

Getting to Know the New LPAR Worksheet

Follow this detailed guide to planning for LPAR.

by Garrett R. Winn

With V4R4, your multiprocessor AS/400 server is capable of using Logical Partitioning (LPAR), the ability to make one multiprocessor server (any 6xx, 7xx, 8xx, or Sxx server) run as if it were two or more servers. This is accomplished by dividing the hardware resources into a primary partition and one or more secondary partitions. The primary partition acts as the “parent” partition and can perform administrative functions on the secondary partitions.

You can take a server and essentially divide it into two or more independent systems, all residing on the same AS/400. This not only reduces the amount of necessary server space but also helps you maintain a separation between the various types of systems. For instance, you can put a development server and a production server into one AS/400 but keep them in separate partitions so that a failure in one partition will not affect the other. (However, failures in the primary partition will bring down all other partitions, since the primary partition performs administrative functions over the secondary partitions).

For more information about LPAR, see the Logical Partitions section under the System Administration, Availability, and Maintenance heading on the IBM AS/400 Infor-

mation Center Web site (www.as400.ibm.com/infocenter).

The actual creation and administration of a partitioned server is fairly easy and straightforward: You treat each partition as if it were a separate server. Planning for LPAR, however, can be a complex and lengthy process. Because of this, IBM has provided the AS/400 Logical Partitions Configuration Planning Worksheet on its Logical Partitioning Web site (www.as400.ibm.com/lpar), which will guide you and your Business Partner (BP) or marketing representative through the necessary steps to getting all the hardware resources you need to create partitions on your AS/400 server. You may want to view this worksheet as you read this article to help you understand what’s being discussed.

Although the worksheet has been around since V4R4, it has recently undergone a significant change, making planning and implementation easier and more accurate. The purpose of this article is to acquaint you with the worksheet and the process of planning for LPAR on your AS/400.

The Worksheet, New and Improved

Originally, the AS/400 Logical Partitions Configuration Planning Worksheet was part of the *AS/400 Logical Partitions Hardware*

Reference Guide, a manual of about 60 pages. It took a lot of time to get through and required significant hardware knowledge to successfully complete. In late January, IBM released the new version of the worksheet, which features a shorter (15 pages) guide for completing the worksheet and more detailed instructions and processes. This was the result of the increased demand for LPAR, specifically for hardware validation of proposed configurations. The new version of the worksheet does not require a lot of reading on your part. It can be downloaded as a Lotus WordPro or Microsoft Word document or viewed and printed online; the guide for completing the worksheet can be downloaded or viewed separately as well.

The main change to the worksheet is the solidification of the planning process, which involves four steps. These steps are included in three separate sections in the worksheet:

- *Section 1* lets customers record the hardware resource requirements for the partitioned system.
- *Section 2* involves entering hardware resource information into one of the AS/400 configurators by a BP or marketing representative.
- *Section 3* lets the BP or marketing representative create a system schematic and fill in additional hardware information for the

partitions, which is then sent in to IBM for validation along with the configurator output.

Another significant addition to the worksheet is the requirement of a system schematic. The basic schematics for 7xx and 8xx servers and expansion units are included in the worksheet. Those who want to do LPAR on a 6xx or Sxx server can use the 7xx server equivalent (720 for 620 or S20; 730 for 640 or S30; or 740 for 650 or S40). The schematic is a great way to visualize how the system will be set up and helps to make each configuration more accurate.

What It Means to Customers

What does all of this change mean to you, the person planning to implement LPAR? It means that you need to do a little decision-making and planning (but less than what was required with the previous version of the worksheet). It also means that you can define the requirements that your BP or marketing representative can use, allowing you to determine which server best fits your needs; otherwise, you can follow the process used in the previous version of the worksheet, determining the server first, then defining your requirements for each partition.

What It Means to BPs and Marketing Reps

The new worksheet formalizes the process that many of you BPs and marketing representatives have already gone through in creating LPAR solutions for your customers. It logically organizes the information, making it easier to create configurations based on your customers' needs. You can complete the worksheet either solely (with some basic customer information) or by working closely with your customers before sending it in to IBM for validation.

It may also be beneficial for you to create a few basic configurations and hand out the worksheet to your customers. This could speed up the process of completing the worksheet and help your customers decide how to implement partitions for their businesses.

Steps for the Customer

Before diving into the worksheet, it would be helpful for you to learn a few things up front and make a couple of decisions about how you want to implement the partitions. Although these concerns are beyond the scope of this article, you should understand the basics contained in the Learning about logical partitions section of the Information Center (www.as400.ibm.com/infocenter) I mentioned.

Preliminary Planning

The most important choices to make at this point are whether to use bus-level or input/output processor-level (IOP-level) partitioning, whether or not to use hardware and device switching between partitions, and whether to upgrade an existing server or order a new server to support LPAR. After you have made these decisions, you can better determine how many partitions you want on the server. The number of partitions you need depends on your business needs and how much separation you want. (Currently, you cannot have more than 24 partitions on a single server, since each partition must have at least one processor assigned to it. No LPAR-capable server has more than 24 processors.) Next, you should perform capacity planning for each partition to determine your basic resource requirements.

After you do this preliminary planning, you will find it much easier to complete Section 1 of the worksheet. It will also help you to get the right system for your needs.

Completing Section 1

You start off the worksheet by defining your hardware requirements for each partition. If you need more than six partitions, you can

Planning for LPAR can be a complex and lengthy process.

just add rows to the table. You may notice right away that the partitions are numbered, starting with 0. Although it can be confusing at first, this convention helps you to remember that partition 0 is the primary partition and that it is different from the secondary partitions.

Use the Capacity Planning Study

After specifying the names for each partition, you are ready to define the requirements for each partition. I found it easier to take the information from the Capacity Planning study obtained through IBM Global Services and go through each partition individually before moving on to the next. This was mostly because I hadn't picked a specific system first, and I just wanted to get all the information so that I could determine what kind of system I needed. If you already know what server you want, it would be useful to complete some of the columns of information (e.g., defining the amount of interactive performance and making sure the total does not exceed what the selected server currently supports).

You'll need to specify total performance (Commercial Processing Workload, or CPW) and interactive performance. The *AS/400*

Logical Partitions Hardware Reference Guide (www.as400.ibm.com/lpar/plan.htm) contains tables that show the possible system CPW and interactive performance for each system.

For the disk capacity information, you need to specify the total capacity that you require in each partition. Using parity protection (RAID) or mirroring will reduce the usable amount of disk capacity, but you should still provide the total amount you require, not the total of what will be usable.

Include Hardware Device Requirements

Next, specify what other hardware you need in each partition. You need to have at least one tape device and one CD-ROM drive for the primary partition. If you are hardware switching, you need one of each of these devices for the secondary partitions involved in the switching. Secondary partitions that do not participate in switching need one of each device. You must also have at least one console for each partition. You should indicate the amount of a particular hardware resource you need (e.g., two CD-ROMs per partition). Be sure to add the total at the bottom of the worksheet. At this point, all you need to

know is what types of hardware you want and how many of each you need. You don't need to have a specific device in mind, although if you do, give this information to your BP or marketing representative for completing Sections 2 and 3 of the worksheet.

Enter General Hardware Information

The final part of Section 1 involves completing a table of general information about the partitions. You need to specify:

- The type of console you would like for each partition (twinax workstation or Operations Console). Operations Console provides a graphical interface for working with a server. Currently, however, there is no specific support for LPAR in Operations Console. You will still have to use DST to configure and manage your partitions and resources.
- Whether or not a partition should have Electronic Customer Support. Each partition can have its own Electronic Customer Support connection, or you could just have it in the primary partition and distribute PTFs and other information to the secondary partitions by other means. Whatever you choose, each partition with it needs a communications line and a modem.
- What disk unit size you prefer depending on

business needs.

- Whether to use mirroring or parity protection (RAID).
- What partition technology you prefer (SPD or PCI). SPD technology is more flexible about hardware placement than PCI. IBM recommends PCI technology in general, but partitioned systems require a lot of extra IOPs, which may be better suited to SPD technology. Either technology will work, but you may need to make some adjustments depending on your choice.

If you are unsure about what to answer here, contact your BP or marketing representative.

Your last task is to provide this information to your BP or marketing representative. You can either work together on the rest of

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the steps or let them take it from this point. If you are letting them take it from here, read the next section to learn what they will be doing.

Steps for the BP or Marketing Rep

Using the information gathered in Step 1, you should be able to determine what server is needed to fulfill all of the customer's requirements. You will need to determine this before using the configurator (available from IBM's Web site) to enter the information from Section 1 of the worksheet.

Use the Configurator

When you use the configurator for Section 2 of the worksheet, remember to specify *feature code 0140* for each partition. This will check your proposed configuration for the necessary load source and console requirements. However, the configurator will not check against any other requirements, so it is up to you to make sure that all of the requirements are met.

If you are doing this for existing hardware, you should be able to get the existing configuration and download it into the configurator. Make sure you check the existing configuration against the actual hardware and correct any inconsistencies so that the most accurate record possible is used. In any case, the configurator will provide you with feature code information that you can use to complete Section 3. You have to provide the final version of this configuration output to IBM in either OUT or TXT format or Rich Text Format (RTF). IBM will not accept the CFR or WIP format for configurations.

Create a System Schematic

Section 3 of the worksheet requires you to create a schematic of the system that you wish to configure. First, you configure the number of processors, interactive performance, and main storage per partition. (You can get most of this information from Section 1.) To determine how many processors you need in a partition, you must first determine the amount of CPW available for each processor (total system CPW divided by total number of processors). Next, find the number of processors required in a partition (system CPW required in the partition divided by amount of CPW available for each processor). Take the result and round up to the next whole number. This is the number of processors that you must have in the partition.

You will also need to define the percentage of interactive performance needed for each partition. Take the interactive performance CPW required in the partition (defined in Step 1) and divide it by the total interactive performance CPW on the system. Multiply the result by 100 to get the required percentage. Since partitions must have a whole percentage number, you need to round up or down. This percentage will be used during the creation of the partitions. The interactive performance percentage cannot be less than 1.5 percent of the system CPW for the partition.

Finally, you need to specify whether or not each partition will use virtual OptiConnect for communication between partitions. Although this will not require additional hardware, it does require a license for either OptiConnect/400 or OptiMover for OS/400 software before it can be used.

Now you are ready to complete the schematic, using the pages from the worksheet. You should delete unused servers and expansion units and create duplicates for expansion units that will be used more than one time. To complete the schematic, use the latest version of the Redbook *AS/400e System Handbook*, along with the extra rules provided in the guide to completing the worksheet.

For the system and each expansion unit, be sure to indicate the bus number, which partition will own the bus (even if the bus is shared, one partition must be defined as the owner—this can be the primary partition if all buses will be shared), and whether the bus will be dedicated to the partition or shared with other partitions. If a bus is dedicated, all the IOPs and IOAs on the bus must be

assigned to the partition that owns the bus. If a bus is shared, any partition can use any IOP and its IOAs. These two types of partitioning are known as bus-level and IOP-level partitioning, respectively. IOP-level partitioning is as low as you can get. You must assign all IOAs and devices on the IOP to a single partition. It is not possible to assign parts of an IOP to different partitions.


Enter Additional Hardware Placement Information

After you are done with the schematics, you will notice a section for additional hardware placement information. Use the tables in this section to provide specific information about the load source disk unit, the console, and the alternate IPL device, and to provide general information about the disk units. (This is an important part of Section 3.) You can verify the schematic and placement rules with what you enter here and show device switching more easily. The information in this section is for the services person who will move hardware resources to the appropriate places and get the system ready for partitions. Complete the tables for every partition that will be on the system.

Send Everything to IBM for Validation

Finally, you BPs and marketing representatives gather all of the information and to send it to IBM for validation. You need to send the completed worksheet, the configuration report, and any additional information that you think IBM needs to validate the proposed configuration. This information can be sent either by fax or by email. Email is probably the best, since you can attach both the worksheet and the configuration file easily.

IBM validates the worksheet and sends it back to you, either with corrections or with approval. The BP or marketing representative can now update the configurator data and submit the order. You should keep the worksheet handy for setting up the hardware and the partitions.

Although a lot has changed with the worksheet, you should find it easier to follow and complete. This new worksheet will help you plan partitions quickly and get them on your system with fewer difficulties. 

Garrett R. Winn has worked with LPAR, at IBM Rochester, as a software engineer since V4R4, and he has written much of the current documentation about LPAR in the IBM AS/400 Information Center and on the Web. Garrett can be reached by email at garrettwinn@hotmail.com.

REFERENCES AND RELATED MATERIALS

- AS/400 Information Center Web site:
www.as400.ibm.com/infocenter

- AS/400 Logical Partitions Hardware Reference Guide: www.as400.ibm.com/lpar/plan.htm
- AS/400e System Handbook, Redbook (GA19-5486-20)
- IBM Logical Partitioning Web Site: www.as400.ibm.com/lpar
- *Slicing the AS/400 with Logical Partitioning: A How to Guide*, Redbook (SG24-5439-00)

