Virtual Storage for i5/OS Logical Partitions

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IBM Advanced Technical Support – Power Systems – i5/OS
Agenda

- Virtualization enhancements for i5/OS
  - i5/OS virtual client partitions
  - PowerVM Virtualization
  - Virtualization scenarios
- i5/OS host & i5/OS client
  - Configuration and installation
  - Backups
- Further information
Virtualization Enhancements for i5/OS
i5/OS Virtual Client Partitions

- i5/OS-based Virtualization
  - i5/OS partition uses I/O resources from another i5/OS partition
  - Eliminates requirement to buy adapters and disk drives for each i5/OS partition
  - Supports simple creation of additional partitions …. e.g., for test and development
  - Requires POWER6 systems with i5/OS V6R1
  - PowerVM not required
  - Can mix virtual and direct I/O in client partition
- Platform support
  - All POWER6 System i models* (non-blade)
- Storage support
  - Determined by host i5/OS partition (SAN, EXP24, integrated disk)
- LPAR management
  - HMC

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PowerVM Virtualization

- VIOS-based Virtualization
  - i5/OS partition uses I/O resources from Virtual I/O Server (VIOS)
  - VIOS is included with PowerVM Standard and Enterprise Edition
  - Requires POWER6 systems with i5/OS V6R1
- Platform support
  - All POWER6 System i models and POWER6 Blade
- Storage support
  - Enables attachment to DS4000*
- LPAR management
  - HMC or IVM**
- Integrated Virtualization Manager
  - Software for creating and managing partitions, part of VIOS
  - Requires VIOS to own i5/OS I/O resources

* Supported models  ** 570 and 595 systems require an HMC
## Virtualization Scenarios

<table>
<thead>
<tr>
<th><strong>Host LPAR</strong></th>
<th><strong>Client LPAR</strong></th>
<th><strong>POWER6 System</strong></th>
<th><strong>HMC</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>i5/OS</strong></td>
<td><strong>i5/OS</strong></td>
<td><strong>PowerVM</strong></td>
<td><strong>HMC</strong></td>
</tr>
<tr>
<td><strong>Hardware platform:</strong> POWER6 System i (not POWER6 blade)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Host LPAR:</strong> i5/OS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LPAR management:</strong> HMC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage:</strong> any supported by i5/OS host</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>VIOS Host LPAR</strong></th>
<th><strong>Client LPAR</strong></th>
<th><strong>POWER6 System</strong></th>
<th><strong>HMC</strong></th>
<th><strong>DS4000</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>i5/OS</strong></td>
<td><strong>PowerVM</strong></td>
<td><strong>HMC</strong></td>
<td><strong>DS4000</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hardware platform:</strong> POWER6 System i (e.g., 9406-MMA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Host LPAR:</strong> VIOS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LPAR management:</strong> HMC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage:</strong> DS4000 (not DS8000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>VIOS + IVM</strong></th>
<th><strong>Client LPAR</strong></th>
<th><strong>POWER6 Blade</strong></th>
<th><strong>FC or SAS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>i5/OS</strong></td>
<td><strong>PowerVM</strong></td>
<td><strong>VIOS + IVM</strong></td>
<td><strong>HMC</strong></td>
</tr>
<tr>
<td><strong>Hardware platform:</strong> POWER6 blade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Host LPAR:</strong> VIOS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LPAR management:</strong> IVM (part of VIOS)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage:</strong> Fibre Channel or SAS* (SOD)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- This presentation does not discuss the i5/OS on POWER blade solution
- See Webcast *i5/OS V6R1 and IBM BladeCenter JS22* ([link](http://w3-1.ibm.com/sales/systems/portal/_s.155/254?navID=f340&geoID=All&prodID=System%20i&docID=siee020608me))

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Part I: i5/OS Client with i5/OS Host
i5/OS V6R1 Host and Client Partitions: Overview

- **Requirements**
  - POWER6 hardware
  - V6R1 on host and client
  - PowerVM not required

- **DASD**
  - Hardware assigned to host LPAR in HMC
  - Can be integrated or SAN
  - Virtualized as NWSSTG objects

- **Optical**
  - DVD drive in host LPAR virtualized directly (OPTxx)

- **Networking**
  - Network adapter (such as IVE) and Virtual Ethernet adapter in host LPAR
  - Virtual Ethernet adapter in client LPAR
Host LPAR Configuration – HMC

- Virtual SCSI server adapter
- At least 1 required per client LPAR, but more possible
- Configured to connect to specific adapter ID on client LPAR
Client LPAR Configuration – HMC

- Virtual SCSI client adapter
- DASD and optical are accessible through the same VSCSI client adapter
- By using multiple adapters, a virtual client LPAR can use DASD from multiple hosts
Client LPAR Configuration – Load Source

- Both B- and D-mode IPL devices are set to virtual SCSI client adapters.
- When installing virtual client LPAR, D-mode IPL is performed from DVD drive in host LPAR.
- LIC and OS are installed on NWSSTG (Network server storage space) objects.

<table>
<thead>
<tr>
<th>Load source</th>
<th>Alternate restart device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description: Virtual Adapter Slot 4</td>
<td>Description: Virtual Adapter Slot 3</td>
</tr>
<tr>
<td>Location code: 4</td>
<td>Location code: 3</td>
</tr>
</tbody>
</table>

- Console
  - Use HMC console
  - Alternate console
  - Operations Console

- Options
  - OK
  - Cancel
  - Help
### Host LPAR Configuration – i5/OS View

**Work with Communication Resources**

System: ITCLS01

Type options, press Enter.
5=Work with configuration descriptions   7=Display resource detail

<table>
<thead>
<tr>
<th>Opt</th>
<th>Resource</th>
<th>Type</th>
<th>Status</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LIN06</td>
<td>6B03</td>
<td>Operational</td>
<td>Comm Adapter</td>
</tr>
<tr>
<td></td>
<td>CMN07</td>
<td>6B03</td>
<td>Not detected</td>
<td>Comm Port</td>
</tr>
<tr>
<td></td>
<td>CMN18</td>
<td>6B03</td>
<td>Operational</td>
<td>Comm Port</td>
</tr>
<tr>
<td></td>
<td>CMB12</td>
<td>6B03</td>
<td>Operational</td>
<td>Comm Processor</td>
</tr>
<tr>
<td></td>
<td>LIN05</td>
<td>6B03</td>
<td>Operational</td>
<td>Comm Adapter</td>
</tr>
<tr>
<td></td>
<td>CMN06</td>
<td>6B03</td>
<td>Not detected</td>
<td>Comm Port</td>
</tr>
<tr>
<td></td>
<td>CMN17</td>
<td>6B03</td>
<td>Operational</td>
<td>Comm Port</td>
</tr>
<tr>
<td></td>
<td>CMB13</td>
<td>268C</td>
<td>Operational</td>
<td>Comm Processor</td>
</tr>
<tr>
<td></td>
<td>LIN07</td>
<td>268C</td>
<td>Operational</td>
<td>LAN Adapter</td>
</tr>
<tr>
<td></td>
<td>CMN08</td>
<td>268C</td>
<td>Operational</td>
<td>Ethernet Port</td>
</tr>
<tr>
<td></td>
<td>CMB14</td>
<td>290B</td>
<td>Operational</td>
<td>Comm Processor</td>
</tr>
<tr>
<td></td>
<td>CTL02</td>
<td>290B</td>
<td>Operational</td>
<td>Comm Adapter</td>
</tr>
<tr>
<td></td>
<td>CMB15</td>
<td>290B</td>
<td>Operational</td>
<td>Comm Processor</td>
</tr>
<tr>
<td></td>
<td>CTL03</td>
<td>290B</td>
<td>Operational</td>
<td>Comm Adapter</td>
</tr>
<tr>
<td></td>
<td>CMB16</td>
<td>290B</td>
<td>Operational</td>
<td>Comm Processor</td>
</tr>
</tbody>
</table>

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

- **Virtual SCSI server adapters in i5/OS (290B device)**
Host LPAR Configuration – Storage Spaces

Storage space objects in host LPAR
Each NWSSTG is a DDxx in client LPAR

Work with Network Server Storage Spaces

Type options, press Enter.
1=Create  2=Change  3=Copy  4=Delete  5=Display  6=Print  10=Add link
11=Remove link

Opt  Name        Server    Seq  Type  Access   Path

CP10LDSRC   CP10        1   *DYN  *UPDATE
CP10MIRROR  CP102       1   *DYN  *UPDATE
CP12LDSRC   CP12        1   *DYN  *UPDATE
CP21LDSRC   CP21        1   *DYN  *UPDATE
CP7MIRROR   CP7         1   *DYN  *UPDATE
D1          CP21B       1   *DYN  *UPDATE
D10         CP10        2   *DYN  *UPDATE
D11         CP10        3   *DYN  *UPDATE
D12         CP10        4   *DYN  *UPDATE

Parameters or command
===>
F3=Exit   F4=Prompt   F5=Refresh   F6=Print list   F9=Retrieve
F11=Display disk status   F12=Cancel   F17=Position to

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### Creating a storage space

- Identical to creating a storage space for AIX or Linux client today

**Create NWS Storage Space (CRTNWSSTG)**

Type choices, press Enter.

<table>
<thead>
<tr>
<th>Option</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network server storage space</td>
<td>CP1DISK1</td>
</tr>
<tr>
<td>Size</td>
<td>30000</td>
</tr>
<tr>
<td>From storage space</td>
<td>*NONE</td>
</tr>
<tr>
<td>Format</td>
<td>*OPEN</td>
</tr>
<tr>
<td>Data offset</td>
<td>*FORMAT</td>
</tr>
<tr>
<td>Auxiliary storage pool ID</td>
<td>2</td>
</tr>
<tr>
<td>ASP device</td>
<td>Name</td>
</tr>
</tbody>
</table>

Bottom

- F3=Exit
- F4=Prompt
- F5=Refresh
- F12=Cancel
- F13=How to use this display
- F24=More keys
Host LPAR Configuration – NWSDs

Work with Configuration Status

Position to . . . . . Starting characters

Type options, press Enter.

1=Vary on  2=Vary off  5=Work with job  8=Work with description
9=Display mode status  13=Work with APPN status...

Opt  Description       Status                -------------Job--------------
CP10             ACTIVE
CP102            ACTIVE
CP12             ACTIVE
CP21             FAILED
CP21B            FAILED
CP7              ACTIVE

Parameters or command

===>
F3=Exit  F4=Prompt

- WRKCFGSTS *NWS provides list of NWSD (Network Server Description) objects
- Each client LPAR has at least 1 NWSD associated with it
- NWSD provides link between storage space object and VSCSI adapters
### Installing Client Partition from IMGCLG

#### Work with Image Catalog Entries

<table>
<thead>
<tr>
<th>Catalog</th>
<th>INSTALLV61</th>
<th>Status</th>
<th>Ready</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Optical</td>
<td>Device</td>
<td>VOPT1</td>
</tr>
<tr>
<td>Directory</td>
<td>/installv61</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Type options, press Enter.

- 1=Add
- 2=Change
- 4=Remove
- 6=Mount
- 8=Load
- 9=Unload
- 10=Initialize volume
- 12=Work with volume

<table>
<thead>
<tr>
<th>Opt</th>
<th>Index</th>
<th>Status</th>
<th>Image File Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AVAIL</td>
<td>*AVAIL</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Loaded</td>
<td>SLIC_N</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Mounted</td>
<td>B2924_01</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Loaded</td>
<td>B2924_02</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Loaded</td>
<td>F2924_01</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Loaded</td>
<td>DP4_TS</td>
</tr>
</tbody>
</table>

F3=Exit  F5=Refresh  F6=Load/Unload image catalog  F7=Verify image catalog  F8=Reorder by index  F12=Cancel  F24=More keys

An image catalog can be used to install multiple virtual client LPARs or PTFs.
Virtual client LPAR logical resources view following D-mode IPL
### Logical Hardware Resources Associated with IOP

Type options, press Enter.

- 2=Change detail  4=Remove  5=Display detail  6=I/O debug
- 7=Verify  8=Associated packaging resource(s)

<table>
<thead>
<tr>
<th>Opt</th>
<th>Description</th>
<th>Type-Model</th>
<th>Status</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>_</td>
<td>Virtual IOP</td>
<td>* 290A-001</td>
<td>Operational</td>
<td>CMB02</td>
</tr>
<tr>
<td>_</td>
<td>Virtual Storage IOA</td>
<td>290A-001</td>
<td>Operational</td>
<td>DC02</td>
</tr>
<tr>
<td>_</td>
<td>Disk Unit</td>
<td>6B22-050</td>
<td>Operational</td>
<td>DD002</td>
</tr>
<tr>
<td>_</td>
<td>Disk Unit</td>
<td>* 6B22-050</td>
<td>Operational</td>
<td>DD001</td>
</tr>
<tr>
<td>_</td>
<td>Optical Storage Unit</td>
<td>% 632C-002</td>
<td>Operational</td>
<td>OPT01</td>
</tr>
</tbody>
</table>

- Virtual storage IOA is the VSCSI client adapter
- Disk units are storage spaces in host LPAR
Client LPAR Configuration – Configured DASD

- Virtual client LPAR’s System ASP with 4 virtual disks (storage spaces)
Backups for i5/OS V6R1 Client with i5/OS Host

■ Simplest approach is to use Dynamic LPAR (DLPAR) resource movement and switch physical tape adapter to client LPAR
  ● Mixing of virtual and direct resources in client is supported
  ● DLPAR movement of resources can be scheduled in the HMC
■ For full-system backup, the client storage spaces can be saved on the host i5/OS partition
  ● Similar to AIX and Linux client partitions
  ● File-level backup is not supported
  ● Storage spaces can be restored on another i5/OS V6R1 host
  ● Storage spaces can be located in IASP, Flash Copy can be used on IASP
CPU Utilization

- CLIENT - 48 virtuals, 3 vSCSI
- HOST for 48 virtuals, 3 vSCSI
- CLIENT - 24 virtual, 2 vSCSI
- HOST for 24 virtual, 2 vSCSI
- CLIENT - 12 virtuals, 1 vSCSI
- HOST for 12 virtuals, 1 vSCSI
- CLIENT - 12 virtuals, 6 vSCSI
- HOST for 12 virtuals, 6 vSCSI

Transactions per Minute

Utilization

Host partition – 24 physical drives in 1 ASP, 1 shared processor, 8 GB main storage. Client partitions – 3 shared processors, 32GB main storage.
Response time

- CLIENT - 48 virtuals, 3 vSCSI
- CLIENT - 24 virtual, 2 vSCSI
- CLIENT - 12 virtual, 1 vSCSI
- CLIENT - 12 virtual, 6 vSCSI

Host partition – 24 physical drives in 1 ASP, 1 shared processor, 8 GB main storage. Client partitions – 3 shared processors, 32GB main storage.
ETEC203 - i5/OS Virtual Client Partitions and DS4000 Storage – 2 days
  ● Workshop will be listed for sign-up by 3/21 on: http://www-03.ibm.com/systems/i/support/itc/educ.html
LSI DS4000 course – March 4-7/08 in Wichita – 3.5 days
Getting Started with DS4000 (IBM) – 2 days
More Information

- **APV Operations Guide (VIOS information)**

- **i5/OS Virtual Client Partitions and DS4000 Storage Read-me First document**
  - Scheduled for availability by 3/21, URL not available yet

- **Performance Capability Reference** manual (Chapter 14)

- **Redbook** *IBM System Storage DS4000 and Storage Manager V10.10*

- **VIOS datasheet (VIOS support only, refer to this presentation for i5/OS + VIOS support)**
The End, Thank You!
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