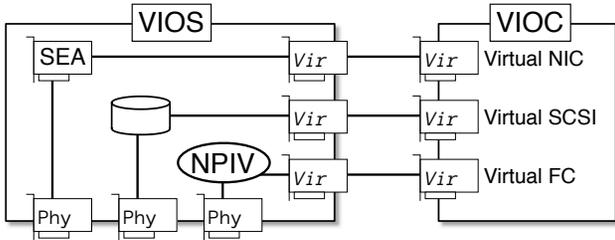


# PowerVM QuickSheet

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## Concepts

- CPU virtualization, LPAR capability, and virtual networking are capabilities provided by the System P hypervisor (*not* VIOS.)
- VIOS (Virtual I/O Server) is a specialized partition that is used to map multiple client virtual adapters to physical ones. It is also an enabler for active memory sharing and live partition mobility.
- Network packets on an internal VLAN can be bridged to an external physical adapter via a SEA (Shared Ethernet Adapter) on the VIOS. The virtual adapter that will handle outbound traffic on the VLAN is marked as a trunk adapter.
- Physical disks, partitions on a disk, or virtual CD/DVD media files can be mapped to virtual server adapters. When a mapping is created, a backing device is required for the virtual target device that will be created.
- Virtual server adapters present “target” devices on a virtual SCSI bus. Virtual client adapters act as “initiators” to virtual server adapters.
- Virtual HBAs are mapped to NPIV capable physical HBAs through the VIOS using the `mfcmap`, and not the `mkvdev` command used for other physical to virtual mappings.



## PowerVM Types (Power6 and later only)

Express	Micropartitions (only 3), VIOS, IVM (no HMC), NPIV
Standard	Express & No 3 LPAR limit, HMC supported multiple shared processor pools
Enterprise	Standard & Live Partition Mobility, Active memory sharing

## Virtual Media Repository

- A virtual media repository is a storage pool LV that contains images that can be “placed” into virtual optical devices assigned to LPARs.
- ```
Create a 15 Gig media repository on storage pool clienthd
mkrep -sp clienthd -size 15G
↪ No name is specified as there can be only one repository.
Create a virtual media image from NFS mounted ISO image
mkvopt -name fedora10 -file /mnt/Fedora10ppcDVD.iso -ro
Create a virtual optical device on vhost4 adapter for “shiva” LPAR
mkvdev -fbo -vadapter vhost4 -dev shiva_dvd
Remove the just created device from the “shiva” LPAR
rmvdev -vtd shiva_dvd
Load the fedora10 media into shiva's virtual DVD
loadopt -vtd shiva_dvd -disk fedora10
Remove the media from the shiva_dvd virtual device
unloadopt -vtd shiva_dvd
Force remove the media from the shiva_dvd virtual device
unloadopt -vtd shiva_dvd -release
List the virtual media, current assignments, & repository space usage
lsrep
Delete the previously created fedora10 virtual media object
rmvopt -name fedora10
List all virtual optical devices & inserted media
lsvopt
```

## Devices

```
Discover new devices (VIOS equivalent of cfgmgr)
cfgdev
List all adapters on the system
lsdev -type adapter
List only virtual adapters
lsdev -virtual -type adapter
List all virtual disk mapping devices (created with mkvdev command)
lsdev -virtual -type disk
Find the WWN of the fcs0 HBA
lsdev -dev fcs0 -vpd | grep Network
List the firmware levels of all devices on the system
lsfware -all (The invscout command is also available)
List all devices (virtual and physical) by their slot address
lsdev -slots
List NPIV capable HBA adapters and port / address usage
lsnports
Determine if SCSI reserve is enabled for hdisk4
lsdev -dev hdisk4 -attr reserve_policy
Turn off SCSI reserve for hdisk4
chdev -dev hdisk4 -attr reserve_policy=no_reserve
Re-enable SCSI reserve for hdisk4
chdev -dev hdisk4 -attr reserve_policy=single_path
List the parent device of hdisk0
lsdev -dev hdisk0 -parent
List all the child devices of scsi1
lsdev -dev scsi1 -child
```

## VIOS Networking

- The `mkvdev -lnagg` and `cfglnagg` commands can be used to set up and manage link aggregation (to external ethernet switches).

```
Enable jumbo frames on the ent0 device
chdev -dev ent0 -attr jumbo_frames=yes
View settings on ent0 device
lsdev -dev ent0 -attr
Find the default gateway and routing info on the VIOS
netstat -routinfo
List open (TCP) ports on the VIOS IP stack
lstdcpip -sockets | grep LISTEN
↪ lstdcpip is like Unix netstat, it lists UDP and Unix sockets too
List TCP and UDP sockets listening and in use
lstdcpip -sockets -family inet
List all (virtual and physical) ethernet adapters in the VIOS
lstdcpip -adapters
Set up initial TCP/IP config (en10 is the interface for the SEA ent10)
mktcpip -hostname vios1 -inetaddr 10.143.181.207 \
  -interface en10 -start -netmask 255.255.252.0 \
  -gateway 10.143.180.1
Show interface traffic statistics on 2 second intervals
netstat -state 2
Show verbose statistics for all interfaces
netstat -cdlistats
Show the default gateway and route table
netstat -routtable
Change the default route on en0 (fix a typo from mktcpip)
chtcpip -interface en0 \
  -gateway -add 192.168.1.1 -remove 168.192.1.1
Change the IP address on en0 to 192.168.1.2
chtcpip -interface en0 \
  -inetaddr 192.168.1.2 -netmask 255.255.255.0
List the port speed of the (physical) ethernet adapter ent0
lsdev -dev ent0 -attr media_speed
List all the possible settings for media_speed on ent0
lsdev -dev ent0 -range media_speed
Set the media_speed to auto negotiate on ent0
chdev -dev ent0 -attr media_speed=Auto.Negotiation
Set the media_speed to auto negotiate on ent0 on next boot
chdev -dev ent0 -attr media_speed=Auto.Negotiation -perm
```

## Storage Pools

- Storage pools are LVM devices used to back VIOS mount points, virtual repositories, and client virtual disks.
- Storage pools are typically used for low-I/O client disk needs or storage constrained environments. It is *not* considered the “performance” option.
- Most of the storage pool commands recognize a “default” storage pool if none is specified. Until one is explicitly set, this is the `rootvg` storage pool.
- A backing device in the storage pool context is effectively a LV. A virtual target device is the name of the mapping of the backing device to a virtual host adapter that a client will attach to.
- The naming convention of backing devices (LVs) and their mappings in these examples tend to include information about the device type (“lv”), the partition it will be used by, and the disk number on that partition. These names are not essential, but useful when viewing a list of devices and mappings as the number of disk mappings tends to exceed any other mapping type on a typical VIOS.

```
List the current storage pools, size, & utilization
lssp
List the default storage pool
lssp -default
Make the client_boot storage pool the default storage pool
chsp -default client_boot
Create a new storage pool called clienthd using hdisk1
mksp -f clienthd hdisk1
List all the backing devices (LVs) in the default storage pool
lssp -bd
List all the backing devices (LVs) in the clienthd storage pool
lssp -bd -sp clienthd
Add hdisk23 to the client_boot storage pool
chsp -add -sp client_boot hdisk23
List all the physical disks in the client_boot storage pool
lssp -detail -sp client_boot
Create a backing device (LV) in the rootvg storage pool w/no mapping
mkbdsp -sp rootvg 8g -bd lv.lakshmi.1
Create backing device and virtual adapter mapping
mkbdsp -sp rootvg 1g -bd lv.shiva.07 \
  -vadapter vhost1 -tn shiva_hd7
↪ The bd is the LV name. The tn is the mapping (lsmapi) name.
Remove vtd (virtual target device) shiva_hd7 but keep backing device
rmbdsp -vtd shiva_hd7 -savebd
↪ This could also be done with rmvdev command
Map backing device lv.shiva.07 to vhost0 (create vtd shiva_hd7)
mkvdev -vdev lv.shiva.07 -vadapter vhost1 -dev shiva_hd7
Remove the vtd and the backing device
rmbdsp -vtd lv.shiva.07
Remove last disk from the sp to delete the sp
chsp -rm -sp client_boot hdisk22
```

## The VIOS Management Shell Account

- The primary / default management account for VIOS is “padmin”.
- The shell for padmin is a restricted shell designed for VIOS admin.
- A full root-user shell can be accessed by using the `oem_setup.env` command.
- The restricted shell has access to common Unix utilities such as `awk`, `grep`, `sed`, and `vi`.
- padmin's home directory is in the path. Scripts cannot be explicitly sourced, but can be created in the home directory and run by name. When writing scripts, note that most VIOS commands are aliases.

```
Redirect the output of ls to a file
ls | tee ls.out
Exit the restricted shell to a root shell
oem_setup.env
↪ Exit back to restricted shell like exiting any shell
List all available commands
help
↪ Use help followed by the command for detailed information
```

## VIOS Management

### OS / System

Mirror the rootvg in VIOS to hdisk1

```
extendvg rootvg hdisk1
mirrorios hdisk1
```

↪ The VIOS will reboot when finished

Shutdown the server

```
shutdown
```

↪ Optionally include `-restart`

Unix uptime equivalent

```
sysstat -short
```

List the version of the VIOS system software

```
ioslevel
```

List the underlying (AIX) OS version of the VIOS

```
oem_platform_level
```

Setup smitty screens

```
cfgassist
```

List the boot devices for this LPAR

```
bootlist -mode normal -ls
```

List LPAR name and ID

```
lslparinfo <=> uname -L
```

List packages installed on the system

```
lssw
```

↪ Equivalent to `lspp -L` in AIX

Install a package without leaving the restricted shell

```
updateios -dev ./errbr61.0.32.3.0.bff -install -accept
```

To display the current date and time of the VIOS

```
chdate <=> date
```

Change the current time and date to 1:02 AM March 4, 2005

```
chdate -hour 1 -minute 2 -month 3 -day 4 -year 2005
```

Change just the timezone to AST

```
chdate -timezone AST
```

↪ Visible on `next` login

### Error Log

Brief dump of the system error log

```
errorlog
```

Detailed dump of the system error log

```
errlog -ls | more
```

Remove error log events older than 30 days

```
errlog -rm 30
```

- The `errlog` command allows you to view by sequence, but does not give the sequence in the default format.

### Users

- `padmin` is the only user for most configurations. It is possible to configure additional users, such as operational users for monitoring purposes.

Display a timestamped list of all commands run on the system

```
lsgcl
```

List attributes of the `padmin` user

```
lsuser padmin
```

List all users on the system

```
lsuser (The optional parameter "ALL" is implied with no parameter)
```

Change the password for the current user

```
passwd
```

Change the MOTD to an appropriate message

```
motd "Unauthorized access is prohibited."
```

### Performance Monitoring

Retrieve statistics for `ent0`

```
entstat -all ent0
```

↪ SEA specific stats are available using `seastat`

Reset the statistics for `ent0`

```
entstat -reset ent0
```

View disk statistics

```
viostat
```

List interface packet counts and MTU stats

```
netstat -state
```

Enable extended disk statistics

```
chdev -dev sys0 -attr iostat=true
```

- The `topas` command is available in VIOS.

## The lsmap Command

- Used to list mappings between virtual adapters and physical resources.

List all (virtual) disks attached to the `vhost0` adapter

```
lsmap -vadapter vhost0
```

List only the virtual target devices attached to the `vhost0` adapter

```
lsmap -vadapter vhost0 -field vtd
```

This line can be used as a list in a for loop

```
lsmap -vadapter vhost0 -field vtd -fmt :|sed -e "s:/ /g"
```

List all SEAs (shared ethernet adapters) on the system

```
lsmap -all -net -field sea
```

List all (virtual) disks and their backing devices

```
lsmap -all -type disk -field vtd backing
```

List all SEAs and their backing devices

```
lsmap -all -net -field sea backing
```

List all virtual fibre adapters

```
lsmap -all -npiv
```

List all LV (storage pool) mappings and backing devices

```
lsmap -all -type lv -field VTD backing
```

↪ Note: No comma is used between the two field items.

## SEA Setup & Management

- IP addresses are configured either on the SEA adapter or another virtual adapter on the VLAN that is not the backing device for the SEA. IP addresses cannot be configured on physical or virtual adapters that are arguments to the `mkvdev` command used to create the SEA.
- The virtual device used in the SEA configuration should have "Access External Networks" (AKA: "Trunk adapter") checked in its configuration (in the profile on the HMC). This is the *only* interface on the VLAN that should have this checked (except for SEA failover config).
- The PVID (`defaultid`) for the SEA is relevant when the physical adapter is connected to a VLAN configured switch and the virtual adapter is configured for VLAN (802.3Q) operation. Traffic passed through the SEA should be untagged in a non-VLAN configuration.

Create a SEA "bridge" between the physical `ent0` and the virtual `ent1`

```
mkvdev -sea ent0 -vadapter ent1 \
      -default ent1 -defaultid 1
```

↪ Explanation of the parameters:

`-sea ent0` – This is the physical interface

`-vadapter ent1` – This is the virtual interface

`-default ent1` – Default virtual interface to send untagged packets

`-defaultid 1` – This is the PVID for the SEA interface

Find virtual adapters associated with SEA `ent4`

```
lsdev -dev ent4 -attr virt.adapters
```

Find control channel (for SEA failover) for SEA `ent4`

```
lsdev -dev ent4 -attr ctl.chan
```

Find physical (backing) adapter for SEA `ent4`

```
lsdev -dev ent4 -attr real.adapter
```

Turn on accounting on the SEA `ent3`

```
chdev -dev ent3 -attr accounting=enabled
```

Get performance stats on SEA

```
seastat -d ent3
```

## Backup

Create a backup of all structures of (online) VGs and/or storage pools

```
savevgstruct vdiskvg
```

↪ Data will be saved to `/home/ios/vgbackups`

List all (known) backups made with `savevgstruct`

```
restorevgstruct -ls
```

Backup the system (mksysb) to a NFS mounted filesystem

```
backupios -file /mnt
```

## VIOS Security

- `ssh` is installed by default on VIOS 2.x

List all open ports on the firewall configuration

```
viosecure -firewall view
```

To enable basic firewall settings

```
viosecure -firewall on
```

List all failed logins on the system

```
lsfailedlogin
```

## The mkvdev & vfcmap Commands

- These commands are used to create a mapping between a virtual adapter and a physical resource. The result of these commands will be a "virtual device" visible in `lsdev` output but not the LPAR profile as seen on the HMC.
- The `mkvdev` command is used to create SEA and disk mappings, `vfcmap` is used to create NPIV mappings.

Create a SEA that links physical `ent0` to virtual `ent1`

```
mkvdev -sea ent0 -vadapter ent1 \
      -default ent1 -defaultid 1
```

Setup NPIV mapping

```
vfcmap -vadapter vfchost0 -fcp fcs2
```

↪ View available port status using `lsnports` command

Remove previously created NPIV mapping

```
vfcmap -vadapter vfchost0 -fcp
```

Create a disk mapping from `hdisk7` to `vhost2` and call it `wd_c1_hd7`

```
mkvdev -vdev hdisk7 -vadapter vhost2 -dev wd_c1_hd7
```

↪ The `-dev` option is optional but strongly recommended in order to create meaningful device names

Another disk mapping using a previously created LV as a backing device

```
mkvdev -vdev lv.lakshmi.1 -vadapter vhost3 \
      -dev lakshmi.hd1
```

Remove a virtual target device (disk mapping) named `vtscsi0`

```
rmvdev -vtd vtscsi0
```

↪ `vtscsi0` is the default mapping naming convention

## SEA Failover

- A SEA failover configuration is a situation when IP addresses *should* be configured on the SEA adapter. If the backing adapter fails then the IP address *should not* be able to communicate with the outside.
- A control channel *must* be configured between the two VIOS using two virtual ethernet adapters that use that VLAN strictly for this purpose. The local virtual adapter created for this purpose should be specified in the `ctl.chan` attribute in each of the SEA setups.
- Both virtual adapters (on the VLAN with clients) should be configured to "Access External network", but one should have a higher priority (lower number) for the "Trunk priority" option. A SEA failover configuration is the only time that you should have two virtual adapters on the same VLAN that are configured in this manner.

Create a SEA failover adapter (run on each VIOS)

```
mkvdev -sea ent0 -vadapter ent1 -default ent1 \
      -defaultid 1 -attr ha_mode=auto \
      ctl.chan=ent3 netaddr=10.143.180.1
```

↪ Explanation of the parameters:

`-sea ent0` – This is the physical interface

`-vadapter ent1` – This is the virtual interface

`-default ent1` – Default virtual interface to send untagged packets

`-defaultid 1` – This is the PVID for the SEA interface

`-attr ha_mode=auto` – Turn on auto failover mode

`(-attr) ctl.chan=ent3` – Define the control channel interface

`(-attr) netaddr=10.143.180.1` – Address to ping for connect test

Change the device to standby mode (and back) to force failover

```
chdev -dev ent4 -attr ha_mode=standby
```

```
chdev -dev ent4 -attr ha_mode=auto
```

↪ `auto` is the default `ha_mode`, `standby` forces a failover situation

See what the priority is on the trunk adapter

```
netstat -cdlistats | grep "Priority"
```

## About this QuickSheet

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