD on the front of the OpenPower server case as seen in Illustration 1.
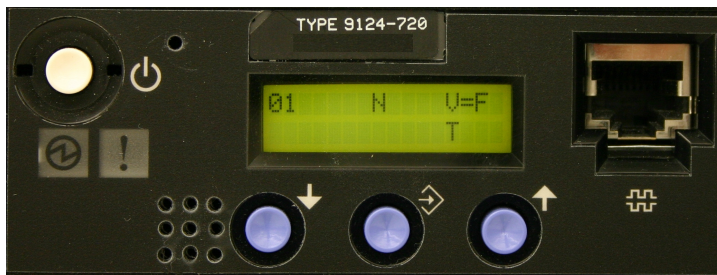
Illustration 1: LCD screen of an unmanaged OpenPower 720 server.

Once the FSP has booted, you can proceed to setting up the FSP. One of the first steps to configuring your FSP is to connect it to a network.

The following example uses a serial console to configure the FSP and power on the server. If you would prefer to use a browser to perform these actions, you should read Fastpath setup for managed (partitioned) mode on page 9 to learn how to setup, access, and configure the FSP. Even though those instructions are for a partitioned server, the FSP setup is nearly identical.

Network Setup

Security implications aside, it is very practical to connect your FSP to a trusted network. When the FSP is on the network, you can use a web browser to interface with the FSP, which offers such functions as powering your OpenPower server on and off. Again, you will have to weigh the security implications of exposing your FSP to a network connection, but in this example, the networks are trusted and the practical gains outweigh the risks.

To begin the network configuration of your FSP via the serial console, cable your laptop or PC to the serial connection port 1 on the back of the OpenPower server using a 15-pin null-modem cable. The serial ports can be seen in Illustration 2. Once connected, you can use a communications program like minicom (http://alioth.debian.org/projects/minicom/) or kermit to create the

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When an HMC is advantageous even for unmanaged mode

There are definitely situations when an HMC is useful even when you only intend to have a single partition on the system. One scenario that comes to mind is for kernel development and test or any situation where you need to reboot your Linux operating system frequently. After a partitioned system reaches standby mode, partitions can power on and off much faster than a unmanaged server.

When the system is in unmanaged mode and you power it on, the system goes through several levels of service checks and RTAS verifications. This is very time consuming. When you have a partitioned system (one or more partitions), each time you power on or off the system, it does not have to go through all of the same stages. A partitioned system has a stage known as standby mode. Most of the aforementioned checks occur as the system comes up to standby mode. After you reach standby mode, you can power on partitions and the boot times are quicker because the checks have already been done.

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serial console. The console session will respond to communications running at 19200[2] baud with data bits of 8, a parity of None, and stop bits of 1.
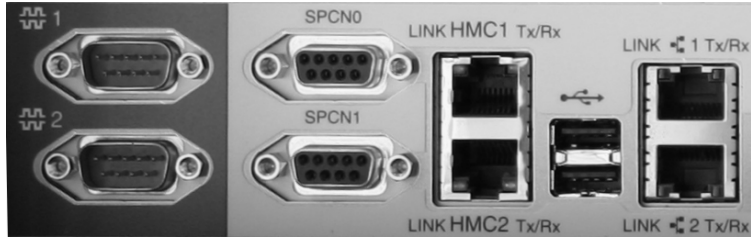
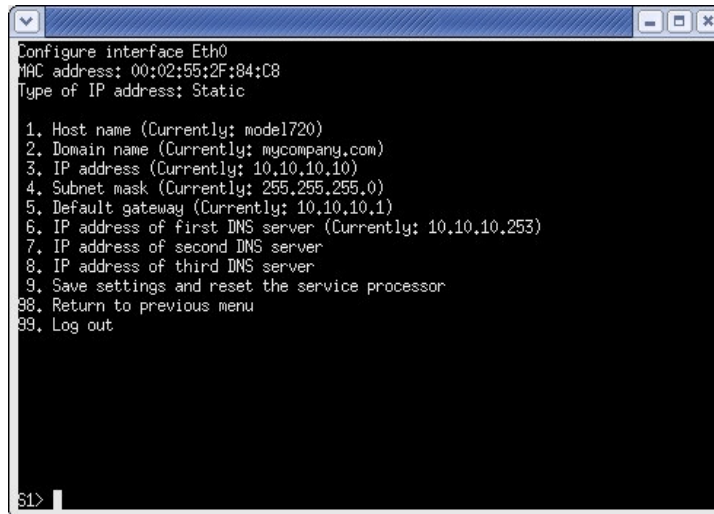**Illustration 2:** Partial view of the OpenPower backplane

If this is the first time you have worked with the FSP, you will be asked to set a variety of passwords. Be sure to retain these passwords.   For more information on setting passwords for the FSP, see http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/info/iphbp/chgpwd.htm. After setting the passwords, you will see a screen similar to Illustration 3[3].

Illustration 3: Main menu through serial ASM interface

From the serial console, select Option 5 (Network Services) and then Option 1 to work with the network configuration. If you have the Ethernet cable plugged into the HMC1 port (see Illustration 2 to identify the port), then you should set the network settings for eth0 (and as you might expect, port HMC2 is eth1). If you have DHCP services available, it's possible that the FSP will lease an address if you had the Ethernet cable plugged into your network during the FSP boot up. Nevertheless, you may want to set the IP address statically so that the FSP has a consistent, routable address and host name. An example of the network configuration is demonstrated in Illustration 4 on page 6.

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2   Baud rates were seen at 9600 as well; If when connecting via serial your communications you observe garbage characters, it's likely an issue with the baud rate.   If you cannot discover the speed setting, you can connect using the web ASM interface and verify or change the serial port speed settings.

3   With varying levels of firmware, you may find that the menus differ slightly.

Illustration 4: Network configuration through ASM serial interface

After you have set your network configuration information, you must select Option 8 to save the settings. This will cause the FSP to reboot[4].

Time and date setup

You will also want to set up the date and time for the hardware. From the main menu, select Option 4 (System Configuration) and on the next menu, select Option 4 (Time of Day) again. You will then see a screen similar to Illustration 5.

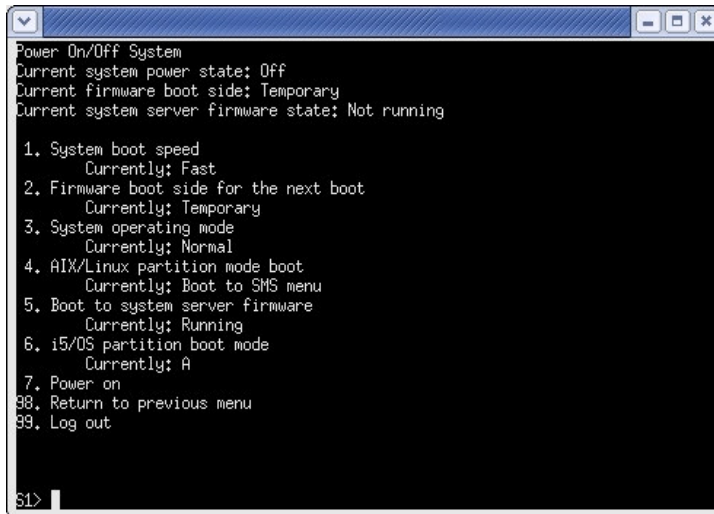**Illustration 5:** Date and time configuration through ASM serial interface

From this menu, you can set the current date and time. Remember the time is set in coordinated universal time (UTC).

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4   Newer versions of the firmware may not require a reboot of the FSP.

For more on UTC, see http://www.timeanddate.com/library/abbreviations/timezones/eu/gmt.html.

Configuring the Power on/off parameters for your server

Before you power on your system, you should set or verify the power on parameters for your OpenPower server. You can check these settings from the same serial console that was used to set the time and date. From the main menu, select Option 1 (Power/Restart Control) and then Option 1 (Power On/Off System). For stand-alone mode you will want your settings to be similar to those reflected in Illustration 6.

After you install a Linux distribution, you can change Option 4 from SMS to a different option like **Continue to operating system**. As its title indicates, this option will not prompt you to go into SMS and during the server power up process, it will continue on to booting yaboot and then the Linux kernel.

**Illustration 6:** Power control through serial ASM interface

Powering on your OpenPower server and starting the Linux install

Put the boot CDROM of your Linux distribution into the OpenPower CDROM drive. Now that your FSP has a network connection and the date and time has been set, you can power up the system to the next stage. This can be done in one of three different ways:
1. Press the white power button on the front of the server.
2. Use a browser connection which interacts with the FSP through the network settings you just completed.
3. Use the same serial console you have been using.

To power on the system using the serial console, select Option 1 from the main menu. Then select Option 1 again. If you select Option 7 (Power-on) the OpenPower server will begin to power up.

If you are using the serial interface, a short time after selecting the Power-on function, your serial session will appear to terminate. The session will appear to be unresponsive as the server progresses through its boot stages until shortly before it reaches SMS. Then the session will reactivate itself. Some terminal programs will hangup or drop connections during this boot up process. The HyperTerm application in most Windows® operating systems seems to be particularly sensitive to this sort of thing. Be sure to use a reliable communications program or choose a different method for your console if you are unable to find a reliable communications program. Eventually, you will get a screen similar to Illustration 7 on page 8.
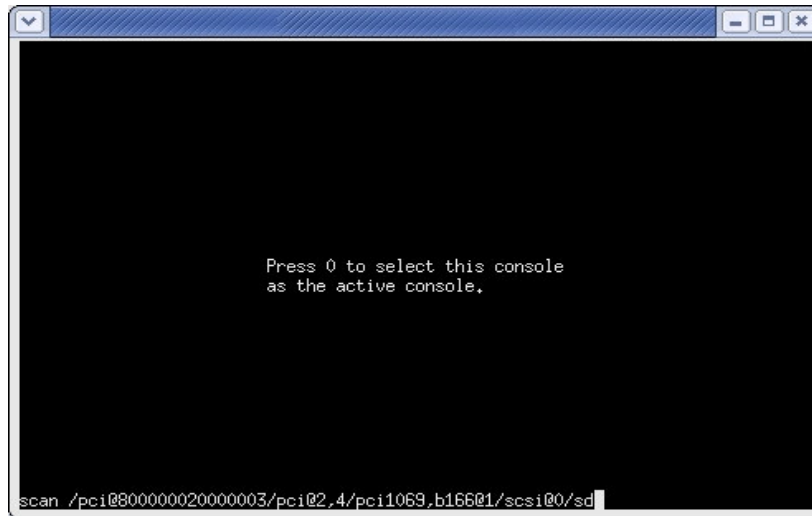
Illustration 7: Console activation and SCSI subsystem scan just before SMS

After you activate the console session and the scan of the physical devices completes, you will see the familiar SMS screens like Illustration 8.
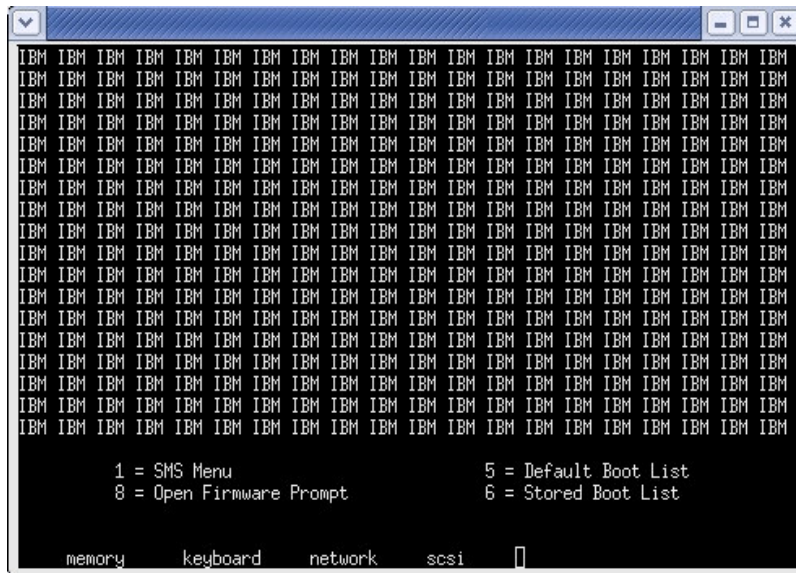
Illustration 8: Boot selection in ASM serial interface

After you see the above screen, you can select to get into SMS. Once in SMS, you can select which device to boot from. In this example, you would select the CDROM device. This should start the Linux install from the boot CDROM.

Fastpath setup for managed (partitioned) mode

For OpenPower servers that need to have more than one partition, an HMC is required. The HMC GUI is the interface for creating, managing, powering on and off, and debugging partitions. It can also provide a console for each of the Linux partitions.

Connecting the FSP and HMC to the network

As with the unmanaged scenario (see Fastpath setup for unmanaged mode), there is significant benefit to having your FSP on a routable network. This makes communications between the FSP and the HMC easier. It also makes communications with the FSP using the browser-based Advanced System Management Interface (ASMI) much more convenient. Consider Illustration 9.
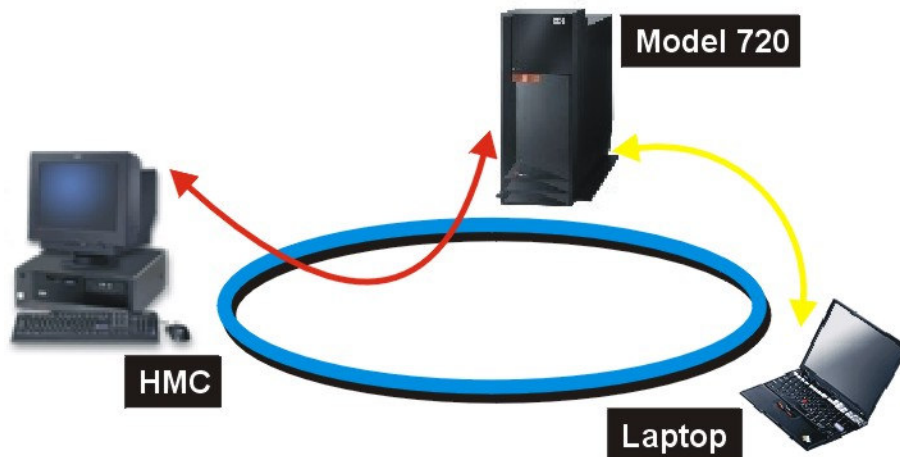
Illustration 9: Simple network layout an OpenPower server and an HMC

If the HMC and FSP are on the routable network, then you can access them from any location; otherwise, you might have to be in the same vicinity to access certain functions of the OpenPower server. As with adding any network device to a routable network, you must determine the risk of doing so based on the security of your network.

The FSP and HMC are preconfigured to use DHCP to obtain network information. It's the author's experience that using static network information is more reliable, especially when you do not have authority or access to the IP information the DHCP server is issuing. Furthermore, it eliminates the possibility, however remote, that the IP addresses of the HMC or OpenPower FSP change.

Connecting the HMC to the network

As part of the HMC install, you may have setup the network information for the HMC. If that network information is accessible by the proposed IP address of the OpenPower FSP, then you can skip this section. Otherwise, from the left-hand navigation pane of the HMC do the following:

1. Expand **HMC Management**
2. Click **HMC Configuration**
3. Select **Customize Network Settings** in the right-hand frame. This will create a dialog similar to Illustration 10.
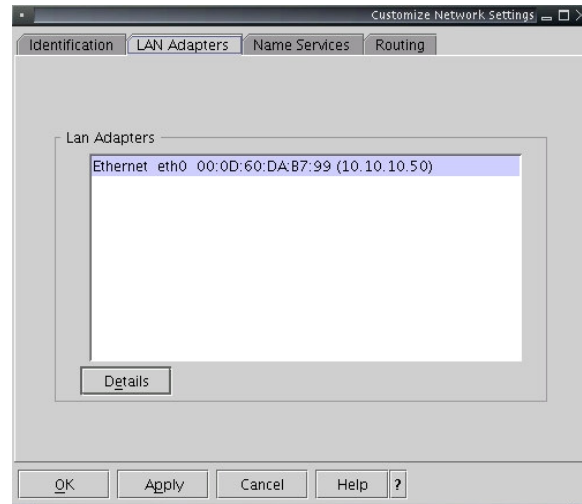
Illustration 10: HMC network configuration

In this case, the HMC only has one network connection. You can set the IP address and subnet mask of the interface by highlighting the interface and clicking the **Details** button. After setting the IP address and subnet mask, set the default route on the **Routing** tab and the DNS information on the **Name Services** tab. After you are satisfied with the network information, you must reboot the HMC for the changes to take affect. Do so at this time so you can continue on to making a connection between the HMC and the FSP described later.

Connecting the FSP to the network

Begin by plugging the port labeled HMC1 on the back of the OpenPower server into your network. This will later be referenced as eth0 in the configuration interface. The next step is to create a network connection between the FSP and another device such as a laptop or PC which is what you can use the HMC2 port for. Using a regular Ethernet cable, connect the port labeled HMC2 directly to a network card port on a laptop or a PC. Both the HMC1 and HMC2 ports can be seen in Illustration 2 on page 5 for reference.

The HMC2 port will default to 192.168.3.147[5] if no DHCP lease can be obtained. Next, configure the network interface on the laptop to something in the 192.168.3.0 subnet; for example, 192.168.3.150. On the laptop, use a browser to access ASMI at the following URL https://192.168.3.147/ .

If this is the first time you have accessed the FSP, you will likely be asked to change passwords for several users. Once you have set the passwords, you can now set the date and time.

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5   If no IP address is leased with DHCP on HMC, it will default its IP address to 192.168.2.147. You can use either HMC1 or HMC2 for connecting to ASMI. The author prefers to connect HMC1 to the LAN and use HMC2 as a backup method of connecting.

Set the date and time

One of the first setup steps you should do is set the correct date and time for the FSP. This not only sets the hardware clock for the Linux partitions but it also makes the FSP log files accurate. To set the date and time, click **System Configuration** and then click **Time of Day** as shown in Illustration 11.

Be sure to set the time in UTC format and then click the **Save Settings** button. If you need help setting the time in UTC format, the following URL might be of some help:http://www.timeanddate.com/library/abbreviations/timezones/eu/gmt.html.
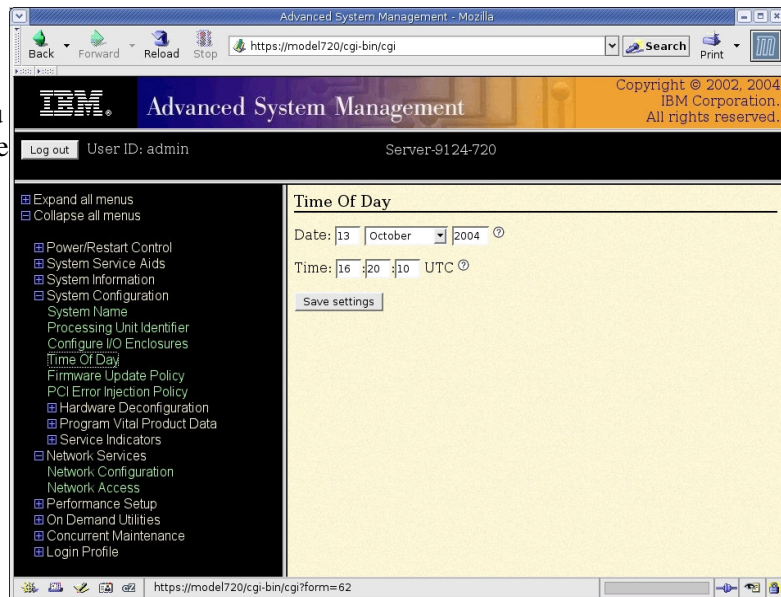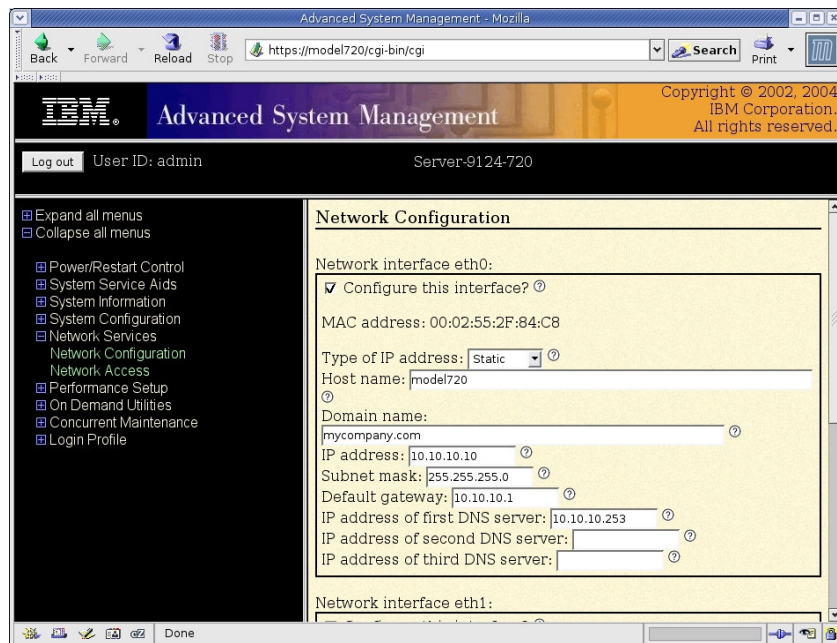
Illustration 11: Date and time configuration using the browser interface

Configure the network for the FSP

In the left-hand navigation bar, click on **Network Services** and then click **Network Configuration**. This will display the Network Configuration in ASMI as seen in Illustration 12.
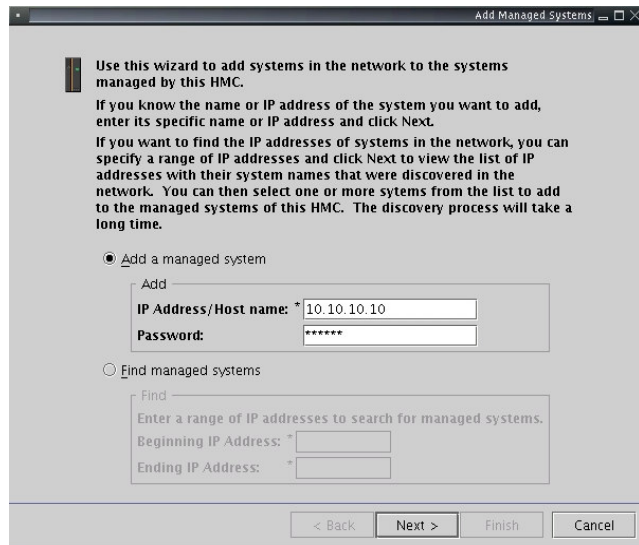
Illustration 12: Network configuration through browser interface

Since the HMC1 port is connected to a routable network, you need to configure eth0. Be sure to check the **Configure this interface?** Option and select **Static** as the type of IP address. At a minimum, you must fill in the host name, domain name, IP address, subnet mask, and the default gateway. If you recall the example network configuration for the HMC in Illustration 10 on page 10, the HMC IP address was set to 10.10.10.50. With the FSP IP address now being set to 10.10.10.10, network communication will be possible. Once you are satisfied with your network configuration, click the **Continue** button. You will be asked to review the information before submission. Submitting the information will cause the FSP to reboot.

Establishing communications between the HMC and the FSP

After the FSP reboots, it will use the new network configuration. The next step is to create communications between the HMC and the FSP. This is done by adding a managed system to your HMC. The managed system is your OpenPower server. To add a managed system to your HMC, you will need to use the HMC interface. From the **Server Management** menu, select **Add Managed System** and a dialog similar to Illustration 13 will appear.

Illustration 13: Adding a managed system to an HMC

When you have entered the IP address of your OpenPower FSP and the password, click the **Next** button and then click **Finish**. After a short wait, the OpenPower server should appear under the Server Management section in the left-hand navigation of the HMC interface.   The status of the server should be **Power Off** as shown in Illustration 14.
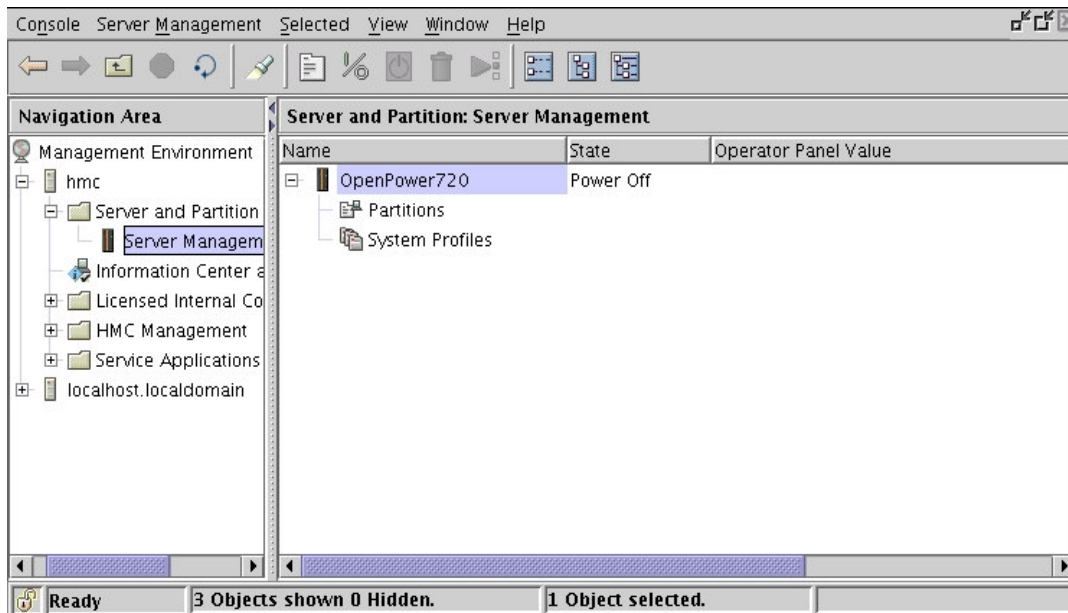
Illustration 14: OpenPower system added to an HMC in the Powered Off state

Partitioning your OpenPower server

Before you can partition your OpenPower server, you must power the system to a partition-standby state. To power on to standby, right-click on the managed system and select **Power On** to launch another dialog that will prompt you for power on options. Select **Partition Standby** and click the **OK** button. This will trigger the system to continue on in its boot process and it will do several service-related checks on its way to standby. You will also see SRCs incrementing on the front panel as well as in the State column on the HMC interface. For more information on what these SRCs mean, see
http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/index.htm?info/ipha3/reference_codes_overview.htm

After a couple of minutes, the HMC interface will display something like Illustration 15.
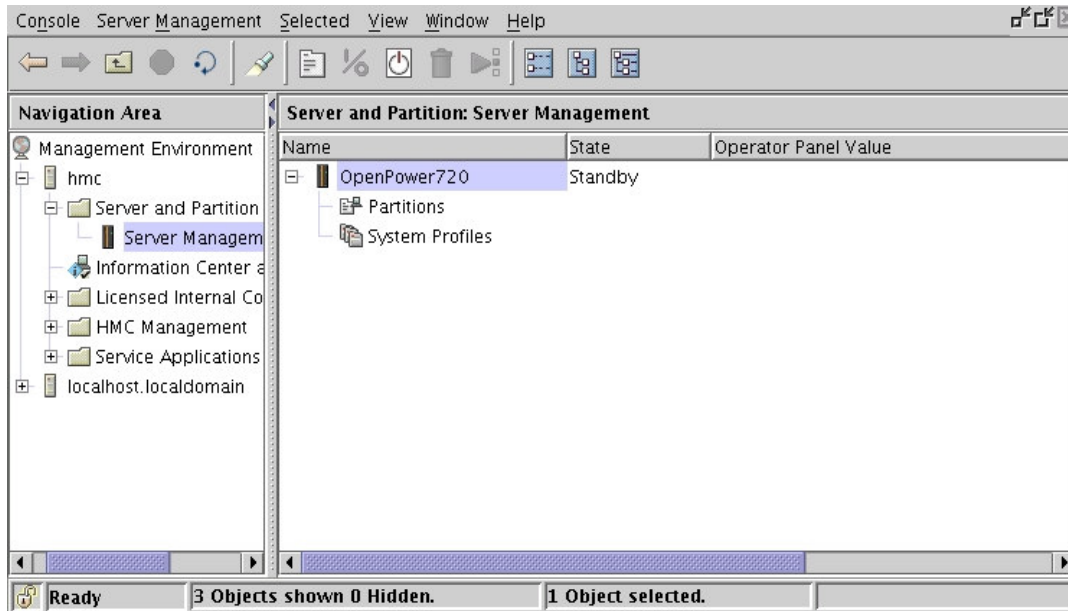
Illustration 15: OpenPower system in the standby power state

You may now partition your OpenPower server according to your needs. For more information on partitioning your OpenPower servers see,
http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/index.htm?info/iphbi/iphbikickoff.htm

Powering on and installing Linux on an OpenPower Partition

Once your partitions have been created, you can install Linux on them. Insert the boot CD provided by your Linux distributor into the CDROM. Next right-click the partition profile that you want to activate and select **Activate**. This will launch another dialog to confirm the power on request and give you an option to open a terminal window or console session. Make your choice and then click **OK**.

The partition will then begin to power on and in whichever console you decided to use you will soon see SMS. From there, you can select which devices to boot from and set the boot device order.

Stages of the control panel

You will see three different idle stages on the front panel LCD. Furthermore, depending on whether your system is managed by an HMC or in unmanaged mode, the panel output will be different. This becomes important if you receive a server that has been used previously and you want to quickly determine if it was using an HMC or not. The following examples show the LCD screen of an OpenPower 720 server. LCD screens on other OpenPower server models might differ slightly. The LCD panel for a machine in unmanaged mode appears like one in Illustration 16 on page 15.
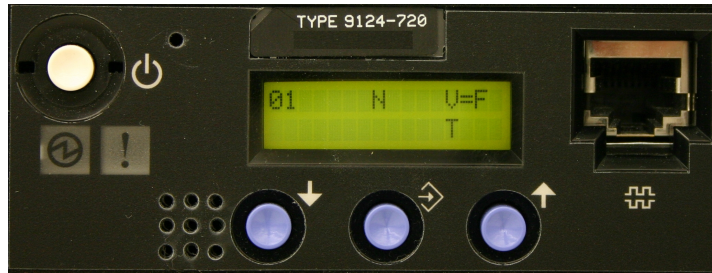
Illustration 16: LCD control panel of an unmanaged system

A managed system has two iterations on this image. Illustration 17 is the LCD output of a managed system that has no current connection with the HMC.
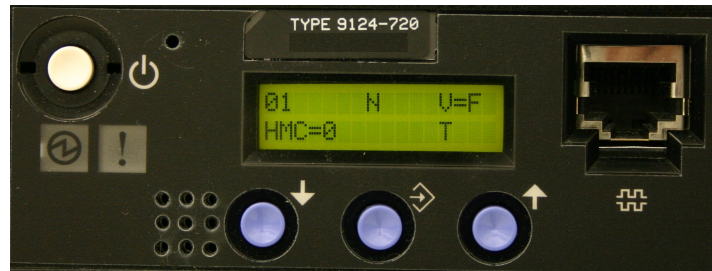
Illustration 17: LCD control panel of a managed system having no HMC communication

Notice in Illustration 17 the output of HMC=0. The notation of HMC= means that this is a managed system. The 0 means that communication between the FSP and HMC is not successful. Numerous factors can contribute to loss of communication including cabling, IP addresses, and the HMC not being powered on or configured properly. Illustration 18 represents a managed system with successful communication.

Illustration 18: LCD control panel of an managed system that has communication with an HMC

If you receive a system that you intend to run in unmanaged mode but you get the HMC= notation, you must reconfigure the FSP to run in unmanaged mode. If you have an HMC available, you can follow the process described at the following web page to reset the FSP into standalone mode:
http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/index.htm?info/iphbl/iphblresetserver.htm.

If you do not have an HMC, you can use the serial console connection as described in Fastpath setup for unmanaged mode on page 4 to connect to the FSP. Once logged in, you can select an option to Reset to Factory Defaults. Both methods will erase any partition data; however, data on the hard disks are still retained. If you use the serial process, the passwords will also be reset

to their defaults; this is not true of the HMC reset method.

Summary

Whether setting up the OpenPower server as a managed or unmanaged system, the procedure is almost identical. You can either use the serial or ASM interface to setup an unmanaged system. To setup a managed system, it is probably more practical to do with the web interface because once the FSP makes a successful connection with the HMC, the serial interface can no longer be used. The managed system also requires the setup and configuration of an HMC so that the system can be partitioned.

About the Author

Brent Baude is a Linux consultant for the IBM eServer Solutions Enablement organization at IBM. He is based in Rochester, Minnesota. Brent's main role is to help solution developers bring their applications to Linux on POWER. Also while in Rochester, Brent has held various positions in the iSeries development lab.

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