Dual VIOS Upgrade walk-through

PowerVM technical webinar #12 for customers/BPs/IBMers

Aim of this session

- Upgrade both VIOS
  - in a Dual VIOS system
  - Non disruptively
- References
- Tips
Updating a VIOS

• Single VIOS
  – If you need to reboot the VIOS, you need to shutdown all the clients

• Dual, redundant VIOS
  – you do not need to shutdown the clients
  – but … beware!
Updating a VIOS

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• updates are available from FixCentral

• DO READ THE INSTALLATION INSTRUCTIONS

• Ensure compatibility of HMC, FW, VIOS, AIX/IBM i/Linux
  – Fix Level Recommendation Tool (FLRT)

Updating a VIOS

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• You cannot necessarily upgrade directly from all releases to
  the latest

• It may be necessary to go through more than one step

• You need to keep your dual VIOS at compatible levels
  – so carry out each step to each VIOS in turn.
  – ensure that all paths are redundant before starting the other VIOS
  – eg: LVM mirrors are in sync
Updating a VIOS

- Avoid complication
- Check/document the environment before upgrading
- Useful commands:

  - `lsvg rootvg`
    - check for stale PPs and stale PV.
  - `lsvg -pv rootvg`
    - check for missing disks.
  - `netstat -cdlistats`
    - check that the Link status is Up on all used interfaces.
Updating a VIOS

- Clients
  - errpt
    - check for CPU, memory, disk, or Ethernet errors, and resolve them before continuing.
  - lsvg -p rootvg
    - check for missing disks.
  - netstat -v
    - check that the Link status is Up on all used interfaces.

All the details are in the Redpaper

General syntax:

```
$ updateios -dev /dev/cd0 -install -accept
```

Redpaper also covers steps to take to check that all is well before proceeding with the redundant VIOS
System
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- IBM Power 750
- 8233-E8B
- 8 cpus
- 16GB RAM
- I/O drawer

LPARs
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peachvios1
$ hostname
peachvios1
$ ioslevel
2.1.2.13-FP-22.1 SP-02
$ lsmap -all -net

SVSA Physloc
--------- ------------------------------
t0  U8233.E8B.100272P-V15-C62-T1
SEA  ent0
Backing device  PE
Status  Available
Physloc  U78A0.001.DNWHG1A-P1-C6-T1

SVSA Physloc
--------- ------------------------------
t0  U8233.E8B.100272P-V15-C62-T1
SEA  ent0
Backing device  PE
Status  Available
Physloc  U78A0.001.DNWHG1A-P1-C6-T1

NO SHARED ETHERNET ADAPTER FOUND

$ hostname
peachvios2
$ ioslevel
2.1.2.13-FP-22.1 SP-02
$ lsmap -all -net

SVSA Physloc
--------- ------------------------------
t0  U8233.E8B.100272P-V16-C62-T1
SEA  ent0
Backing device  PE
Status  Available
Physloc  U78A0.001.DNWHG1A-P1-C6-T4

SVSA Physloc
--------- ------------------------------
t0  U8233.E8B.100272P-V16-C62-T1
SEA  ent0
Backing device  PE
Status  Available
Physloc  U78A0.001.DNWHG1A-P1-C6-T4

NO SHARED ETHERNET ADAPTER FOUND

$ lsmap -all

SVSA             Physloc      Client Partition ID
--------------- ------------------------------ ------------------
vhost0  U8233.E8B.100272P-V15-C23  0x00000017
VTD    peach3_1_vtd
Status  Available
LUN    0x8100000000000000
Backing device  peach3_1_lv
Physloc  

$ lsmap -all

SVSA             Physloc      Client Partition ID
--------------- ------------------------------ ------------------
vhost0  U8233.E8B.100272P-V16-C23  0x00000017
VTD    peach3_1_vtd
Status  Available
LUN    0x8100000000000000
Backing device  peach3_1_lv
Physloc  

$
Client

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# hostname
peach3.aixncc.uk.ibm.com
#

# ifconfig -a
en0:
  flags=1e080863,480<UP,BROADCAST,NOTRAILERS,NOTREXT,RUNNING,SIMPLEX,MULTICAST,GROUPRT,64BIT,CHECKSUM_OFFLOAD(ACTIVE),CHAIN>
  inet 9.137.62.43 netmask 0xff19ff00 broadcast 9.239.62.255
tcp_sendspace 262144 tcp_recvspace 262144 rfc1323 1
lo0:
  flags=e08084b,c0<UP,BROADCAST,LOOPBACK,RUNNING,SIMPLEX,MULTICAST,GROUPRT,64BIT,LARGESEND,CHAIN>
  inet 127.0.0.1 netmask 0xff000000 broadcast 127.255.255.255
  inet6 ::1%1/0
tcp_sendspace 131072 tcp_recvspace 131072 rfc1323 1

# oslevel -s
7100-01-03-1207
#

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# lscfg -vpl hdisk0
hdisk0  U8233.E8B.100272P-V23-C15-T1-L8100000000000000 Virtual SCSI
Disk Drive

PLATFORM SPECIFIC

Name: disk
Node: disk
Device Type: block

# lscfg -vpl hdisk1
hdisk1  U8233.E8B.100272P-V23-C16-T1-L8100000000000000 Virtual SCSI
Disk Drive

PLATFORM SPECIFIC

Name: disk
Node: disk
Device Type: block
#
```
# bootlist -m normal -o
hdisk0 blv=hd5 pathid=0
hdisk1 blv=hd5 pathid=0
#

# lsvg -l rootvg

rootvg:

<table>
<thead>
<tr>
<th>LV NAME</th>
<th>TYPE</th>
<th>LPs</th>
<th>PPVs</th>
<th>PVs</th>
<th>LV STATE</th>
<th>MOUNT POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>hd5</td>
<td>boot</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>closed/syncd</td>
<td>N/A</td>
</tr>
<tr>
<td>hd6</td>
<td>paging</td>
<td>16</td>
<td>32</td>
<td>2</td>
<td>open/syncd</td>
<td>N/A</td>
</tr>
<tr>
<td>hd8</td>
<td>jfs2log</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>open/syncd</td>
<td>N/A</td>
</tr>
<tr>
<td>hd4</td>
<td>jfs2</td>
<td>39</td>
<td>78</td>
<td>2</td>
<td>open/syncd</td>
<td>/</td>
</tr>
<tr>
<td>hd2</td>
<td>jfs2</td>
<td>128</td>
<td>256</td>
<td>2</td>
<td>open/syncd</td>
<td>/usr</td>
</tr>
<tr>
<td>hd9var</td>
<td>jfs2</td>
<td>14</td>
<td>28</td>
<td>2</td>
<td>open/syncd</td>
<td>/var</td>
</tr>
<tr>
<td>hd3</td>
<td>jfs2</td>
<td>132</td>
<td>264</td>
<td>2</td>
<td>open/syncd</td>
<td>/tmp</td>
</tr>
<tr>
<td>hd1</td>
<td>jfs2</td>
<td>11</td>
<td>22</td>
<td>2</td>
<td>open/syncd</td>
<td>/home</td>
</tr>
<tr>
<td>hd10opt</td>
<td>jfs2</td>
<td>4</td>
<td>8</td>
<td>2</td>
<td>open/syncd</td>
<td>/opt</td>
</tr>
<tr>
<td>hd1admin</td>
<td>jfs2</td>
<td>8</td>
<td>16</td>
<td>2</td>
<td>open/syncd</td>
<td>/admin</td>
</tr>
<tr>
<td>livedump</td>
<td>jfs2</td>
<td>32</td>
<td>32</td>
<td>1</td>
<td>closed/syncd</td>
<td>/var/adm/ras/livedump</td>
</tr>
<tr>
<td>lg_dumplv</td>
<td>sysdump</td>
<td>32</td>
<td>32</td>
<td>1</td>
<td>closed/syncd</td>
<td>N/A</td>
</tr>
</tbody>
</table>
#

lsvg -l rootvg | awk '{print $1}' | while read LV
do
lsv -m $LV
done
```

A picture paints a kiloword
Updating a VIOS

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BACK UP
THE VIOS
FIRST

BACKUP

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- All your clients
  - However you normally do it
- Resources defined on the Hardware Management Console
  - Profiles
  - HEA information
- The VIO Server operating systems (both of them)
  - backupios
    - tape device
    - optical device
    - file system (local or nfs mounted File System)
  - Client data is not backed up.
- Full details in the Redbook

Full details in the Redbook

Redbook
Backup - Resources defined on the HMC

- backup the partition information on the HMC

Backup - Resources defined on the HMC

- Save Critical Console Data

Back up the Virtual I/O Server to DVD-RAM

$ backupios -cd /dev/cd0 -udf -accept
Creating information file for volume group volgrp01.
Creating information file for volume group storage01.
Backup in progress. This command can take a considerable amount of time to complete, please be patient...
Initializing mkcd log: /var/adm/ras/mkcd.log...
Verifying command parameters...
Creating image.data file...
Creating mksysb image...
Creating list of files to back up.
Backing up 44933 files..........
44933 of 44933 files (100%)
0512-038 mksysb: Backup Completed Successfully.
Populating the CD or DVD file system...
Copying backup to the CD or DVD file system...
............................................
............................................
............................................
............................................
............................................
............................................
............................................
..............................
Building chrp boot image...
Backing up the VIOS operating system to file

- backupios
- will result in either:
  - A tar file that contains all of the information needed for a restore
  - A mksysb image
- Both methods depend on an installation server for restoration.

```
tar
$ backupios -file /mnt
Creating information file for volume group storage01.
Creating information file for volume group volgrp01.
Backup in progress. This command can take a considerable amount of time to complete, please be patient...
$ Good for installios
```
**tar**

- A full backup tar file package
  - including all of the resources that the `installios` command will need to install a Virtual I/O Server
    - `mksysb`,
    - `bosinst.data`,
    - `Network`
    - `Bootimage`
    - `SPOT`
  - from an HMC using the `installios` command.
- In this example the command argument is a directory
  - the file name will be `nim_resources.tar`.

**mksysb**

```
$ backupios -file /mnt/VIOS_BACKUP_27Jun2006_1205.mksysb -mksysb
/mnt/VIOS_BACKUP_27Jun2006_1205.mksysb doesn't exist.
Creating /mnt/VIOS_BACKUP_27Jun2006_1205.mksysb
Creating information file for volume group storage01.
Creating information file for volume group volgrp01.
Backup in progress. This command can take a considerable amount of time to complete, please be patient...
Creating information file (/image.data) for rootvg.
Creating list of files to back up...
Backing up 45016 files...........................
45016 of 45016 files (100%)
0512-038 savevg: Backup Completed Successfully.
```

Good for NIM
Backing up for DR

- Many more things to consider
  - or it could be exactly the same ;-)  
- Disks and network adapters  
  - may be in different slots etc  
- The recovery machine could be very different  
  - eg: compare p710, p770, p795  
- See the Redbook

Restoring

- Depends on type of backup  
- Covered in Redbook  
- Similar to doing an install  
- An install is actually a restore of a mksysb

Hopefully you will never need to do this
OK – Let’s do it

Fix Level Recommendation Tool

The Fix Level Recommendation Tool (FLRT) provides cross-product compatibility information and its recommendations for IBM products. Use FLRT to plan upgrades of key components or to verify the current health of a system. Enter your current levels of firmware and software to receive a recommendation. When planning upgrades, enter the levels of firmware or software you want to use, so you can verify needs and compatibility across products before you upgrade.

OS family
- AIX
- 2iOS
- Linux
- Mac OS
- UNIX
- Windows
- Other

Products supported by this service include software products that run on AIX, IBM i, Linux on Power, select Linux distributions, Windows, 2iOS, and select UNIX distributions.


FLRT
Possibly several steps to latest levels

Upgrade recommended 2.2.0.13  View package
Notice: 2.2.0.10-FP24 must be downloaded and installed first. Alternatively you can install VIOS 2.2.0.10 FixPack 24 and VIOS 2.2.0.13-FP24-SP03 concurrently if you have not installed VIOS 2.2.0.10 FixPack 24. If you wish to take advantage of the fixes and functionality, it is recommended that both VIOS 2.2.0.10 FixPack 24 and VIOS 2.2.0.13-FP24-SP03 be installed concurrently, to avoid fileset requisite issues. Please review the VIOS 2.2.0.13-FP24-SP03 README for detailed instructions. Rerun assuming this upgrade

Upgrade recommended 2.2.1.1  View package

Upgrade recommended 2.2.0.13

View package
Installation procedure for combine FP24 and SP03

To install this combined Fix Pack 24 and Service Pack 03, log in to VIOS as padmin, and then follow these steps, entering the specified commands.

Check the ioslevel
$ ioslevel

To apply this Service Pack, the ioslevel must be:
2.1.0.0 THROUGH 2.2.0.0

After Fix Pack 24 and Service Pack 03 have been downloaded to the same directory, enter the following commands:
$ updateios -commit
$ oem_setup_env
$ /usr/lib/lppmgr -d <Directory_path> -u -r
$ exit
$ updateios -install -accept -dev <Directory_path>

If you are upgrading to FP24 + SP03 from VIOS level 2.1.3, run the following command. (Skip to then next step if you are upgrading from a prior level of the VIOS.)
$ swrole - PAdmin

To load all changes, reboot the VIOS as User padmin.
$ shutdown -restart

After the reboot is complete, verify the correct IOS level by entering the following command:
$ ioslevel

We are starting at:
2.1.2.13-FP-22.1 SP-02

We are starting at:
2.1.2.13-FP-22.1 SP-02

Download and copy the two sets together

$ ls -l
total 256
drwxr-xr-x 2 root  system  57344 23 Apr 22:26 both
drwxr-xr-x 2 root  system  28672 23 Apr 06:17 VIOS_2.2.0.10-FP24
drwxr-xr-x 2 root  system  36864 23 Apr 06:48 VIOS_2.2.0.13-FP24-SP03
$ du -sg both
7.92    both
$

$ df -gF
Filesystem GB blocks Used Available Capacity Mounted on
/dev/hd4  0.25  0.07  0.19  29% /
/dev/hd2  3.25  2.60  0.65  20% /usr
/dev/hd3  0.75  0.19  0.56  26% /var
/dev/hd1  3.50  0.00  3.50  1% /tmp
/dev/hd11 10.00 3.22  6.78  33% /home
/dev/hd1admin 0.25  0.00  0.25  1% /admin
/proc - - - - /proc
/dev/hd10tp  1.25  0.88  0.37  71% /opt
/dev/livedump 0.25  0.80  0.25  1% /var/adm/ras/livedump
/dev/VMLibrary 32.00 3.35 28.65 11% /var/vio/VMLibrary
$
Check there is enough room

$ oem_setup_env
# chfs -a size=+10G /home
Filesystem size changed to 41943040
# exit
$

$ df -gP .
Filesystem      GB blocks      Used Available Capacity Mounted on
/dev/hd1          20.00      3.22     16.78      17% /home
$

$ mkdir both
$

Then copy the files across – I used scp

Follow the readme (overcoming the bugs in it ☹)

$ updateios -commit
There are no uncommitted updates.
$

$ oem_setup_env
# /usr/lib/lppmgr -d /home/padmin/both -u -r
ksh: /usr/lib/lppmgr: not found.
# type lppmgr
lppmgr not found.
# find / -name "*lppm*"
/usr/lib/instl/lppmgr
#
Use the real command

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```bash
# /usr/l1ib/instl/lppmgr -d /home/padmin/both -u -r
lppmgr: Source table of contents location is /home/padmin/both/.toc
lppmgr: Building table of contents in /home/padmin/both ..
lppmgr: Building table of contents completed.
lppmgr: Generating duplicate list..
Results:
======================= start list =============================
U831382.bff
U832126.bff
======================== end list ==============================
rm: removing /home/padmin/both/U831382.bff
rm: removing /home/padmin/both/U832126.bff
lppmgr: Building table of contents in /home/padmin/both ..
lppmgr: Building table of contents completed.
# exit
```

updateios

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```bash
$ updateios -install -accept -dev /home/padmin/both
==============================================================================
+-----------------------------------------------------------------------------+
Pre-installation Verification...
+-----------------------------------------------------------------------------+
Verifying selections...done
Verifying requisites...done
Results...

WARNINGS

Problems described in this section are not likely to be the source of any immediate or serious failures, but further actions may be necessary or desired.

Already Installed

The following filesets which you selected are either already installed or effectively installed through superseding filesets.
tpc.rte 4.1.0.97  # TPC Runtime Install Files
tivoli.tsm.client.msg.ZH_TW 6.1.0.0  # TSM Client Messages - Chinese...
...
Check conflicts

Conflicting Versions of Filesets
--------------------------------
The following filesets are conflicting versions of filesets for which there are multiple versions on the installation media. Since a specific version was not selected, the newest installable version has been selected.

- tivoli.tivguid 1.3.3.1                    # IBM Tivoli GDID on AIX
- sysmgmt.cimserver.pegasus.rte 2.9.0.20   # Pegasus CIM Server Runtime E...

Superseded Fileset Updates
----------------------------
Fileset updates listed in this section will not be installed. Newer updates which supersede (replace) these were selected instead (either by you or automatically by the installation program). Make sure that the superseding updates listed passed pre-installation verification.

- bos.rte.install 6.1.6.1                       (Superseded by 6.1.6.15)

<< End of Warning Section >>

Successes

SUCCESSES
-----------
Filesets listed in this section passed pre-installation verification and will be installed.

Mandatory Fileset Updates
------------------------
(being installed automatically due to their importance)
- bos.rte.install 6.1.6.15       # LPP Install Commands

<< End of Success Section >>
Statistics

FILESET STATISTICS

1422 Selected to be installed, of which:
  1 Passed pre-installation verification
  3 Replaced by superseding updates
  204 Already installed (directly or via superseding filesets)
  1214 Deferred (see *NOTE below)

  1 Total to be installed

*NOTE The deferred filesets mentioned above will be processed after the installp update and its requisites are successfully installed.

Resources and final check

RESOURCES

Estimated system resource requirements for filesets being installed:

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Needed Space</th>
<th>Free Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>/usr</td>
<td>37296</td>
<td>1366696</td>
</tr>
<tr>
<td>/tmp</td>
<td>456</td>
<td>7332616</td>
</tr>
<tr>
<td>TOTAL</td>
<td>37752</td>
<td>8699312</td>
</tr>
</tbody>
</table>

NOTE: "Needed Space" values are calculated from data available prior to installation. These are the estimated resources required for the entire operation. Further resource checks will be made during installation to verify that these initial estimates are sufficient.

End of installp PREVIEW. No apply operation has actually occurred.

Continue the installation [y|n]?
Doing it

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$-------------------------------------------------------------------------------------------------
Installing Software...
$-------------------------------------------------------------------------------------------------
installp: APPLYING software for:
    bos.rte.install 6.1.6.15
<< Copyright notice for bos >>>...........
Licensed Materials - Property of IBM
5765G6200
Copyright International Business Machines Corp. 1985, 2011.
Copyright BULL 1993, 2011.
Copyright Digi International Inc. 1988.
.
.
rsc.t.opt.storagerm 3.1.0.4          ROOT   APPLY    SUCCESS
bos.esagent.ivm 6.6.6.15        USR         APPLY       SUCCESS
installp: * * *  A T T E N T I O N ! ! !
Software changes processed during this session require this system
and any of its diskless/dataless clients to be rebooted in order
for the changes to be made effective.

Finished – but need to set the role

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$ ioslevel
Access to run command is not valid.
$ 
$ swrole - PAdmin
padmin’s Password:
$ 
$ ioslevel
2.2.0.13-FP24 SP-03
$ 

This does NOT mean VIOS clients

Notice the spaces
Reboot the VIOS

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- Start a ping on the client
- $ shutdown - restart
- The ping continues

```
# lsvg -l rootvg
rootvg:
 LV NAME             TYPE       LPs     PPs     PVs LV STATE      MOUNT POINT
hd5                 boot       1       2       2    closed/syncd N/A
hd6                 paging     16      32      2    open/syncd N/A
hd8                 jfs2log    1       2       2    open/stale    N/A
hd4                 jfs2       7       14      2    open/stale    /
hd2                 jfs2       64      128     2    open/stale    /usr
hd3                 jfs2       14      28      2    open/stale    /var
hd1                 jfs2       4       8       2    open/stale    /tmp
hd10opt             jfs2       1       2       2    open/syncd   /home
hd11admin           jfs2       4       8       2    open/syncd   /admin
lg_dump:sysdump    jfs2       32      32      1    open/syncd   N/A
livedump            jfs2       8       16      2    open/syncd   /var/adm/ras/livedump
```

Mirrors go stale

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- The ping continues...
So fix them
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# varyonvg rootvg
#

# lsvg -1 rootvg
rootvg:

<table>
<thead>
<tr>
<th>LV NAME</th>
<th>TYPE</th>
<th>LPs</th>
<th>PPs</th>
<th>PVs</th>
<th>LV STATE</th>
<th>MOUNT POINT</th>
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<td>32</td>
<td>2</td>
<td>open/syncd</td>
<td>N/A</td>
</tr>
<tr>
<td>hd8</td>
<td>jfs2log</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>open/syncd</td>
<td>N/A</td>
</tr>
<tr>
<td>hd9var</td>
<td>jfs2</td>
<td>14</td>
<td>28</td>
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<td>/var</td>
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<td>264</td>
<td>2</td>
<td>open/syncd</td>
<td>/tmp</td>
</tr>
<tr>
<td>hd1</td>
<td>jfs2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>open/syncd</td>
<td>/home</td>
</tr>
<tr>
<td>hd11admin</td>
<td>jfs2</td>
<td>11</td>
<td>22</td>
<td>2</td>
<td>open/syncd</td>
<td>/opt</td>
</tr>
<tr>
<td>livedump</td>
<td>jfs2</td>
<td>4</td>
<td>8</td>
<td>2</td>
<td>open/syncd</td>
<td>/admin</td>
</tr>
<tr>
<td>/var/adm/ras/livedump</td>
<td>jfs2</td>
<td>8</td>
<td>16</td>
<td>2</td>
<td>open/syncd</td>
<td></td>
</tr>
<tr>
<td>lg_dumplv</td>
<td>sysdump</td>
<td>32</td>
<td>32</td>
<td>1</td>
<td>closed/syncd</td>
<td>N/A</td>
</tr>
</tbody>
</table>
#

Then do the following
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- Upgrade the second VIOS
- Reboot it
- Resynch the mirrors again in the client (all of them)
  - `rm -rf ~padmin/both`

- That completes this upgrade
So, I downloaded

And followed the same basic process to upgrade both VIOS
But it was more simple this time
– Only one upgrade per VIOS rather than two concurrent ones

$ ioslevel
2.2.1.1

Don’t forget

$ updateios -commit
All updates have been committed.

$ 

• DO read the readme
  – eg: you need 30GB in rootvg

• swrole – PAdmin
Not needed

The following errors can be ignored during installation; these requisites are not required on the VIOS.

MISSING REQUISITES: The following filesets are required by one or more of the selected filesets listed above. They are not currently installed and could not be found on the installation media.

- X11.loc.fr_FR.base.lib 4.3.0.0 # Base Level Fileset
- X11.samples.apps.clients 6.1.0.0 # Base Level Fileset
- X11.samples.lib.Core 6.1.0.0 # Base Level Fileset
- bos.INed 6.1.6.0 # Base Level Fileset
- bos.mls.rte 6.1.7.0 # Base Level Fileset
- bos.mls.rte 6.1.1.0 # Base Level Fileset
- devices.tmiscsw.rte 6.1.0.0 # Base Level Fileset
- rsct.exp.cimrm 2.5.4.0 # Base Level Fileset

Then Fixcentral told me:

Which brought me up to the latest level
**tips**

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- Do it in a console window (not a telnet/ssh to the VIOS)
  - On AIX, run `script filename` to keep a log
  - Use ssh to connect to HMC
  - Then run `vtmenu`

- Only use `oem_setup_env` when you **absolutely** must!

- DLPAR in more RAM and cpu for the upgrade

- `updateios -cleanup`

- If you use one or more File Backed Optical Media Repositories, you need to unload media images before you apply the Fix Pack.

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**Check there is no vOptical loaded**

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- To check for loaded images, run `lsvopt`
  The **Media** column lists any loaded media.

- To unload media images, run the following commands on all VTDs that have loaded images.
  ```bash
  unloadopt -vtd <file-backed_virtual_optical_device>
  ```

- To verify that all media are unloaded, run `lsvopt` again.
  The command output should show **No Media** for all VTDs.
Further Information

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• There are many sources of information for PowerVM
  – Including
    • Infocenter
    • Wikis
    • Movies
    • Redbooks

• You can always Read The Fine Manual
  – padmin can use the man command

• Formal Training
  – http://ibm.com/training
Summary

- Don't use oem_setup_env for general admin

- Document your setup

- Backup properly and regularly

- Keep up to date

- Read the readme – in full

- If you need multiple upgrades to each VIOS, then you must upgrade both to each level, in turn.

- Plenty of Redbooks