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Creating IBM i Client Partitions Using Virtual Partition Manager

Introduction

This IBM® Redpaper™ provides steps, considerations, limitations, and links to information regarding the creation of IBM i Client Partitions using the third generation of Virtual Partition Manager (VPM).

Beginning with IBM i 7.1, the Virtual Partition Manager was enhanced and now allows you to create and manage Linux partitions and IBM i partitions without the use of the Hardware Management Console (HMC), Systems Director Management Console (SDMC), or Integrated Virtualization Manager (IVM). It involves the use of VPM and the new support for Ethernet layer-2 bridging between a physical Ethernet adapter and a virtual Ethernet adapter that provides the ability for an IBM i partition to share a physical Ethernet connection with other partitions in the same system.

The intended audience for this Redpaper publication is advanced system administrators.

Virtual Partition Manager Enhancements to Create IBM i Partitions

The Virtual Partition Manager (VPM) is a partition management tool that supports the creation of partitions that use only virtual input/output (I/O) and does not require the Hardware Management Console, Systems Director Management Console, or Integrated Virtualization Manager. In addition to being able to manage Linux guest partitions, the VPM now supports creation and management of IBM i partitions.

This enhanced VPM function is available on IBM POWER6® and IBM POWER7™ IBM Express Servers™ that do not have an external management console. With this enhancement to IBM i 7.1, the ability to create up to four IBM i partitions are enabled in VPM. Client IBM i partitions, which are created with VPM, use virtual I/O to connect back to the IBM i I/O server partition to access the physical disk and network. VPM in the IBM i I/O server

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partition creates the virtual SCSI and virtual Ethernet adapters for the client partitions. The user can then use Network Storage Spaces (NWSSTG) and Network Storage Descriptions (NWSD) in the IBM i I/O server partition to define the storage for the client partitions. Tape, disk, and optical are allowed to be virtualized to the client partitions.

The IBM i Client partitions can be IBM i 7.1 or IBM i 6.1 with either 6.1 or 6.1.1 machine code. A PowerVM license is required to partition the server using VPM.

Ethernet Layer-2 Bridging

The latest IBM i V7R1 Technology Refresh has new support for Ethernet layer-2 bridging between a physical network and the IBM Power Systems™ virtual Ethernet. Using layer-2 bridging, one Ethernet port in an IBM i partition can provide network access for other logical partitions on the same platform. This cooperation is similar in functionality to the Shared Ethernet Adapter (SEA) support provided by a Power Systems Virtual I/O Server (VIOS) partition.

This system works by putting two Ethernet adapters (one physical, one virtual) into a mode where they can receive traffic that is not specifically destined for their address and selectively sending those frames onto the other network according to the IEEE 802.1D standard ("bridging"the frames). Because of this, frames transmitted by virtual Ethernet adapters on the same vlan as the bridging virtual Ethernet adapter can be sent to the physical network, and frames from the physical network can be received by adapters on the virtual network.

Preparing for Ethernet layer-2 bridging

To get started with the configuration of Ethernet layer-2 bridging, you must select a physical Ethernet resource to use for layer-2 bridging. Here are the general requirements that an Ethernet resource must meet to use Ethernet layer-2 bridging:

- The system must be running with the newest level of PTF Groups, Technology Refresh Groups, and Cumulative Package.
- Any Ethernet resource that supports line speeds of 1Gbps or greater is supported, except for Host Ethernet Adapter (HEA) resources. Host Ethernet Adapter already supports the ability for multiple partitions to use a single physical port by assigning each partition a logical port.
- It must not be in use by any varied-on line description, LAN console, or remote support.
- An aggregate line description can also be used to bridge traffic to the external network.
- A virtual Ethernet resource must be available for layer-2 bridging with access external network enabled:
  - If using a Hardware Management Console, a virtual Ethernet adapter must be created for the desired VLAN ID, and the Access external network box must be checked to indicate that this virtual Ethernet adapter will be used to bridge traffic to the physical network.
  - If using the IBM i Virtual Partition Manager, the virtual Ethernet adapter is automatically created with the ability to access the external network.
- A unique alphanumeric name (up to 10 characters) must be chosen for the bridge identifier.

Note: Use the selected Ethernet resources only for layer-2 bridging (not for IBM i TCP/IP configuration). Even when you can use it for TCP/IP, there is significant processing overhead for any host traffic that uses bridged resources.

Configuring Ethernet layer-2 bridging

In this section, we provide the general configuration steps that you must do to get Ethernet layer-2 bridging up and running:

1. Create an Ethernet line description for the physical Ethernet resource, and set its Bridge identifier (BRIDGE) to your chosen bridge name.
2. Create an Ethernet line description for the selected virtual Ethernet resource, and set its Bridge identifier (BRIDGE) to the same bridge name.
3. When both line descriptions are varied on, traffic is bridged between the two networks, and any other partitions with virtual Ethernet adapters on the same VLAN as the new virtual Ethernet resource can access the same network as the physical Ethernet resource.

Common errors

CHGLINETH cannot be used to change the Bridge identifier of a line description that was created prior to the latest TR. If equivalent behavior is desired:

1. Use the Copy option on WRKLIND to make a temporary copy of the line description.
2. Delete the existing line description.
3. Use the Copy option again on WRKLIND to replicate the original line description, specifying the desired Bridge identifier.
4. Delete the temporary line description.

No more than one physical Ethernet adapter's line description with a given Bridge identifier can be varied on at the same time. Likewise, no more than one virtual Ethernet adapter's line description with a given Bridge identifier can be varied on at the same time. An error is returned when trying to vary on any more line descriptions with that Bridge identifier, indicating that the configuration is in error.

For a given bridge, select one physical Ethernet line description and one virtual line description to be bridged. If more than one bridge is required, use a different Bridge identifier for each additional bridge.

As previously mentioned, the selected virtual Ethernet resource must be marked as allowing access to the external network. If an incorrect virtual Ethernet resource is selected, an error is returned when trying to vary on its line description, indicating that the selected resource cannot enable promiscuous mode. Create a virtual Ethernet resource that can be used to access the external network.

Managing Ethernet layer-2 bridging

While an Ethernet line description is varied off, its Bridge identifier (BRIDGE) can be changed to a different name or to *NONE, indicating that it is not to be used for bridging.

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Note: In IBM i V7R1, an Ethernet line description's Bridge identifier is not visible from DSPLIND. Use the CHGLINETH command and prompt to see the Bridge identifier for an Ethernet line description.

Preparing Your System for the Virtual Partition Manager

This section provides step-by-step instructions about how you can remove logical resources from IBM i using the Virtual Partition Manager, in preparation for defining new IBM i partitions. With your new Power System, by default, the IBM i partition currently owns all of the processor, memory, and I/O resources.

You can invoke the Virtual Partition Manager either through Dedicated Service Tools (DST) or System Service Tools (SST) tasks. The advantage of using SST is that you can bring your Power System to full operational mode rather than having to do your partition definitions in a restricted state where the rest of the operating system has not started, and users cannot use the system.

After you define the partitions, a system IPL is required to complete the removal of resources from IBM i.

Configuring an IBM i Client Partition using VPM

The following procedure gives you a general idea of what it takes to configure a new IBM i Client Partition using Virtual Partition Manager (VPM):

1. From the IBM i command line type the command in Figure 1.

```
STRSST
```

Figure 1 STRSST command

2. Press Enter. Sign on with a service tool user profile that at least has authority to System partitions - operations, System partitions - administration, Hardware service manager, and Start Service Tools functions.
3. Select option **5**, Work with system partitions, and press Enter. If this is the first time, you will see an initial information panel similar to Figure 2.

```
                Logical Partitioning Environment Supported
                                                        System:   ZD8AP1
  Virtual Partition Manager is supported. The system is in a
  state that does allow this operating system to partition the
  server.  Refer to the Virtual Partition Manager documentation
  for more information.

  Press ENTER to confirm using Virtual Partition Manager to
    Partition the server.
```

Figure 2 Logical Partitioning Environment Supported panel

4. Press Enter. The Work with System Partitions panel is displayed, as shown in Figure 3.

```
                        Work with System Partitions
                                                                System:   ZD8AP1
Attention:  Incorrect use of this utility can cause damage
to data in this system.  See service documentation.

  Number of partitions  . . . . . :  2
  Partition release . . . . . . . :  V7R1M0

  Partition identifier  . . . . . :  1
  Partition name  . . . . . . . . :  ZD8AP1    *

Select one of the following:


     2. Work with partition status
     3. Work with partition configuration
     4. Clear configuration data
     5. Create a new partition

Selection
     _

F3=Exit   F12=Cancel
```

Figure 3 Work with Systems Partitions panel

5. Select option **3**, Work with partition configuration, and press Enter. The Work with Partition Configuration panel is displayed, as shown in Figure 4 on page 6.

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```
                    Work with Partition Configuration
                                                          System:   ZD8AP1
Available processor units . . . . :    2.90
Available memory (MB) . . . . . :  3808
Memory region size (MB) . . . . . :  32

Type option, press Enter.
  1=Display  2=Change  9=Delete

                                                                    Virtual
   Partition     ---------Processor----------     Memory        Ethernet ID
Opt  ID  Name      Total   Units  Uncap  Weight       (MB)  WLM  1  2  3  4
 _    1  ZD8AP1        1    1.00    1    Med          2048   2   1  2  2  2
 _    2  XPF71         1    0.10    1    Med          1536   2   3  2  2  2









F3=Exit   F5=Refresh   F11=Work with partition status   F12=Cancel
```

Figure 4 Work with Partition Configuration panel

6. If from the previous panel you perceive there are not enough resources (processor units and memory, highlighted) to define a new IBM i partition, edit your host partition (Partition ID 1) to remove some resources, and make them available for the guest partitions.

Note: Considering that Virtual Partition Manager does not support dynamic movement of resources, you might want to define your partitions as uncapped partitions to automatically assign unused processing units to a partition that needs the resources.

7. Press F3. Select option **5**, Create a new partition, and press Enter. The Select Operating Environment Panel is displayed, as shown in Figure 5 on page 7.

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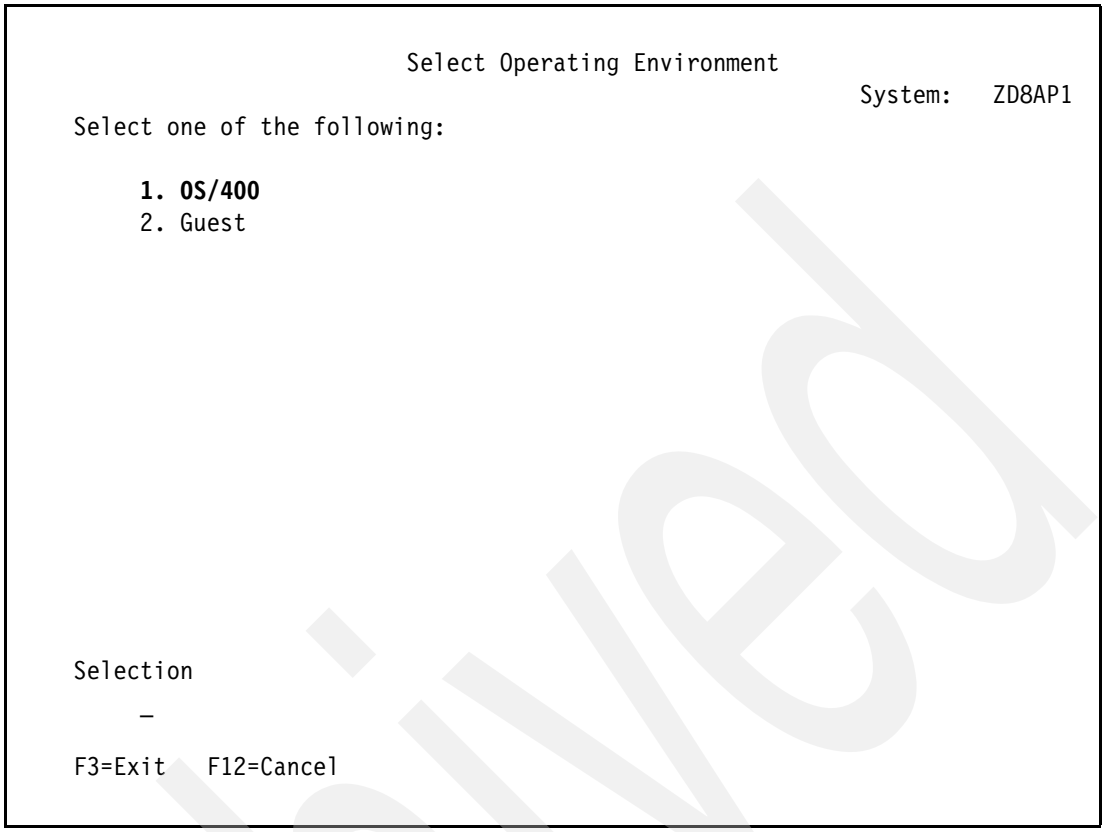

Figure 5 Select Operating Environment panel

8. Select option **1**, OS/400®, and press Enter. The Create New Partition Panel is shown. Complete the fields (highlighted), as shown in Figure 6 on page 8.

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```
                              Create New Partition
                                                              System:   ZD8AP1
Complete blanks, press Enter.

  Partition identifier and name  . . . . . .  3   XPF61

  Number of available system processors  . . . :  2
  Number of partition processors . . . . . .  1
  Minimum / maximum number of processors . . . .  1  / 1
  Use shared processor pool  . . . . . . . . .  1  1=Yes, 2=No
    Shared processor pool units  . . . . . . .  0  . 10
    Minimum / maximum processor pool units . . .  0  . 10  / 1  . 00
    Uncapped processing  . . . . . . . . . . .  1  1=Yes, 2=No
      Uncapped processing weight . . . . . . .  128  0, 64, 128, 255
  Size of available memory (MB)  . . . . . . . :  3808
  Size of partition memory (MB)  . . . . . . .  1536
  Minimum / maximum size of memory (MB)  . . . .  1024  / 1536
  Enable workload management . . . . . . . . .  2  1=Yes, 2=No
  Virtual Ethernet Identifiers (1=Yes, 2=No)
    1   2   3   4
    3   2   2   2

F3=Exit   F12=Cancel
```

Figure 6 Create New Partition panel - Entering the values for the new partition

Note: you must use option **3** for the Virtual Ethernet ID 1 to select it as the console device.

9. Press Enter twice. A confirmation message is displayed, as shown in Figure 7.

```
  Partition 3   create was successful.
```

Figure 7 Confirm New Partition completion message

10. Press F16. Select option **1**, Start a service tool, and press Enter.
11. Select option **7**, Hardware service manager, and press Enter.
12. Select option **1**, Packaging hardware resources (systems, frames, cards,...), and press Enter. The Packaging Hardware Resources panel is displayed, as shown in Figure 8 on page 9.

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```
                          Packaging Hardware Resources

                                        Local system type . . . . :  9409
                                        Local system serial number:  HV-80001

    Type options, press Enter.
      2=Change detail    3=Concurrent maintenance    4=Remove    5=Display
detail
      8=Associated logical resource(s)    9=Hardware contained within package

                                       Type-                          Resource
    Opt Description                    Model    Unit ID               Name
     _  System                         9409-E8A U9409.E8A.HV80001     SYS01
     _   System Unit             +     78A0-001 U78A0.001.DNWFR27     FR01
     _   Virtual Backplane       +   <  268C-001 U9409.E8A.HV80001     P21
     _   Disk Unit System        +                                    DE01
     _   Tape Unit                    6380-001                       SD001




    F3=Exit    F5=Refresh    F6=Print    F8=Exclude non-reporting resources
    F9=Reserve frame space       F10=Non-reporting resources
    F11=Display SPCN system information   F12=Cancel   F13=Unresolved locations
```

Figure 8 Packaging Hardware Resources panel

13. Select option **9**, Hardware contained within package, next to Virtual Backplane, and press Enter. The details for the Virtual Backplane are displayed. Page down until you find the first resource with a location code of **V1-C330**, as shown in Figure 9 on page 10.

Note: Every time you create an IBM i Client Partition using Virtual Partition Manager, 3 vSCSI adapters are created. The C label (C330) can be dissected: The first digit is the LPAR ID (3). The second and third digits represent the vSCSI identifier (30, 31, and 32). The vSCSI ID ending in 0 (30) is the Load Source and Alternate Restart Device.

Archived

```
                          Packaging Hardware Resources
                                                    Unit ID:  U9409.E8A.HV80001
 Type options, press Enter.
 2=Change detail    3=Concurrent maintenance    4=Remove    5=Display detail

   8=Associated logical resource(s)    9=Hardware contained within package


                                    Type-    Resource

 Opt Description                    Model    Name       Location

  _   Virtual Comm IOA               268C-002 P65        V1-C7

  _    Virtual Comm Port            268C-002 P66        V1-C7-T1

  _   Virtual Comm IOA               290B-001 P46        V1-C230

  _   Virtual Comm IOA               290B-001 P47        V1-C231

  _   Virtual Comm IOA               290B-001 P48        V1-C232

  _   Virtual Comm IOA               290B-001 P51        V1-C330

  _   Virtual Comm IOA               290B-001 P52        V1-C331

  _   Virtual Comm IOA               290B-001 P53        V1-C332


                                                                        Bottom

 F3=Exit F5=Refresh F6=Print F7=Include empty positions and not owned positions

   F8=Exclude non-reporting resources     F10=Non-reporting resources

   F12=Cancel                           F13=Unresolved locations
```

Figure 9 Packaging Hardware Resources panel - Locating the Virtual Comm IOA

14. Select option **8**, Associated logical resource(s), next to Virtual Comm IOA resource you identified in the previous step, and press Enter. The Logical Resources Associated with a Packaging Resource panel is displayed, as shown in Figure 10 on page 11.

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```
            Logical Resources Associated with a Packaging Resource

   Packaging resource:
                                  Type-Model  Resource Name
       Virtual Comm IOA          290B-001    P51

   Type options, press Enter.
    2=Change detail    4=Remove    5=Display detail    6=I/O debug
    7=Verify           8=Associated packaging resource(s)

   Opt Description                   Type-Model Resource Name Status
    _  Virtual Comm IOA               290B-001   CTL06         Operational
    _  Virtual IOP                    290B-001   CMB15         Operational









    F3=Exit      F5=Refresh      F6=Print      F12=Cancel

   Write down the Resource Name for the Virtual Comm IOA.
```

Figure 10 Logical Resources Associated with a Packaging Resource panel

15. Press F3 twice. Press F10. You will access the IBM i command line.
16. From the IBM i command line, type the command in Figure 11 to create a Network Server Description for the new IBM i guest partition.

```
   CRTNWSD NWSD(XPF61) RSRCNAME(CTL06) TYPE(*GUEST *OPSYS) PTNNBR(3)
RSTDDEVRSC(OPT01) IPLSRC(*PANEL) PWRCTL(*NO) TEXT(XPF61)
```

Figure 11 CRTNWSD command

Note: We are excluding OPT01 because we are going to use Virtual Media Images to install SLIC.

17. Press Enter. From the IBM i command line, type the command in Figure 12 to create a Network Storage Space for the new IBM i guest partition.

```
   SBMJOB CMD(CRTNWSSTG NWSSTG(XPF61) NWSSIZE(35840) FORMAT(*OPEN)
OFFSET(*FORMAT) TEXT(XPF61)) JOB(XPF61) JOBQ(QSYSNOMAX)
```

Figure 12 CRTNWSSTG command

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18. Press Enter. After the creation of the Network Storage Space finishes, from the IBM i command line, type the command in Figure 13 to link the Network Storage Space to the Network Server Description.

```
ADDNWSSTGL NWSSTG(XPF61) NWSD(XPF61)
```

Figure 13 ADDNWSSTGL command

19. Press Enter. Assume that the Ethernet line description that is associated to the host partition is ETHLINE. From the IBM i command line type the command in Figure 14 to retrieve the Bridge Identifier.

```
CHGLINETH LIND(ETHLINE) + F4
```

Figure 14 CHGLINETH command

The details of the Ethernet line description are displayed, as shown in Figure 15.

```
                    Change Line Desc (Ethernet) (CHGLINETH)

   Type choices, press Enter.

   Line description . . . . . > ETHLINE     Name
   Resource name  . . . . . .   CMN08       Name, *SAME, *AGG,
*NWID...
   Bridge identifier  . . . . .   B1        Name, *SAME, *NONE
   Online at IPL  . . . . . .   *YES        *SAME, *YES, *NO
   Vary on wait . . . . . .     *NOWAIT     *NOWAIT, 15-180 seconds

                                                                Bottom

   F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
   F24=More keys
```

Figure 15 Change Line Desc (Ethernet) (CHGLINETH) panel

Note: If the Bridge identifier is currently set to *NONE, you must vary off the line and then change the line description to include a Bridge identifier. For further information, review “Common errors” on page 3.

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20. Write the Bridge identifier down, and press F3. From the IBM i command line, type the command in Figure 16 to identify the Virtual Ethernet Resource.

```
DSPHDWRSC TYPE(*CMN)
```

Figure 16 DSPHDWRSC command

21. Press Enter. The Display Communication Resources panel is displayed, as shown in Figure 17. Page down until you locate the first Ethernet port of type 268C, and write it down.

```
                          Display Communication Resources
                                                                 System:
ZD8AP1
    Type options, press Enter.
      5=Display configuration descriptions   7=Display resource detail

    Opt  Resource        Type  Status              Text
     _     LIN04         5767  Operational         LAN Adapter
     _       CMN07       5767  Operational         Ethernet Port
     _       CMN08       5767  Operational         Ethernet Port
     _   CMB10           6B20  Operational         Comm Processor
     _     CTL02         6B20  Operational         Comm Adapter
     _   CMB25           268C  Operational         Comm Processor
     _     LIN11         268C  Operational         LAN Adapter
     _       CMN37       268C  Operational         Ethernet Port
     _   CMB11           290B  Operational         Comm Processor
     _     CTL03         290B  Operational         Comm Adapter
     _   CMB12           290B  Operational         Comm Processor
     _     CTL04         290B  Operational         Comm Adapter
     _   CMB13           290B  Operational         Comm Processor
     _     CTL05         290B  Operational         Comm Adapter
     _   CMB14           6B04  Operational         Comm Processor

More...
    F3=Exit   F5=Refresh   F6=Print   F12=Cancel
```

Figure 17 Display Communication Resources panel

22. From the IBM i command line, type the command in Figure 18 to create the Ethernet line description to be linked to the host Ethernet line description.

```
CRTLINETH LIND(VETHLINE) RSRCNAME(CMN37) BRIDGE(B1)
```

Figure 18 CRTLINETH command

23. Press Enter. From the IBM i command line, type the command in Figure 19 on page 14 to vary on the Ethernet line description.

Archived

```
VRYCFG CFGOBJ(VETHLINE) CFGTYPE(*LIN) STATUS(*ON)
```

Figure 19 VRYCFG command - Varying on the Virtual Ethernet Line Description

24. Press Enter. From the IBM i command line, type the command in Figure 20 to vary on the Network Server Description.

```
VRYCFG CFGOBJ(XPF61) CFGTYPE(*NWS) STATUS(*ON)
```

Figure 20 VRYCFG command - Varying on the Network Server Description

25. Press Enter. At this point, we assume that you already set up an Image Catalog for IBM i installation and that it is loaded into OPTVRT01 virtual optical device.
26. Configure the LAN console of the new partition.
27. It is time to IPL the new partition. Press F3 to return to SST, as shown in Figure 21.

```
                        System Service Tools (SST)

Select one of the following:

     1. Start a service tool
     2. Work with active service tools
     3. Work with disk units
     4. Work with diskette data recovery
     5. Work with system partitions

     7. Work with system security
     8. Work with service tools user IDs and Devices









Selection
     _

F3=Exit          F10=Command entry          F12=Cancel
```

Figure 21 System Service Tools (SST) panel

28. Select option **2**, Work with active service tools, shown in Figure 22 on page 15. Press Enter.

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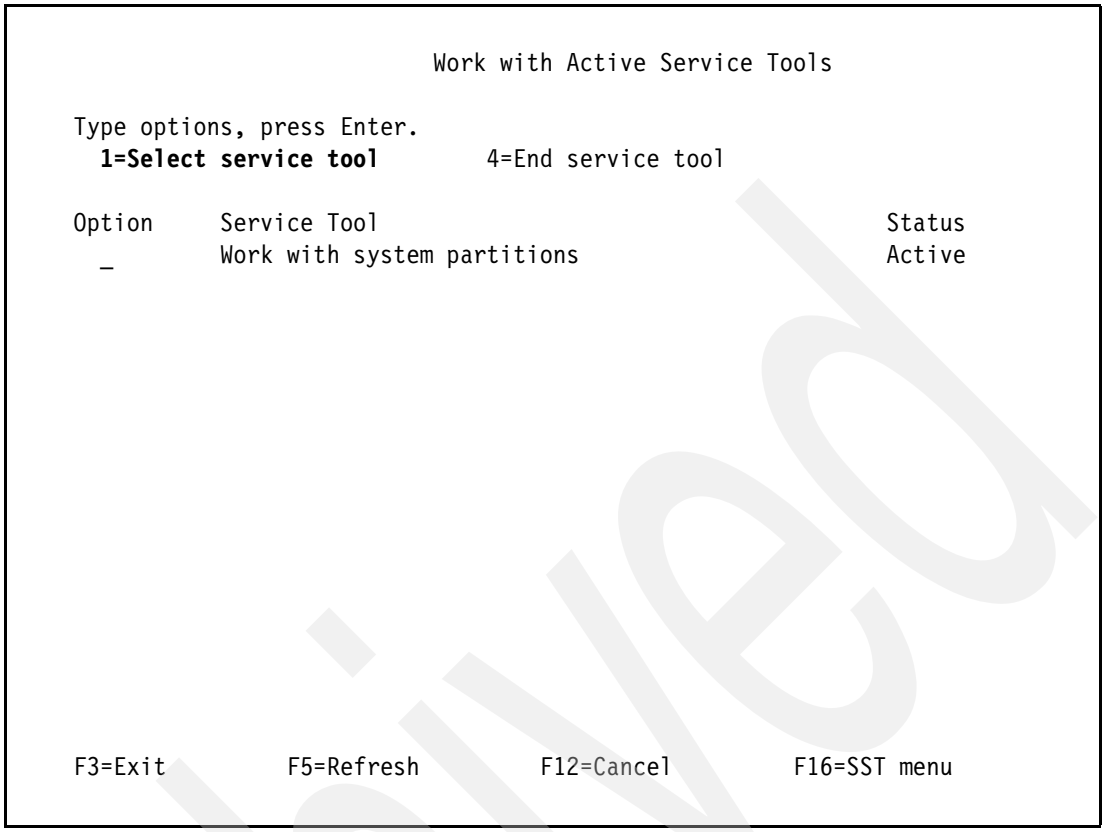

Figure 22 Work with Active Service Tools panel

29. Select option **1**, Select service tool, to Work with system partitions, as shown in Figure 23 on page 16. Press Enter.

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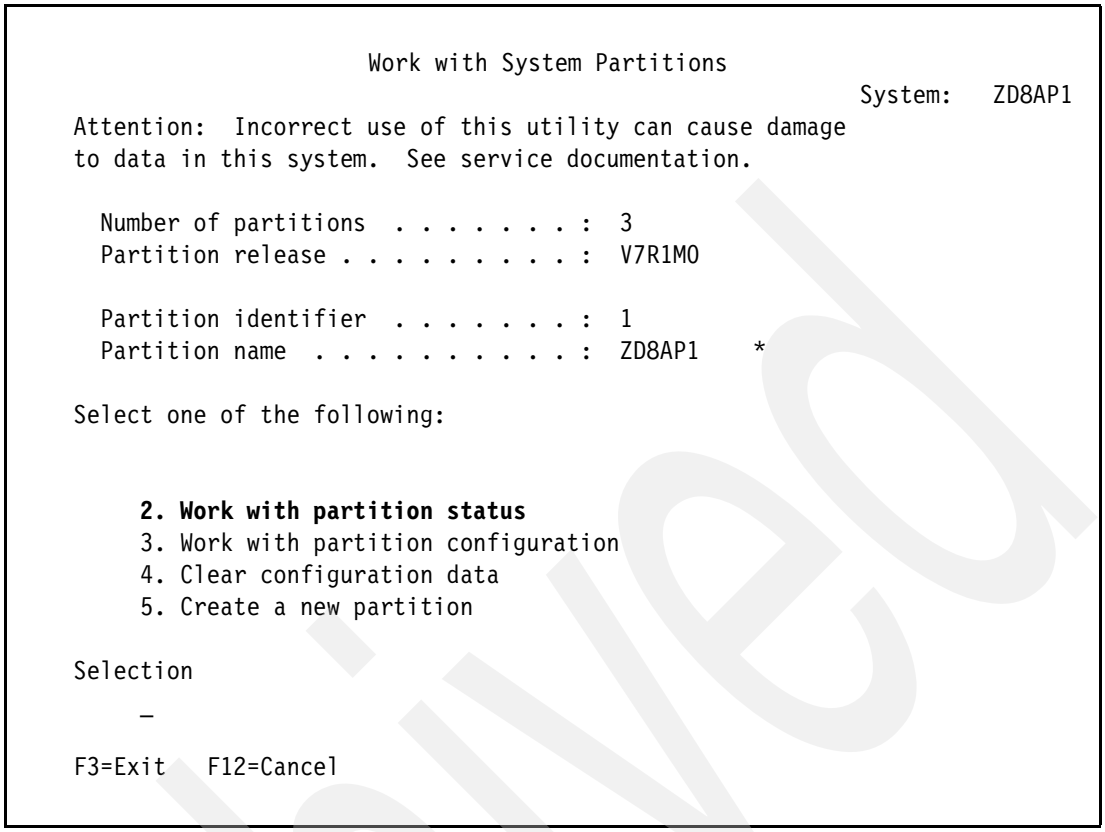

Figure 23 Work with System Partitions panel

30. Select option 2, Work with partition status, and press Enter. The Work with Partition Status panel is displayed, as shown in Figure 24 on page 17.

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```
                          Work with Partition Status
                                                                 System:   ZD8AP1
Type options, press Enter.
1=Power on      3=IPL restart   7=Delayed power off   8=Immediate power off
  9=Mode normal  10=Mode manual
  A=Source A      B=Source B      C=Source C           D=Source D

     Partition             IPL     IPL                  Reference
Opt  Identifier  Name      Source  Mode     State       Codes
 __    1         ZD8AP1    B       Normal   On
 __    2         XPF71     A       Manual   Off
 __    3         XPF61     D       Manual   Off




F3=Exit   F5=Refresh                    F10=Monitor partition status
F11=Work with partition configuration   F12=Cancel   F23=More options
```

Figure 24 Work with Partition Status panel

31. Select option **1**, Power on, next to Partition XPF61, as shown in Figure 25 on page 18. Press Enter. The Reference Codes are displayed while the IPL is progresses.

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```
                          Work with Partition Status
                                                                 System:   ZD8AP1
Type options, press Enter.
1=Power on      3=IPL restart   7=Delayed power off   8=Immediate power off
  9=Mode normal  10=Mode manual
  A=Source A      B=Source B      C=Source C           D=Source D

     Partition             IPL     IPL                  Reference
Opt  Identifier  Name      Source  Mode     State       Codes
 __    1         ZD8AP1    B       Normal   On
 __    2         XPF71     A       Manual   On
 __    3         XPF61     D       Manual   Power On    C200 3150

F3=Exit   F5=Refresh                    F10=Monitor partition status
F11=Work with partition configuration   F12=Cancel   F23=More options
```

Figure 25 Work with Partition Status panel - IBM i Client partition IPL in progress...

From here on, it is business as usual.

Virtual Partition Manager history

The first generation of VPM was introduced with IBM POWER4™ and OS/400 V4R4:

- Slicing the IBM AS/400® with Logical Partitioning: A How to Guide

  http://www.redbooks.ibm.com/redbooks/pdfs/sg245439.pdf
- LPAR Configuration and Management Working with IBM eServer™ iSeries® Logical Partitions

  http://www.redbooks.ibm.com/redbooks/pdfs/sg246251.pdf
- Capacity Planning for Logical Partitioning on the IBM eServer iSeries Server

  http://www.redbooks.ibm.com/redbooks/pdfs/sg246209.pdf

The second generation of VPM was introduced with IBM POWER5™ and IBM i5/OS® V5R3:

- Virtual Partition Manager A Guide to Planning and Implementation

  http://www.redbooks.ibm.com/redpapers/pdfs/redp4013.pdf

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Online resources

- Installing, upgrading, or deleting IBM i and related software

  http://publib.boulder.ibm.com/infocenter/iseries/v7r1m0/topic/rzahc/sc415120.pdf

- Preparing an optical image catalog to install software

  http://publib.boulder.ibm.com/infocenter/iseries/v7r1m0/topic/rzahc/scenarioprepareimagecatalog.htm

- Installing IBM i fixes from an image catalog

  http://publib.boulder.ibm.com/infocenter/iseries/v7r1m0/topic/rzam8/rzam8fixinstallimage.htm

- IBM i virtual optical storage

  http://publib.boulder.ibm.com/infocenter/iseries/v7r1m0/topic/rzam4/rzam4virtual.htm

The team who wrote this paper

This paper was produced by a team of specialists from around the world working at the International Technical Support Organization, Rochester Center.

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