Virtual IO Server

What is Advanced POWER Virtualization (APV)

- APV – the hardware feature code for POWER5 servers that enables:
  - Micro-partitioning – fractional CPU entitlements from a shared pool of processors, beginning at one-tenth of a CPU
  - Partition Load Manager (PLM) – a policy-based, dynamic CPU and memory reallocation tool
  - VIO Server (virtual SCSI and Shared Ethernet Adapter)
    - ✓Physical disks can be shared as virtual disks to client partitions
    - ✓Shared Ethernet Adapter (SEA) – A physical adapter or EtherChannel in a VIO Server can be shared by client partitions. Clients use virtual Ethernet adapters
- Virtual Ethernet – a LPAR-to-LPAR Virtual LAN within a POWER5 Server
  - Does **not** require the APV feature code

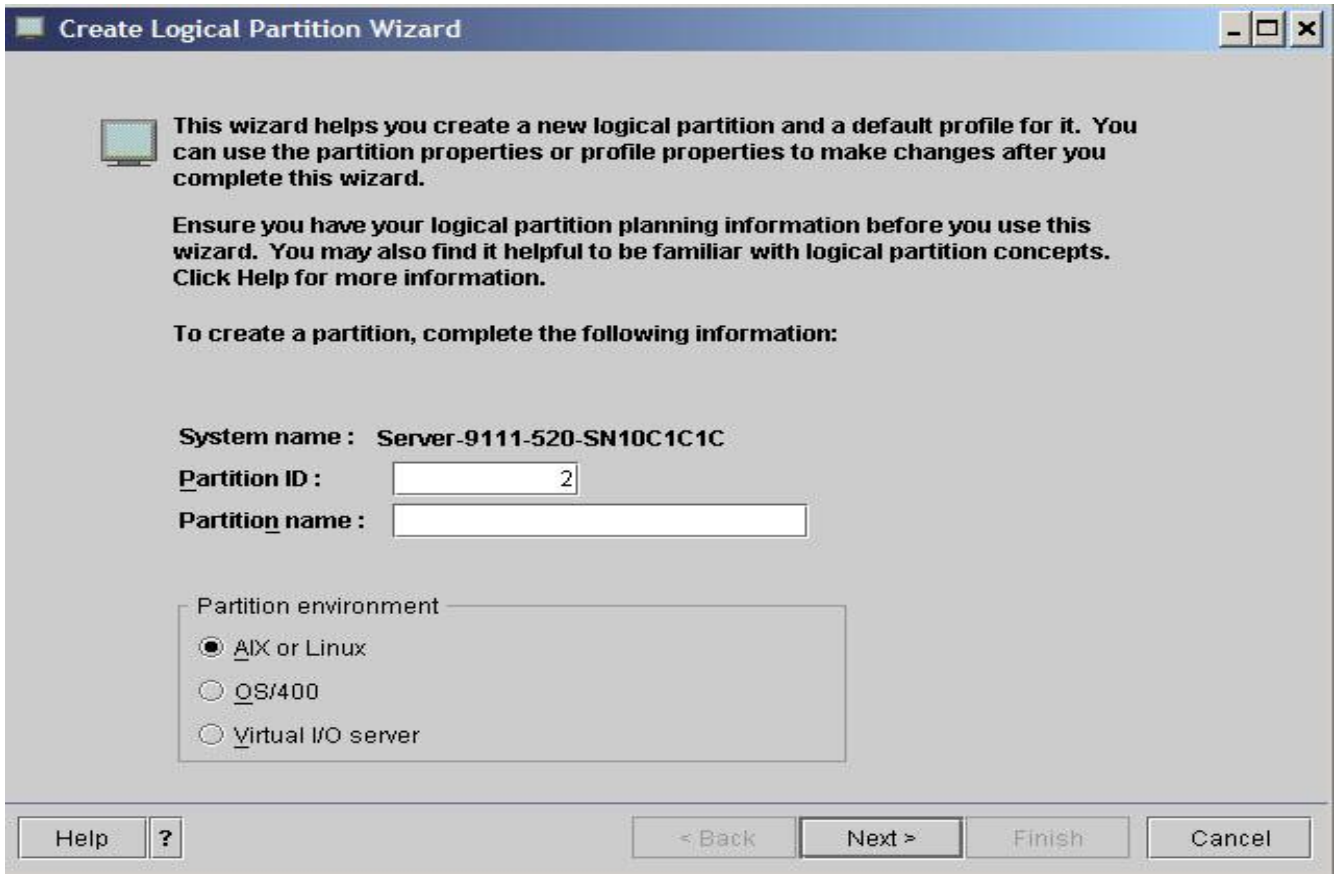
Why Virtual I/O Server?

- POWER5 systems will support more partitions than physical I/O slots available
  - Each partition still requires a boot disk and network connection, but now they can be virtual instead of physical
- VIO Server allows partitions to share disk and network adapter resources
  - The Fibre Channel or SCSI controllers in the VIO Server can be accessed using Virtual SCSI controllers in the clients
  - A Shared Ethernet Adapter in the VIO Server can be a layer 2 bridge for virtual Ethernet adapters in the clients
- The VIO Server further enables on demand computing and server consolidation

Virtual I/O Server Characteristics

- Requires AIX 5.3 and POWER5 hardware with APV feature
- Installed as a special purpose, AIX-based logical partition
  - Uses a subset of the AIX Logical Volume Manager and attaches to traditional storage subsystems
- Inter-partition communication (client-server model) provided via the POWER Hypervisor
- Clients "see" virtual disks as traditional AIX SCSI hdisks, although they may be a physical disk or logical volume on the VIO Server
- One physical disk on a VIO server can provide virtual disks to several clients by assigning each of them a logical volume

Creating the Virtual IO Server



Virtual I/O Server installation

- VIO Server code is packaged and shipped as an AIX mksysb image on a VIO CD

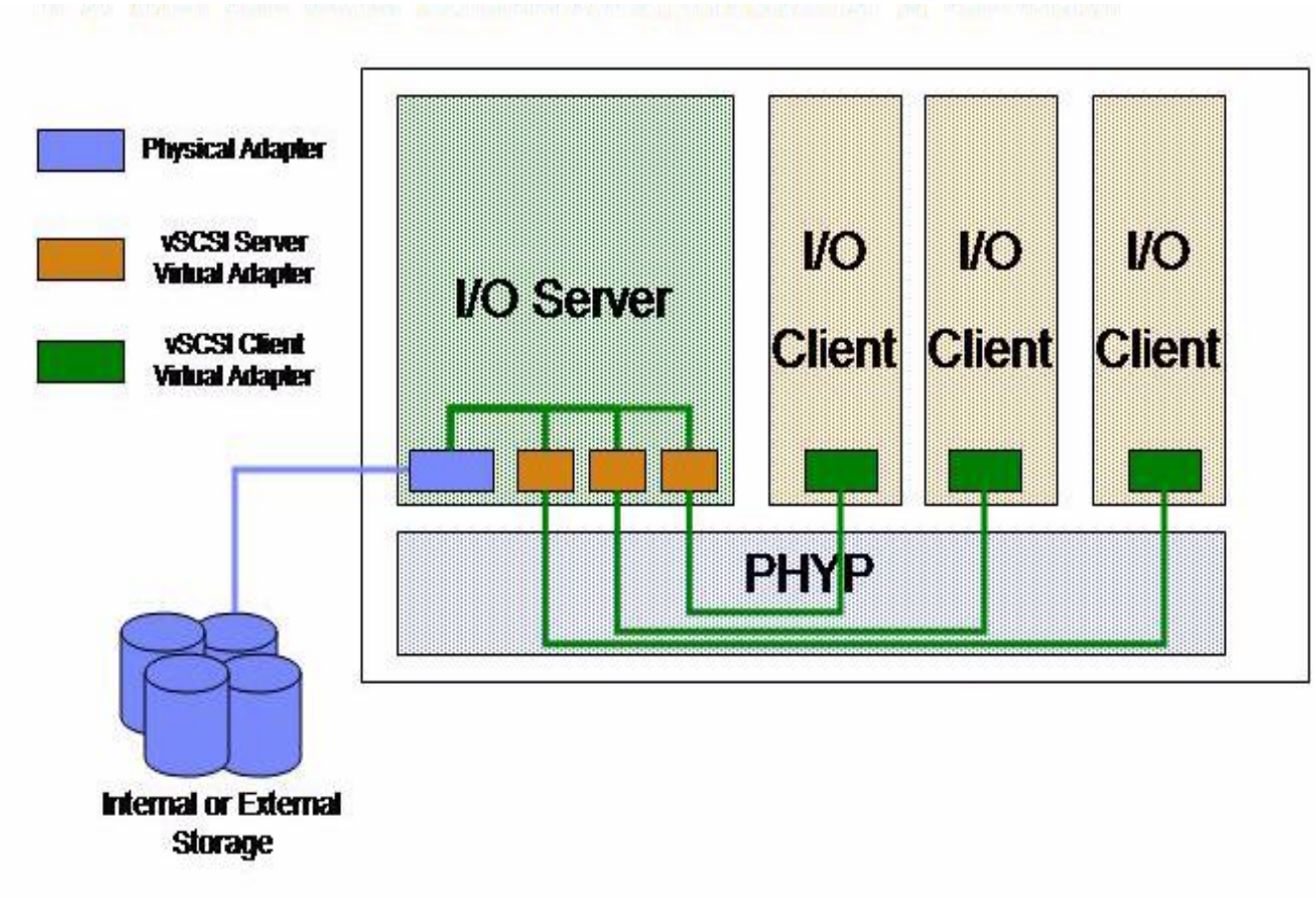
- Installation methods
- CD install
  - ✓ HMC install - Open rshterm and type "installios"; follow the prompts
  - ✓ The Network Installation Manager (NIM) is now supported
    - ✓ http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/index.htm?info/iphb1/iphb1_vios_configuring_installnim.htm

- VIO Server can support multiple client types
  - ✓ AIX 5.3
  - ✓ SUSE Linux Enterprise Server 9 for POWER
  - ✓ Red Hat Enterprise Linux AS for POWER Version 3 and 4

Virtual I/O Server Administration

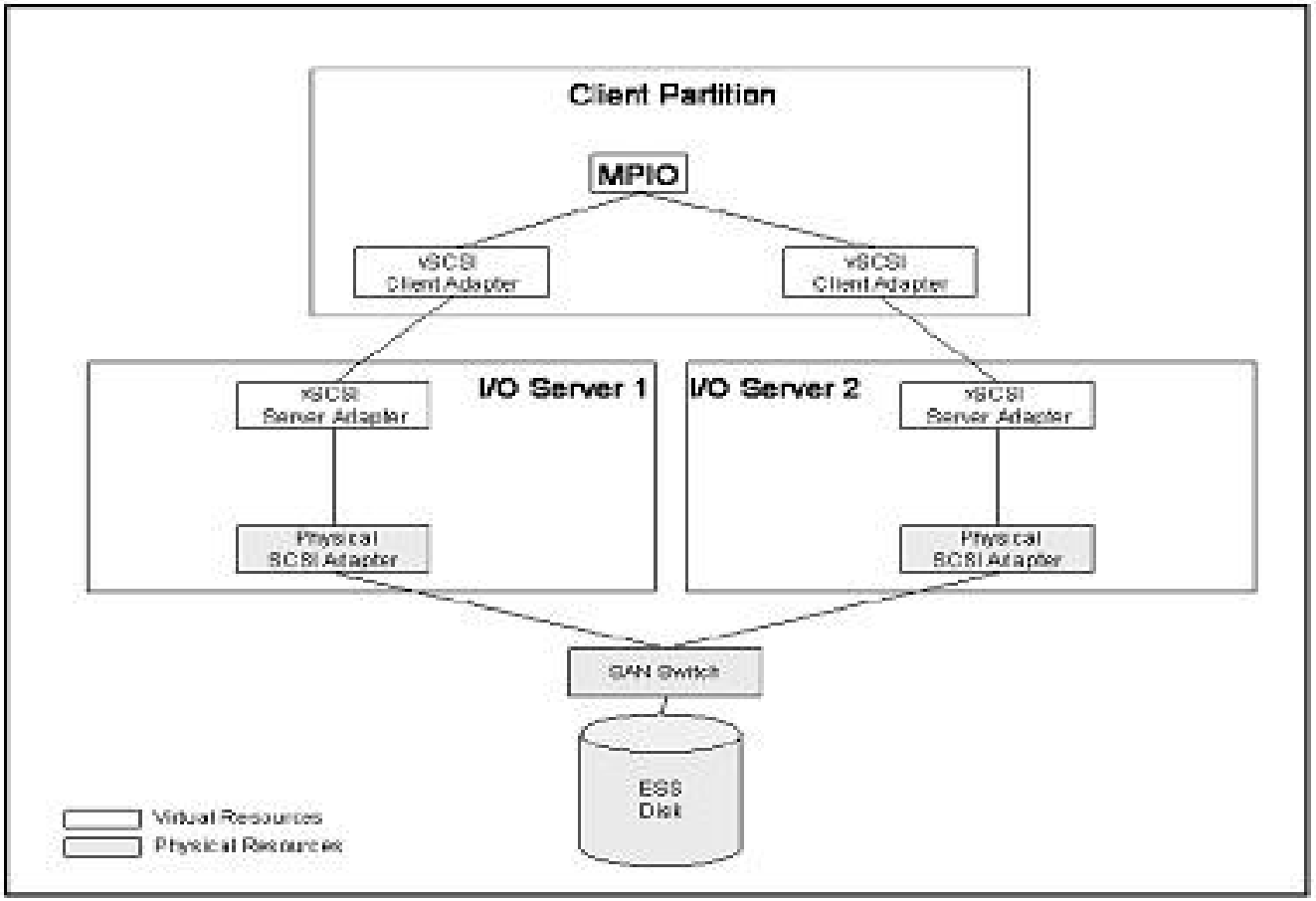
- The VIO server uses a command line interface running in a restricted shell – no smitty or GUI
- A special user – padmin – executes VIO server commands
- First login after install, user padmin is prompted to change password
- After that, padmin runs the command "license –accept"
- There is no root login on the VIO Server
- Slightly modified commands are used for managing devices, networks, code installation and maintenance, etc.
- The padmin user can start a root AIX shell for setting up third-party devices using the command "oem_setup_env"

VIO Server/Client Overview

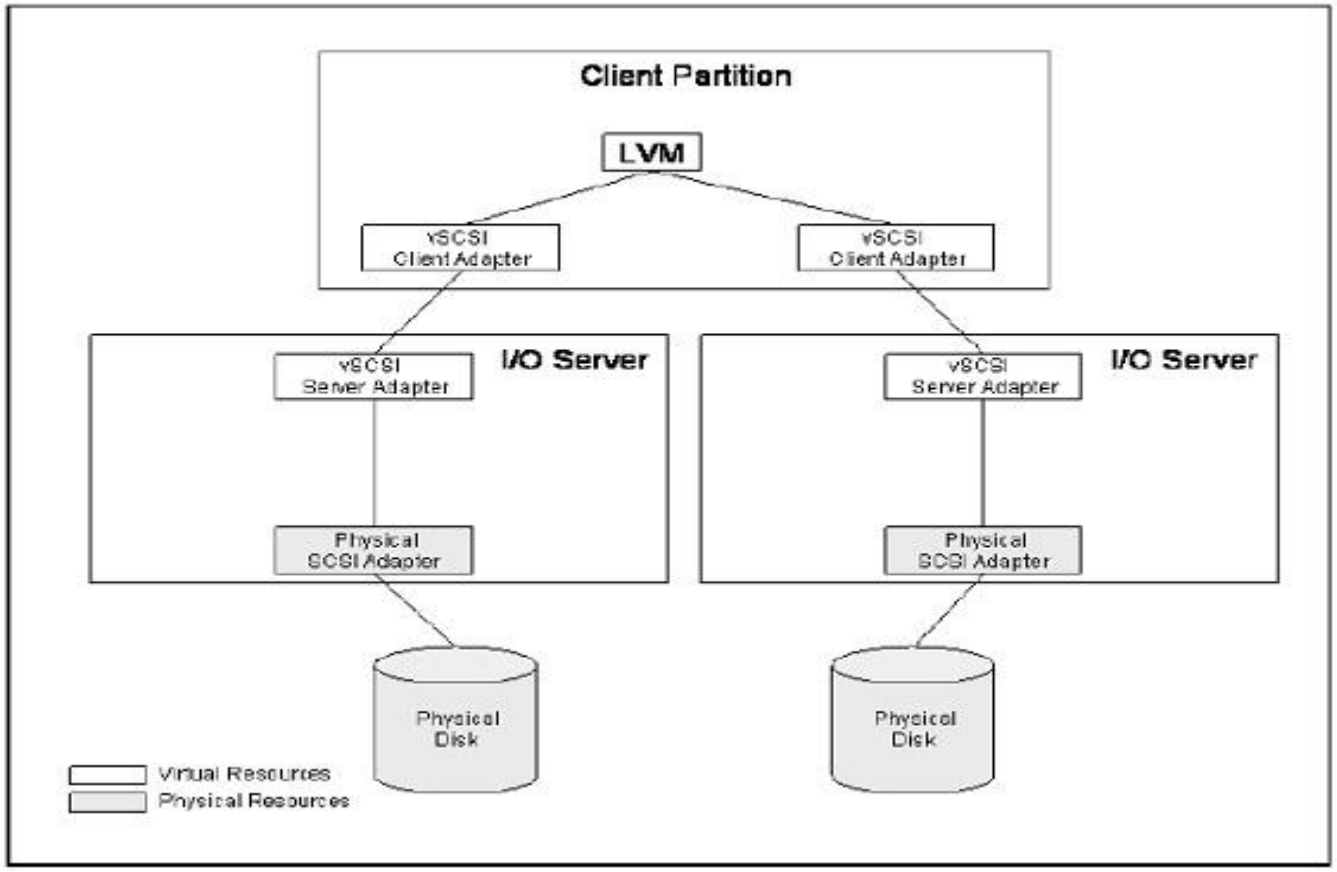


VIO Server Configuration with MPIO

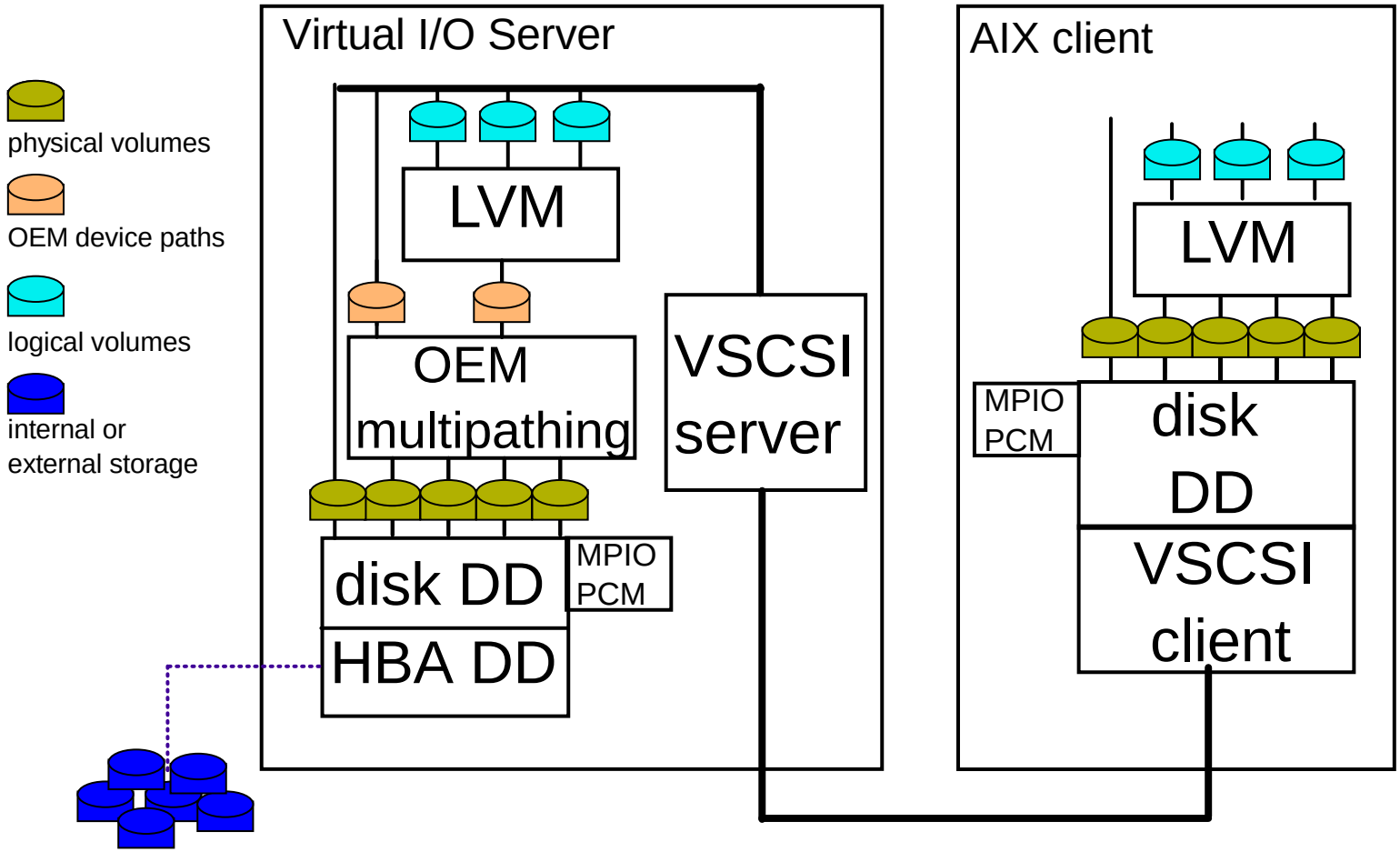
- Client sees one hdisk – with two MPIO paths lspath –l hdisk0
- Paths are fail-over only. No load balancing in client MPIO
- hdisk1 in each VIO server attached to vscsi server adapter as a raw disk
- Set reserve_policy attribute on hdisk1 to no_reserve in each VIO server
- LUN appears in each VIO server as hdisk1
- Single RAID5 LUN carved in ESS, made visible to one Fibre Channel adapter in each of the VIO servers



VIO Server Configuration with LVM Mirroring



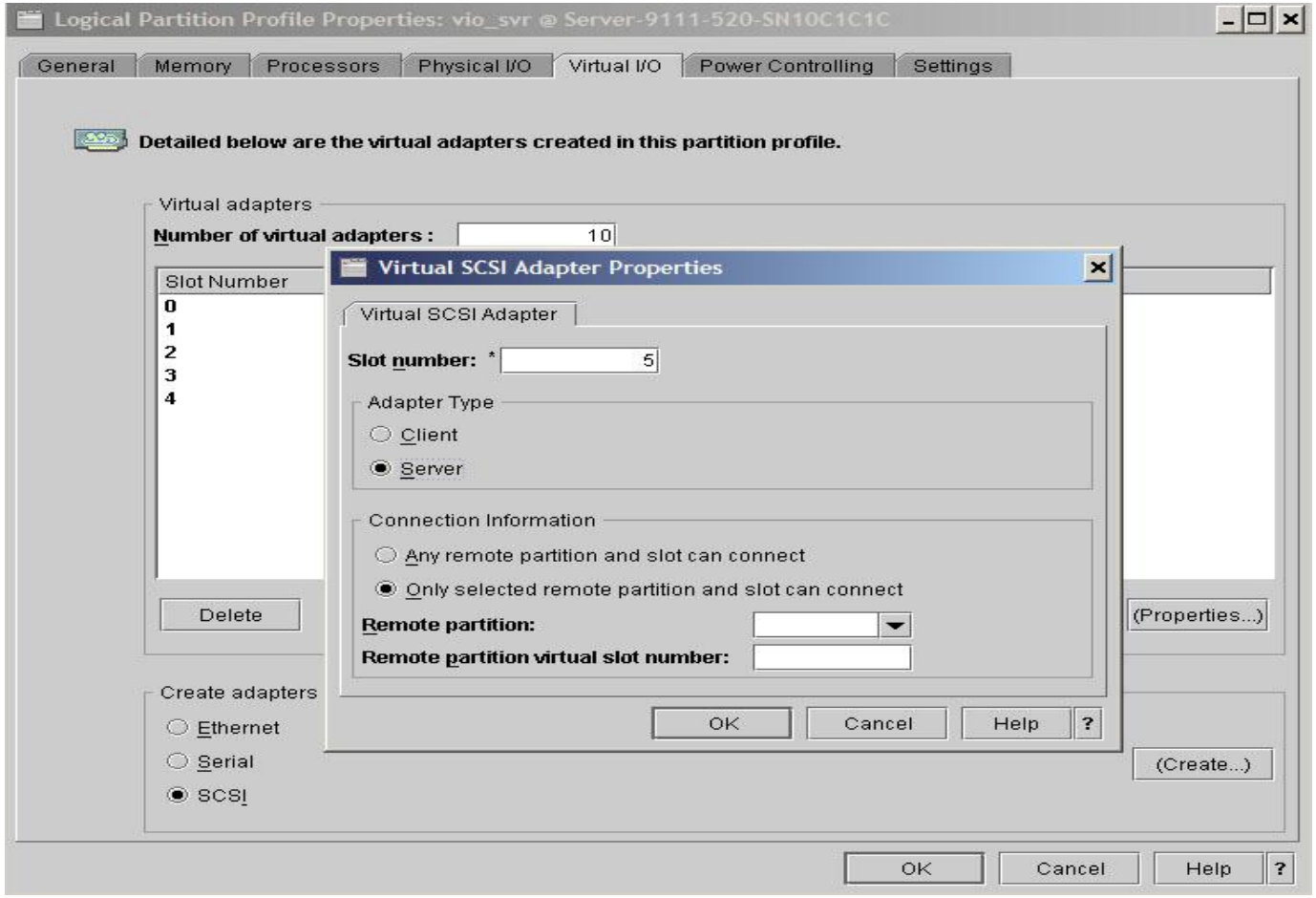
Internals AIX



Virtual I/O Server Resource Configuration

- Add physical devices to the VIO Server
- If serving LVs as hdisks, create a volume group on one or more disks with mkvg
  - ✓ mkvg [-f] [-vg VolumeGroup] PhysicalVolume
  - ✓ mkvg –f –vg rootvg_clients hdisk2
    rootvg_clients
- Create logical volumes on the volume group
  - ✓ mklv [-lv NewLogicalVolume | -prefix Prefix] VolumeGroup Size [PhysicalVolume …]
  - ✓ mklv –lv aix_sq07 rootvg_clients 7G hdisk2

Create Server Virtual SCSI Adapter



Same panel whether you are creating VIO server for the first time, or DLPAR adding virtual SCSI adapter to a running VIO server later.

VIO Server Virtual Adapter Configuration

- A virtual adapter added by DLPAR doesn't show up in VIO Server until after running cfgdev
- lsdev -virtual

```
name            status      description

ent2            Available   Virtual I/O Ethernet Adapter (l-lan)
vhost0          Available   Virtual SCSI Server Adapter
vhost1          Available   Virtual SCSI Server Adapter
vsa0            Available   LPAR Virtual Serial Adapter
```

- cfgdev -dev vio0
- lsdev -virtual

```
name            status      description

ent2            Available   Virtual I/O Ethernet Adapter (l-lan)
vhost0          Available   Virtual SCSI Server Adapter
vhost1          Available   Virtual SCSI Server Adapter
vhost2          Available   Virtual SCSI Server Adapter ←
vsa0            Available   LPAR Virtual Serial Adapter
```

Virtual IO Server Resource Mapping

- Configuring virtual target device

```
mkvdev –vdev aix_sq07 –vadapter vhost0 –dev vt_aix_sq07
mkvdev –vdev hdisk7 –vadapter vhost1 –dev vt_hdisk7
```

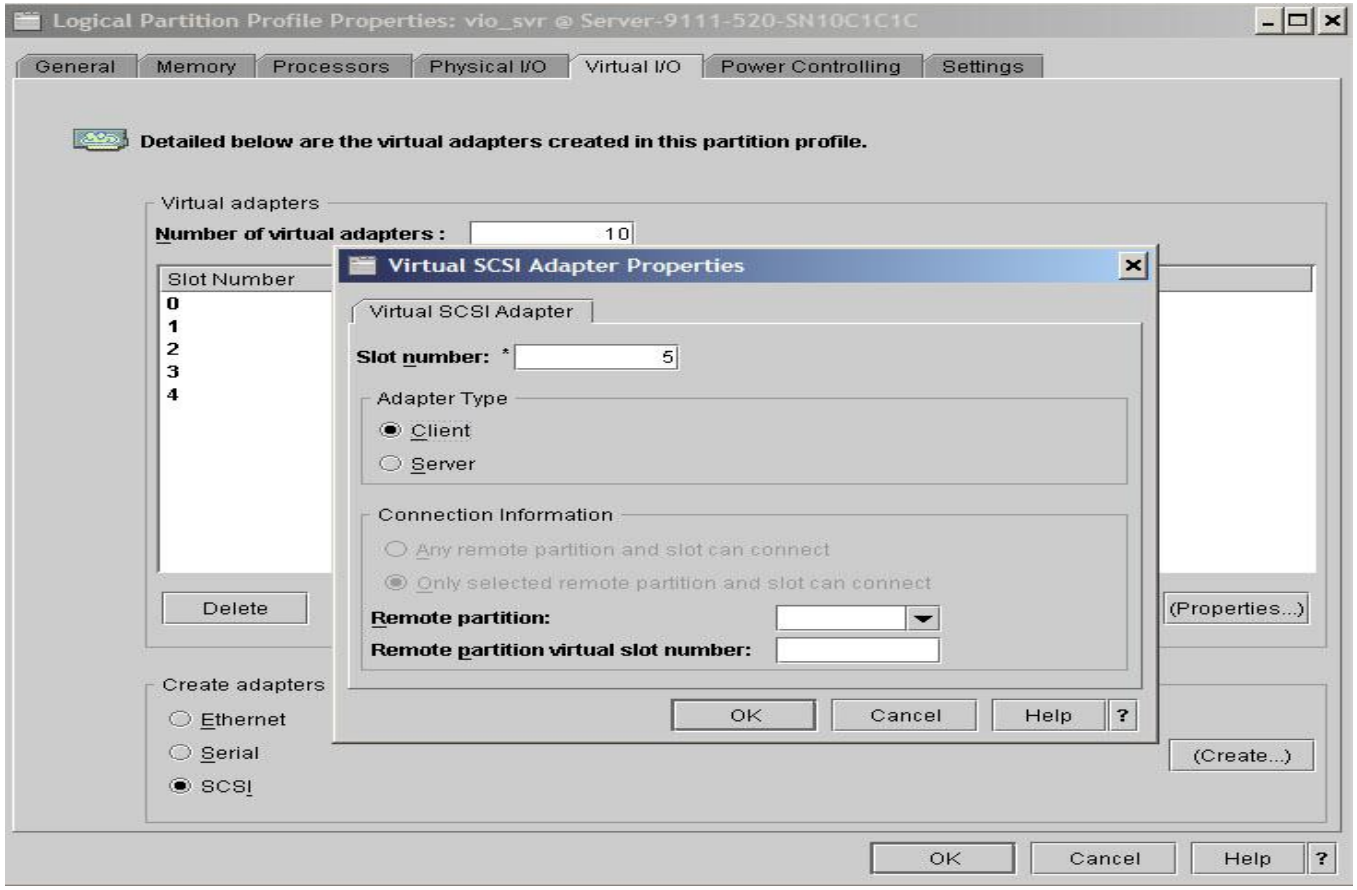
- $ lsdev -virtual

```
name          status     description

ent2          Available  Virtual I/O Ethernet Adapter (l-lan)
vhost0        Available  Virtual SCSI Server Adapter
vhost1        Available  Virtual SCSI Server Adapter
vsa0          Available  LPAR Virtual Serial Adapter
vt_aix_sq07 Available  Virtual Target Device - Logical Volume
vt_hdisk7     Available  Virtual Target Device - Disk
```

VIO Resources Map

```
$ lsmap -all
SVSA            Physloc                                    Client Partition ID
--------------- ------------------------------------------ ------------------
vhost0          U9111.520.10C1C1C-V3-C2                    0x00000001

VTD                   vtscsi0
LUN                   0x8100000000000000
Backing device        aix_sq07
Physloc

SVSA            Physloc                                    Client Partition ID
--------------- ------------------------------------------ ------------------
vhost1          U9111.520.10C1C1C-V3-C4                    0x00000001

VTD                   vtscsi1
LUN                   0x8100000000000000
Backing device        hdisk7
Physloc               U787A.001.DNZ00ZE-P1-C1-T1-L4-L0
```

Create Client Virtual SCSI Adapter



Similar panel to create client virtual scsi adapter as the panel for server virtual scsi adapter. "This slot connects to which slot in which remote LPAR?"

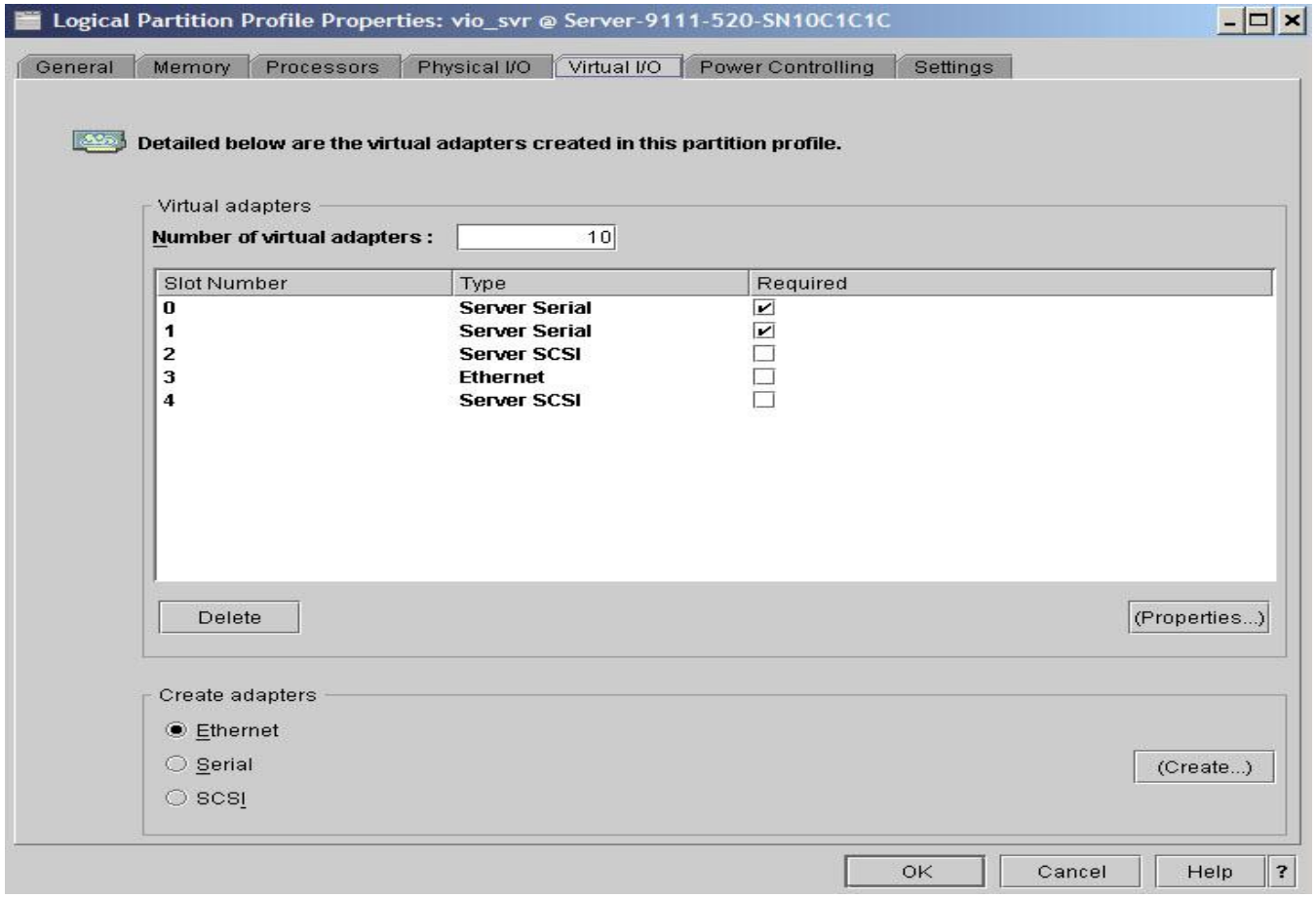
Client Virtual Disk Attributes

```
root@sq07.dfw.ibm.com / # lsdev -Cc disk
  hdisk0 Available  Virtual SCSI Disk Drive

root@sq07.dfw.ibm.com / # lscfg -vl hdisk0
  hdisk0          U9117.570.10C0EDC-V7-C5-T1-L810000000000  Virtual SCSI Disk
    Drive

root@sq07.dfw.ibm.com / # lsattr -El hdisk0
  PCM             PCM/friend/vscsi                          Path Control Module
    False
  algorithm       fail_over                                 Algorithm
    False
  max_transfer    0x20000                                    Maximum TRANSFER
    Size    True
  pvid            00cc0edc916c5bd800000000000000000         Physical volume identifier
    False
  queue_depth     3                                         Queue DEPTH
    False
  reserve_policy  no_reserve                                Reserve Policy
    False

root@sq07.dfw.ibm.com / # lscfg -vl vscsi1
  vscsi1          U9117.570.10C0EDC-V7-C6-T1  Virtual SCSI Client Adapter
      Device Specific.(YL).....U9117.570.10C0EDC-V7-C6-T1
```

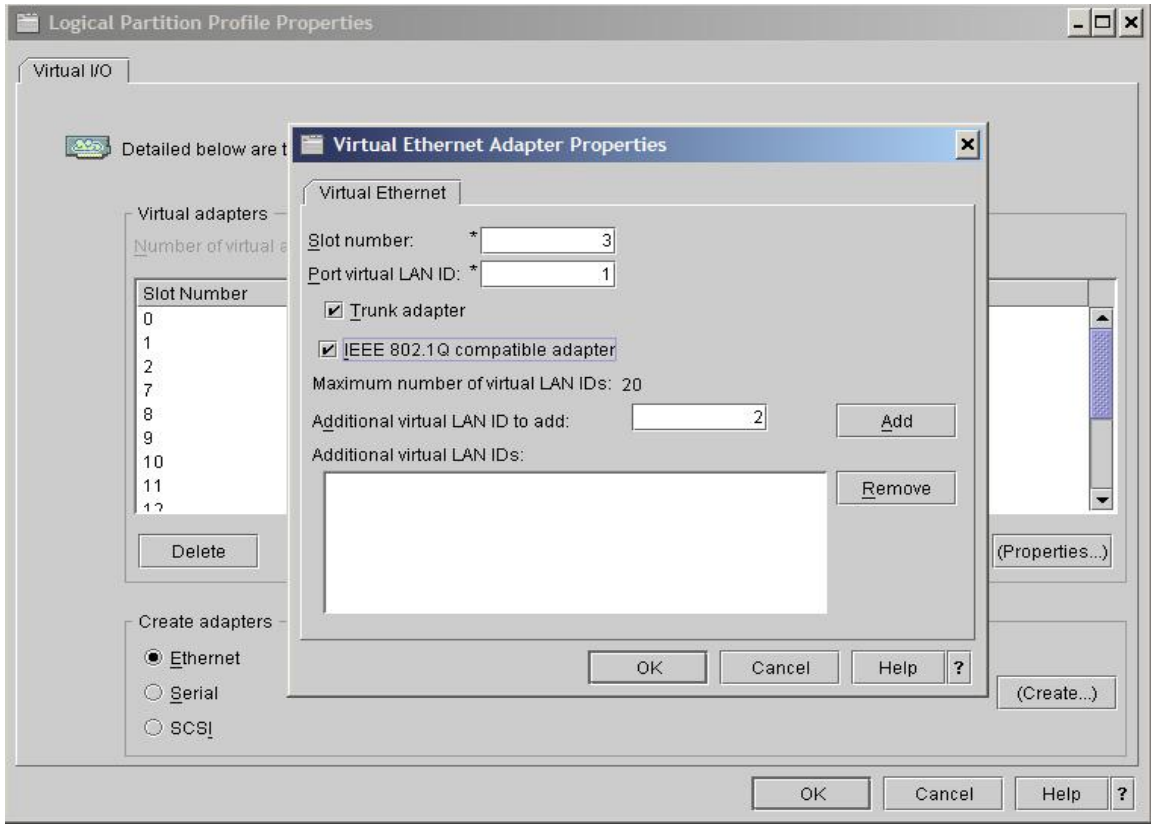
Virtual Ethernet

- **Virtual Ethernet**
  - ✓ Enable inter-lpar communications without a physical adapter
  - ✓ IEEE-compliant Ethernet programming model
  - ✓ Implemented through inter-partition, in-memory communication
- **VLAN splits up groups of network users on a physical network onto segments of logical networks**
- **Virtual switch provides support for multiple (up to 4K) VLANs**
  - ✓ Each partition can connect to multiple networks, through one or more adapters
  - ✓ VIO server can add VLAN ID tag to the Ethernet frame as appropriate. Ethernet switch restricts frames to ports that are authorized to receive frames with specific VLAN ID
- **Virtual network can connect to physical network through "routing" partitions – generally not recommended**

Create Virtual Ethernet Adapter



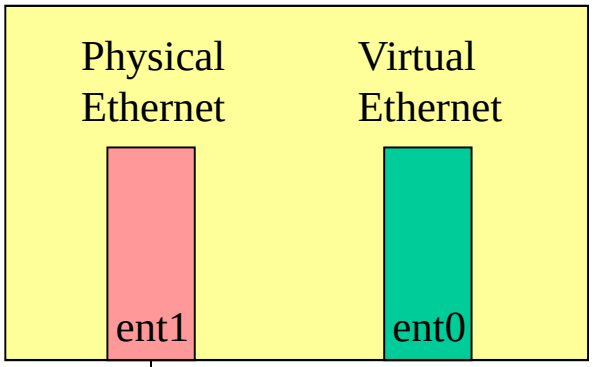
Configure Shared Ethernet Adapter - SEA



SEA Configuration

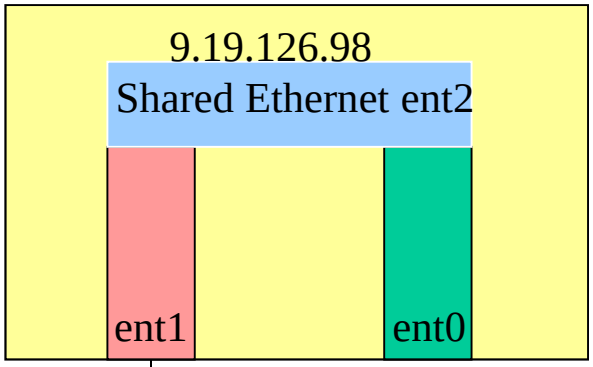
```
$ lsdev | grep ent[0-9]
ent0          Available Virtual I/O Ethernet Adapter (l-lan)
ent1          Available 10/100 Mbps Ethernet PCI Adapter II (1410ff01)

$ mkvdev –sea ent1 –vadapter ent0 –default ent0 –defaultid 1
ent2 Available

$ lsdev | grep ent[0-9]
ent0          Available Virtual I/O Ethernet Adapter (l-lan)
ent1          Available 10/100 Mbps Ethernet PCI Adapter II (1410ff01)
ent2          Available Shared Ethernet Adapter

$ lsattr -El ent2
pvid              1       PVID to use for the SEA device
   True
pvid_adapter   ent0    Default virtual adapter to use for non-VLAN-tagged packets
   True
real_adapter   ent1    Physical adapter associated with the SEA
   True
thread            0       Thread mode enabled (1) or disabled (0)
   True
virt_adapters ent0     List of virtual adapters associated with the SEA (comma
   separated)     True
```

Shared Ethernet Adapter setup



VIO Server after mksysb Install

mkvdev –sea ent1 –vadapter ent0 –default ent0 –defaultid 1
ent2 Available



If VIO server requires a local IP address on this adapter configuration, the address is placed on shared adapter interface en2 (smitty chinet as root). It is not configured on physical, nor on virtual adapter.

VIO Server after sea config

Reference

InfoCenter

- http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/index.htm

- Virtualizing your compute environment
- http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/info/iphb1/iphb2.pdf

- VIO Server and PLM command line reference
- http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/info/iphb1/commands/commands.pdf

Redbook

- Advanced POWER Virtualization on IBM System p5
  http://www.redbooks.ibm.com search on SG24-7940
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