



p109921 - Using the viosupgrade tool to move to VIOS 3.1

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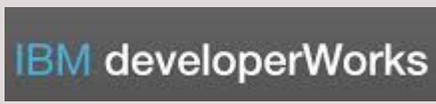
“Chris’s AIX blog” on developerWorks.

IBM Champion for Power Systems.

IBM Redbooks: NIM A-Z, Exploiting WPARs and AIX 7.1 Differences Guide.



 @cgibbo Twitter – All things AIX and POWER



VIOS 3.1

VIOS 3.1 (2H 2018)

- **Security & Resiliency**

- General clean-up
 - clean AIX 7.2 base
 - removal of old packages and solutions
- Storage multipathing enhancements
- Improved CAA features for SSP Clusters

- **Cloud ready**

- iSCSI (network storage) virtualization

- **Modernization**

- Code base: AIX 7.2 TL3
- Better I/O & accelerator enablement
- Smaller footprint

- **Performance**

- Native mode (p8, p9)

VIOS 3.1 Cont'd

- GA: 2H 2018
- P9, P8, P7+
- Min resource reqs:
 - https://www.ibm.com/support/knowledgecenter/en/9040-MR9/p9eeo/p9eeo_ipeeo_main.htm
- VIOS Recognized solutions
 - <https://www.ibm.com/developerworks/community/wikis/home#!/wiki/VIOS%20Recognized/page/VIOS%20Recognized%20Solutions>
- Use of Open Technologies
 - OpenSSH / OpenSSL, Postgres DB
- USB flash drive install support
- Removed
 - IVM (Integrated Virtualization Manager), Hibernation
- ESP (Early Support Program)

VIOS 3.1 Upgrade

■ Upgrade (manual) process:

- Backup VIOS config, fresh install (prepared image), restore VIOS config

■ VIOS upgrade tool to automate upgrade process

- Upgrade through NIM: Both bos & altdisk installs are supported
- Upgrade through autoinstall: VIOS can trigger it's own installation using mkysb image on alternate disk - Support is available only in **VIOS 2.2.6.30**
- Fully automated SSP cluster restore is not supported through this tool. Installation needs to be triggered on individual node basis.

■ VIOS 3.1 Upgrade Plan – Non-SSP users

- Direct upgrade is possible from VIOS 2.2.x.x to VIOS 3.1
- Ex: VIOS 2.2.4.x / VIOS 2.2.5.x / VIOS 2.2.6.x to VIOS 3.1

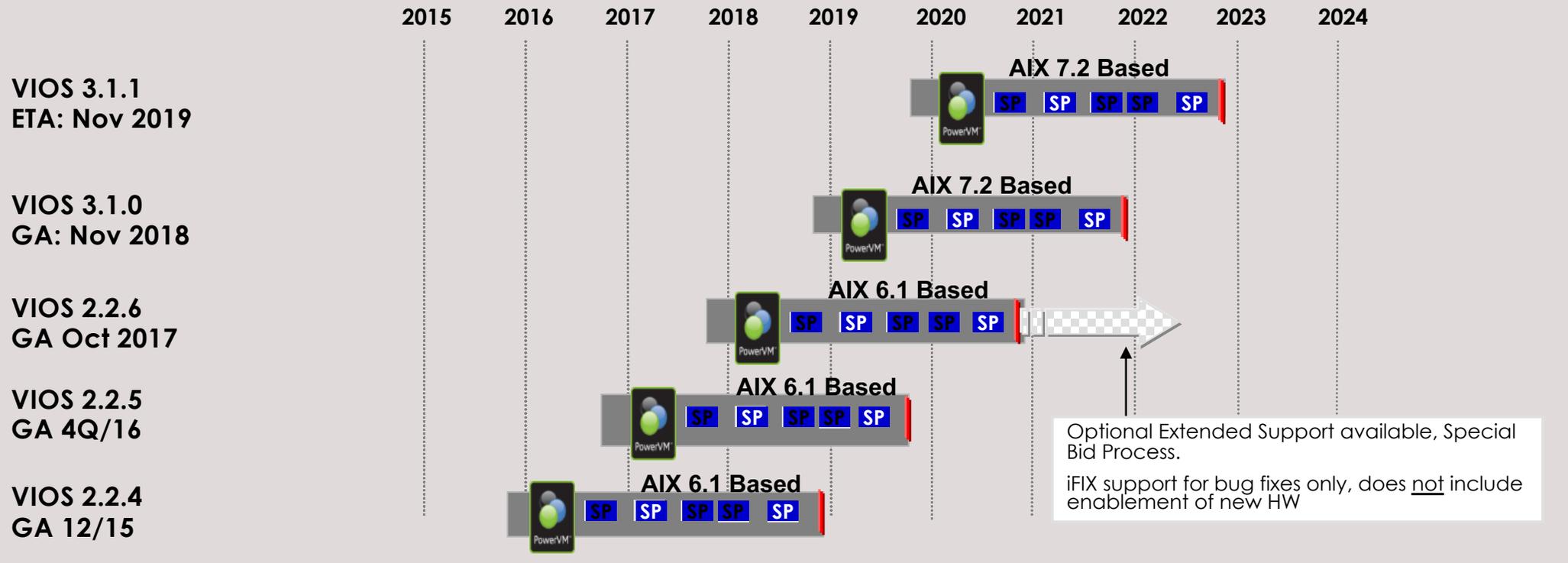
■ VIOS 3.1 Upgrade Plan – SSP users (Non-disruptive)

- Two steps process
- VIOS 2.2.6.20 or lower -> Upgrade to VIOS 2.2.6.30
- VIOS 2.2.6.30 -> VIOS 3.1 (Fresh install)

■ VIOS 3.1 Upgrade Plan – SSP users (Disruptive)

- Direct migration from VIOS 2.2.4.x / 2.2.5.x / 2.2.6.x to VIOS 3.1
- Only Full cluster restore – Partial cluster restore is not supported
- SSP LU's will be down during the upgrade process

VIOS Releases & Lifecycle



- A new VIOS Release / Technology Level is typically released once per year
<https://www.ibm.com/support/pages/powervm-vios-lifecycle-information>
- Service model is 3 years of standard support (service packs and i-fixes) for each VIOS release
- VIOS 3.1.0, 2.2.6, and 2.2.5 supported on are POWER9
- VIOS 3.1 and VIOS 2.2.6 images available on IBM ESS (Entitled Software Support) website

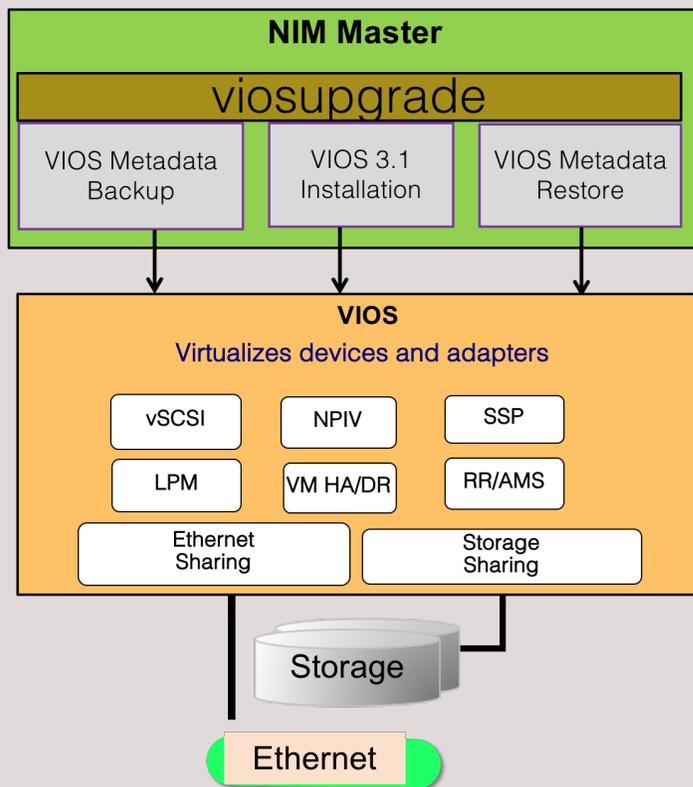
VIOS Upgrade

Why is this VIOS upgrade process different and why can't we use "updateios" for migration from VIOS 2.2.x.x to 3.1?

- VIOS 3.1 is a new and complete overwrite install (based on AIX 7.2)
- Update is not possible from VIOS 2.2 to VIOS 3.1
- Tooling available to simplify non-disruptive VIOS 3.1 upgrade
- Recreating virtual to physical device mappings in VIOS after the fresh installation can be complex and time consuming
 - Virtual I/O metadata
 - vSCSI - vSCSI client to vhost adapter mappings
 - NPIV - VFC client to VFC Host mappings
 - SEA - Shared Ethernet Adapter mappings
 - SSP metadata - Shared Storage Pool Cluster configuration
 - SSP database - SSP LU mappings to vscsi client adapters

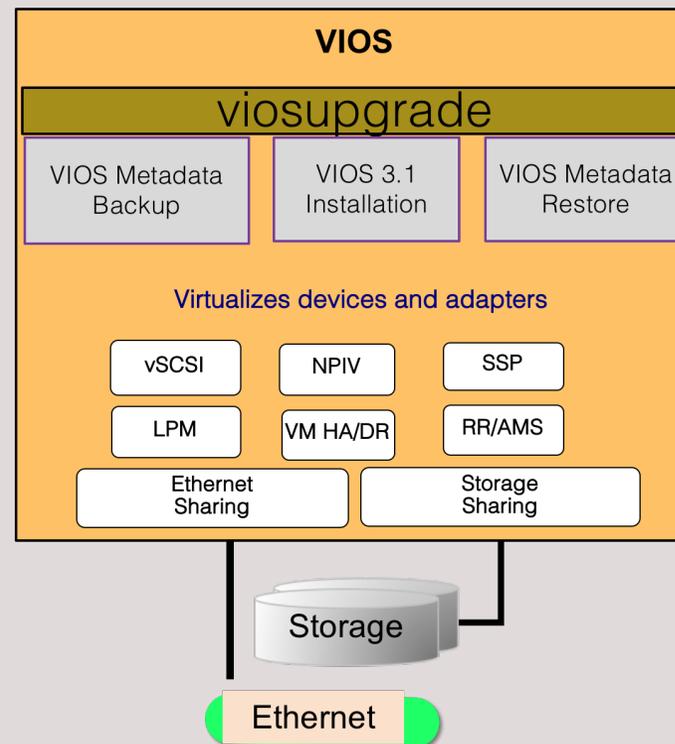
VIOSUPGRADE Tool – 2 variants

Variant 1: NIM Master



NIM Environment: NIM Master triggers the VIOS installation

Variant 2: VIOS



Non-NIM Environment: VIOS triggers its own installation

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How do I use the viosupgrade tool to upgrade to VIOS 3.1?

Here's one example of how you could use this new tool to upgrade: https://www.ibm.com/developerworks/community/blogs/cgaix/resource/viosupgrade_altdisk_v3_GA.pdf
Chris Gibson, IBM Systems Lab Services (Sept 6th, 2018). Rough Draft. Updated (v3, Dec 6th, 2018).

This example shows you how to use the **viosupgrade** tool to upgrade to 3.1.

https://www.ibm.com/support/knowledgecenter/en/POWER9/p9hcg/p9hcg_viosupgrade.htm

https://www.ibm.com/support/knowledgecenter/en/ssw_aix_72/com.ibm.aix.cmds6/viosupgrade.htm

Please note, that this process is an **upgrade** and **NOT** a migration. It is essentially a fresh install with a viosbr restore. It will require some reconfiguration afterwards.

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“viosupgrade” command from VIOS – Non-NIM environment

NOTE: The procedure describes testing of ESP VIOS 3.1 code, pre-GA. Post-GA, some of this information may no longer be relevant or required. Please refer to the appropriate release notes for VIOS 3.1, before attempting to follow these instructions.

This procedure assumes that you know what you’re doing and have done a little planning and preparation first. It is highly recommended that you read and refer to Nigel Griffiths presentation for more information on upgrading to VIOS 3.1, *BEFORE* you attempt to upgrade a VIOS to 3.1:

https://www.ibm.com/developerworks/community/blogs/cgaix/resource/80_Upgrading_to_VIOS31_in_Action.pdf

In this example, we have a SSP cluster of 4 VIOS (two VIOS nodes on each physical Power System CEC). Two of the cluster nodes have already been upgraded to VIOS 3.1.0.00. The cluster status (below) shows that nodes vio1 and vio2 are both UP_LEVEL (on 3.1). The last two nodes, vio3 and vio4 are ON_LEVEL, running 2.2.6.30. **The 2.2.6.30 level provides access to the “viosupgrade” tool.**

```
[padmin@vio3]$ cluster -status -verbose | grep -E 'Node Name|Node Upgrade Status'
Node Name:          vio1
Node Upgrade Status: 3.1.0.00 UP_LEVEL
Node Name:          vio2
Node Upgrade Status: 3.1.0.00 UP_LEVEL
Node Name:          vio3
Node Upgrade Status: 2.2.6.30 ON_LEVEL
Node Name:          vio4
Node Upgrade Status: 2.2.6.30 ON_LEVEL
```

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The following steps are based on the following paragraph from the VIOS 3.1 ESP upgrade instructions document:

“viosupgrade” command from VIOS – Non-NIM environment

VIO Servers from 2.2.6.30 to 3.1.0.00 or later can be upgraded using “viosupgrade” command where VIOS can upgrade itself. This method is another way of upgrading VIOS in a non-NIM environment where it uses alt_disk_mksysb command to install 3.1.0.00 on the provided new disk.

Note: If user wishes to boot back to the older image, they can do so by setting the bootlist for the old rootvg disk and restart the VIOS.

Command: *viosupgrade -l -i <mksysb image> -a <hdisk>*

Example: *viosupgrade -l -i vios3.1_mksysb -a hdisk1*

Upgrade Status: *Following command gets the status of the VIOS upgrade operation after the VIOS partition restarts using the newly installed image.*

Status: *viosupgrade -l -q*

Note: *Query option (“-q”) is provided to query the installation status when VIOS comes up with the newly installed image. This option does not provide any output during VIOS backup and installation process (prior to the VIOS restart).*

The 2.2.6.30 level provides the “viosupgrade” tool.

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The following steps were performed to upgrade both nodes to VIOS 3.1.0.00.

1. On the first VIOS, vio3, we check the VIOS level is 2.2.6.30 and then make available, a spare disk which we will use as an alternate root volume group.

```
[padmin@vio3]$ ioslevel
2.2.6.30
[padmin@vio3]$ r oem
oem_setup_env
[root@vio3]# lspv
hdisk0          00fa2d4742c2fa99          rootvg          active
hdisk1         00fa2d4757ea53dc         altinst_rootvg
hdisk2          00fa2d21bdb01ff7          caavg_private   active
hdisk3          none                      None
hdisk4          none                      None
```

```
[root@vio3]# alt_rootvg_op -X altinst_rootvg
Bootlist is set to the boot disk: hdisk0 blv=hd5
```

```
[root@vio3]# lspv
hdisk0          00fa2d4742c2fa99          rootvg          active
hdisk1         00fa2d4757ea53dc         None
hdisk2          00fa2d21bdb01ff7          caavg_private   active
hdisk3          none                      None
hdisk4          none                      None
```

```
[root@vio3]# chpv -C hdisk1
```

```
[padmin@vio3]$ lspv -free
NAME          PVID          SIZE (megabytes)
hdisk1       00fa2d4757ea53dc 122880
```

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2. We take note of several important VIOS configurations items, so that we can compare these before and after the upgrade process. This will allow us to ensure the upgrade has completed as expected.

```
$ lsmap -all
$ lsmap -all -net
# lsseas -c
$ pv -list
$ lu -list
$ cluster -status
$ cluster -status -verbose
# lsdev -Cc adapter
# ifconfig -a
# netstat -nr
# hostname
# lspv
# lsdev -Cc disk

# for i in `lsdev -Cc disk | awk '{print $1}'`
do
echo $i
lsattr -El $i -a queue_depth -a reserve_policy
echo
done

$ cat config/ntp.conf
$ cat /etc/netsvc.conf
$ grep TZ /etc/environment
```

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3. The viosupgrade command has the following options.

```
[padmin@vio3]$ viosupgrade -h
```

Usage:

```
viosupgrade -l -i image_file -a mksysb_install_disk [-c]
```

```
viosupgrade -l -q
```

Flags:

- l** Specifies local Node Installation.
- i** Specifies image file for the alternate disk installation.
- a** Specifies alternate disk to install the provided image.
- c** Specify if the node is part of the cluster.
- q** Queries the status of VIOS restore operation after booting the VIOS with newly installed image.

4. We start the upgrade process on vio3. First we copied the VIOS 3.1 mksysb image to the /home/padmin directory on vio3. Then we ran the viosupgrade tool with -l, for local node installation, -i to specify the mksysb image for the alt rootvg creation and -c to indicate the node was part of a SSP cluster.

Please Note: This step assumes that you have already created a VIOS 3.1 mksysb image, using the following procedure:
<https://www-01.ibm.com/support/docview.wss?uid=isg3T1011386#4>

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For the GA release, you will need to download the ISO images from the IBM ESS website first.

<https://www.ibm.com/servers/eserver/ess/index.wss>

Step 2: Select the software you wish to download

Product Number	Product Name
<input type="checkbox"/> 5765-CD3	AIX Enterprise Edition
<input type="checkbox"/> 5765-H23	PowerHA for AIX Standard Edition V6
<input type="checkbox"/> 5765-H39	PowerHA for AIX Standard Edition V7
<input type="checkbox"/> 5765-PVE	PowerVM Enterprise Edition
<input checked="" type="checkbox"/> 5765-VE3	PowerVM Enterprise ED V3

03.01.00	packages	<input type="checkbox"/>	2344: IBM PowerVM V3 / VIOS v03.01.00,ENU,DVD	10263
		<input type="checkbox"/>	README for ISO Download	1
		<input type="checkbox"/>	ISO, Virtual I/O Server v3.1.0.20 DVD 1 of 2 (5/2019)	4492
		<input type="checkbox"/>	ISO, Virtual I/O Server v3.1.0.20 DVD 2 of 2 (5/2019)	934
		<input type="checkbox"/>	ISO, Virtual I/O Server v3.1.0.21 Flash (5/2019)	4836

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Then you can use the 'cat' command to combine all the files into one file for the mksysb resource. This is not a new procedure. This has been required for many years and is no different for VIOS 3.1.

e.g. on my Mac:

```
$ hdid Virtual_IO_Server_Base_Install_3.1.0.0_DVD_1_of_2_112018.iso
$ hdid Virtual_IO_Server_Base_Install_3.1.0.0_DVD_2_of_2_112018.iso

$ df | grep CD
/dev/disk2      8766040    8766040         0   100%         0    0  100%   /Volumes/CDROM
/dev/disk3      2669004    2669004         0   100%         0    0  100%   /Volumes/CDROM 1

$ cat /Volumes/CDROM/usr/sys/inst.images/mksysb_image /Volumes/CDROM/usr/sys/inst.images/mksysb_image2
/Volumes/CDROM\ 1/usr/sys/inst.images/mksysb_image > vios31_mksysb_image
```

In our case, we copied the mksysb to our NIM master and from there, copied it to each of the VIOS.

Please refer to Nigel Griffiths presentation for more information on creating the necessary mksysb from the ISO images on ESS:

https://www.ibm.com/developerworks/community/blogs/cgaix/resource/80_Upgrading_to_VIOS31_in_Action.pdf

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VIOS Flash ISO Image – mkysyb

```
$ hdid Virtual_IO_Server_Base_Install_3.1.0.21_Flash_052019.iso
/dev/disk2 /Volumes/CDROM
$ cd /Volumes/CDROM/usr/sys/inst.images/
$ ls -ltr
total 6956904
dr-xr-xr-x  3 cgibson  staff          84 28 Apr 09:16 installp
-r-xr-xr-x  1 cgibson  staff 3561932800 28 Apr 09:16 mkysyb_image
```

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```
$ scp vios3100_mksysb padmin@vio3:
```

```
[padmin@vio3]$ viosupgrade -l -i vios3100_mksysb -a hdisk1 -c
```

```
Welcome to viosupgrade tool.
```

```
Operation triggered for given node(s).
```

```
Please wait for completion..
```

```
Initiating VIOS configuration backup..
```

```
VIOS configuration backup successful.
```

```
Initiating installation on alternate disk(s)..
```

```
Installation on alternate disk(s) successful.
```

```
Copying files to altinst_rootvg.
```

```
Waking up altinst_rootvg successful.
```

```
Putting volume group altinst_rootvg to sleep ...
```

```
forced unmount of /alt_inst/var/adm/ras/livedump
```

```
forced unmount of /alt_inst/var/adm/ras/livedump
```

```
forced unmount of /alt_inst/var
```

```
forced unmount of /alt_inst/var
```

```
forced unmount of /alt_inst/usr
```

```
forced unmount of /alt_inst/usr
```

```
forced unmount of /alt_inst/tmp
```

```
forced unmount of /alt_inst/tmp
```

```
forced unmount of /alt_inst/opt
```

```
forced unmount of /alt_inst/opt
```

```
forced unmount of /alt_inst/home
```

```
forced unmount of /alt_inst/home
```

```
forced unmount of /alt_inst/admin
```

```
forced unmount of /alt_inst/admin
```

```
forced unmount of /alt_inst
```

```
forced unmount of /alt_inst
```

```
Fixing LV control blocks...
```

```
Fixing file system superblocks...
```

```
VIOS will be rebooted after '60' seconds to boot from the newly installed disk.
```

```
Press ctrl+c to terminate.
```

```
Rebooting . . .
```

Note: When you call the viosupgrade tool with all the mandatory arguments, the VIOS automatically initiates its own installation after taking the VIOS backup (viosbr). The following steps are involved with viosupgrade tool when this gets triggered from VIOS (next slide).

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- a. VIOS metadata backup will be taken and temporarily saved in /tmp filesystem. If filesystem space is not sufficient to hold the backup data. Filesystem size will be automatically increased to accommodate the backup file.
- b. Installs bos.alt_disk_install fileset to get the alt_disk_mksysb command from VIOS 3.1 ISO image for VIOS 3.1 installation.
- c. Initiates this new alt_disk_mksysb from VIOS to install the mksysb image on the alternate disk.
- d. After alt_disk_mksysb installation, filesystem from alternate mksysb disk will be mounted and the backup file from the temporary location will be copied to this filesystem. Alternate mksysb disk is expected to have sufficient disk space to copy the backup file.
- e. New bootlist will be created with alternate mksysb disk.
- f. Initiates the reboot of VIOS on alternate mksysb disk.
- g. Upon successful booting with new mksysb disk, after starting the VIO daemon service, inittab triggers auto VIOS restore process.
- h. Auto restore looks for the restore signature file in the root filesystem. If this file exists, then it initiates restore process and restores VIOS metadata with newly installed mksysb image.

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- i. In some cases, VIOSBR restore requires node reboot to complete the restore process. If viosbr restore returns the message "to reboot and restart the restore command", the system will be automatically rebooted.
- j. Upon 2nd reboot, again initab looks for the restore signature file, if it exists, it initiates the restore command again.
- k. This step will be repeated as long as it gets the error code 98. In order to avoid any issues related to infinite loop, these steps (reboot + restore) will be called 3 times in a row (on all circumstances, there is no need for more than 2 reboots). If restore command fails to successfully restore VIOS metadata configuration, an error will be logged in the Error log before exiting from the backup process.
- l. If restore fails with any other error code, an error log entry will be logged to Error log to indicate the error with VIOS metadata restore process. It's the user's responsibility to fix the issue and re-run the "viosbr – restore" command manually to restore the metadata. Error log entry will have the details of the backup file path for users.
- m. If restore returns successfully, restore signature file has been removed and an entry will be logged in the restore log file.
- n. User can run viosupgrade with "-q" option to check the status of the VIOSBR restore process.

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5. The VIOS will reboot a couple of times. Monitor this from the HMC. Once the VIOS has finished it reboots, login via the HMC vterm console. You will be prompted to set the padmin password and accept license agreements. Verify that ioslevel returns the expected version, 3.1.0.00.

```
IBM Virtual I/O Server
```

```
login: padmin
```

```
[compat]: 3004-610 You are required to change your password.
```

```
Please choose a new one.
```

```
padmin's New password:
```

```
Enter the new password again:
```

```
Indicate by selecting the appropriate response below whether you  
accept or decline the software maintenance terms and conditions.
```

```
Accept (a) | Decline (d) | View Terms (v) > a
```

```
$
```

```
$ ioslevel
```

```
3.1.0.00
```

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6. Monitor the status of the viosupgrade tool, viosbr restore. If you have logged in before the restore process has completed, you may see a message stating that the VIOS will be rebooted again. Otherwise, you will see a message that the restore is completed and the cluster node has also been recovered/restarted.

```
$ viosupgrade -l -q
Welcome to viosupgrade tool.
Getting status of node(s):

Please see the viosbr restore status:
=====

Viosbr restore timestamp:
Tue Sep  4 00:07:27 CDT 2018

License acceptance is successful

Restoring the backup..

RULES: The restored device settings do not match the recommended factory default settings
Restoration of other components configurations are complete in PRE phase.
Please reboot the VIOS system before restoring further devices

Restore summary on vio3:
Backedup Devices that are unable to restore/change
=====

DEPLOYED or CHANGED devices:
=====
Dev name during BACKUP           Dev name after RESTORE
-----
'ArtexRules' are restored successfully
*****
The command's response was not recognized. This may or may not indicate a problem.
*****

viosbr restore requires reboot.
Rebooting..
```

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```
$ viosupgrade -l -q
Welcome to viosupgrade tool.
Getting status of node(s):
```

Please see the viosbr restore status:
=====

```
Viosbr restore timestamp:
Tue Sep 4 00:11:49 CDT 2018
```

License acceptance is successful

Restoring the backup..

```
Restore summary on vio3:
Backedup Devices that are unable to restore/change
=====
```

VMLibrary

DEPLOYED or CHANGED devices:
=====

Dev name during BACKUP -----	Dev name after RESTORE -----
'ArtexRules' are restored successfully	
ct_node_id	794b545abb5a278f
ent8	ent7
hdisk0	hdisk0
hdisk1	hdisk1
hdisk2	hdisk2
hdisk3	hdisk3
hdisk4	hdisk4
ent7	ent9

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Restore is successful..

Cluster restarted after viosbr restore..

Inittab entry is removed..

\$

7. Once the upgrade was completed, cluster status reported that vio3 was “3.1.0.00 UP_LEVEL”.

```
[padmin@vio3]$ cluster -status -verbose | grep -E 'Node Name|Node Upgrade Status'
Node Name:          vio1
Node Upgrade Status: 3.1.0.00 UP_LEVEL
Node Name:          vio2
Node Upgrade Status: 3.1.0.00 UP_LEVEL
Node Name:          vio3
Node Upgrade Status: 3.1.0.00 UP_LEVEL
Node Name:          vio4
Node Upgrade Status: 2.2.6.30 ON_LEVEL
```

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```
[padmin@vio3]$ cluster -status -verbose
```

```
Cluster Name:          powervc
Cluster Id:            c33ad822f0c311e780030090fa7711d5
Cluster State:         OK
Repository Mode:       EVENT
Number of Nodes:       4
Nodes OK:              4
Nodes DOWN:            0
```

```
Pool Name:            aixsp
Pool Id:              000000000A34520C0000000005A4D3B79
Pool Mirror State:    NOT_MIRRORED
```

```
Node Name:            viol
Node Id:              c341aa8af0c311e780030090fa7711d5
Node MTM:             8284-1
Node Partition Num:   1
Node State:           OK
Node Repos State:     OK
Node Upgrade Status:  3.1.0.00 UP_LEVEL
Node Roles:
  Pool Name:          aixsp
  Pool Id:            000000000A34520C0000000005A4D3B79
  Pool State:         OK
```

```
Node Name:            vio2
Node Id:              c592b512f0c411e780100090fa7711d5
Node MTM:             8284-1
Node Partition Num:   2
Node State:           OK
Node Repos State:     OK
Node Upgrade Status:  3.1.0.00 UP_LEVEL
Node Roles:
  Pool Name:          aixsp
  Pool Id:            000000000A34520C0000000005A4D3B79
  Pool State:         OK
```

```
Node Name:            vio3
Node Id:              e86fa388f0c411e780170090fa7711d5
Node MTM:             8284-2
Node Partition Num:   1
Node State:           OK
Node Repos State:     OK
Node Upgrade Status:  3.1.0.00 UP_LEVEL
Node Roles:
  Pool Name:          aixsp
  Pool Id:            000000000A34520C0000000005A4D3B79
  Pool State:         OK
```

```
Node Name:            vio4
Node Id:              094a437ef0c511e7801e0090fa7711d5
Node MTM:             8284-2
Node Partition Num:   2
Node State:           OK
Node Repos State:     OK
Node Upgrade Status:  2.2.6.30 ON_LEVEL
Node Roles:
  Pool Name:          aixsp
  Pool Id:            000000000A34520C0000000005A4D3B79
  Pool State:         OK
```

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9. Several system configuration options had to be re-instated e.g. NTP, TZ, netsvc.conf, padmin env profile, etc. We changed each of these to the desired settings.

```
; add env profile settings to padmin .profile and .kshrc.
```

```
[root@vio4]# grep kshrc /home/padmin/.profile
export ENV=/home/padmin/.kshrc
```

```
[root@vio4]# cat .kshrc
export EXTENDED_HISTORY=ON
export EDITOR=/usr/bin/vi
export HOST="$(/usr/bin/uname -n)"
export ENTSTAT_MODE=closed.error
alias aix="ioscli oem_setup_env"
alias history='fc -t'
```

```
if [ "$(whoami)" != "root" ]; then
    export PS1="[ $(whoami)@${HOST} ]$ "
else
    export PS1="[ $(whoami)@${HOST} ]# "
fi
```

```
set -o vi
```

p109921 - Using the viosupgrade tool to move to VIOS 3.1

```
; add ntp servers into /home/padmin/config/ntp.conf
```

```
[padmin@vio4]$ cat config/ntp.conf
# IBM_PROLOG_BEGIN_TAG
# This is an automatically generated prolog.
#
# bos610 src/bos/usr/ios/cli/ntp.conf 1.1
#
# Licensed Materials - Property of IBM
#
# Restricted Materials of IBM
#
# COPYRIGHT International Business Machines Corp. 2006
# All Rights Reserved
#
# US Government Users Restricted Rights - Use, duplication or
# disclosure restricted by GSA ADP Schedule Contract with IBM Corp.
#
# IBM_PROLOG_END_TAG
# server time3-1b.austin.ibm.com
# server time3-2c.austin.ibm.com prefer
slewalways yes
disable pll
disable auth
server 10.1.1.2 prefer
server 10.1.1.3
driftfile /home/padmin/config/ntp.drift
tracefile /home/padmin/config/ntp.trace
logfile /home/padmin/config/ntp.log
```

```
;uncomment ntp from /etc/rc.tcpip and start ntp.
```

```
[root@vio3]# grep ntp /etc/rc.tcpip
start /usr/sbin/xntpd -a '-c /home/padmin/config/ntp.conf' "$src_running"
```

```
[root@vio3]# startsrc -s xntpd -a '-c /home/padmin/config/ntp.conf'
```

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```
; set TZ
```

```
# chtz Australia/Melbourne
```

```
; add this line to /etc/netsvc.conf
```

```
hosts = local4,bind4
```

Note: The /etc/hosts and /etc/resolv.conf files are both automatically copied to the upgraded environment, by the viosupgrade tool. i.e.

```
$ grep cp viosupg.pl
```

```
    $rc = system("mkdir /alt_inst/$backupfile_path ; cp -p  
/home/padmin/cfgbackups/${Backup_file}.tar.gz /alt_inst/$backupfile_path");  
    $rc = system("cp -p /etc/resolv.conf /alt_inst/etc/resolv.conf");  
    $rc = system("cp -p /etc/hosts /alt_inst/etc/hosts");  
    $rc = system("cp -p /home/padmin/viosupg_restore.sh  
/alt_inst/usr/ios/sbin/viosupg_restore.sh");
```

p109921 - Using the viosupgrade tool to move to VIOS 3.1

NOTE: GA version of viosupgrade includes new option to backup specified files and include in recovery.

-g Specifies the filename having the list of files to be copied to newly installed rootvg.

e.g.

```
# viosupgrade -l -i vios3100_mkysyb -a hdisk1 -c -g /home/padmin/filestosave.txt
```

In /home/padmin create a file called filestosave.txt. It should be a list of files you want the upgrade to save such as /etc/inetd.conf, etc. My filestosave.txt consists of:

```
/etc/motd  
/etc/netsvc.conf  
/etc/inetd.conf  
/etc/hosts  
/etc/environment  
/etc/profile  
/etc/inittab  
/etc/resolv.conf  
/etc/ntp.conf  
/etc/group
```

These will get saved to /home/padmin/backup_files and you can compare to them after the upgrade.

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10. With all the config changes completed, we reboot the VIOS at this point. This will ensure that all the correct settings are now in use and the date/time will be correct for the entire VIOS node/system. We then verified, again, that all of the SSP and VIOS config had been recovered correctly. i.e.

```
[padmin@vio3]$ lu -list
```

```
POOL_NAME: aixsp
```

```
TIER_NAME: SYSTEM
```

LU_NAME	SIZE (MB)	UNUSED (MB)	UDID
novalink-842D21W	65536	32608	f915eba0c34bd88264c4a958cd7db431
novalink-842D47W	65536	31818	67ebff3245b08369c7c4a166386d813a
volume-AIX72_rootvg_00~	122880	122887	f48fa8c1b6066b095d024a6e48574a1e
SNAPSHOTS			
5f711424a003092d2be917b5f8abe8d5IMSnap			
32303b99e9dee936884e2897c5ac7e46IMSnap			
volume-kristian_test-3~	122880	105222	5f711424a003092d2be917b5f8abe8d5
volume-kristian_test-9~	122880	122653	dbbf805a38422ed05f2298e110845930
volume-kristian_test-9~	122880	122744	63c262d3342fe56885b8c57a9189ee04
volume-xwing-89fda67c-~	122880	122537	32303b99e9dee936884e2897c5ac7e46

```
[padmin@vio3]$ pv -list
```

```
POOL_NAME: aixsp
```

```
TIER_NAME: SYSTEM
```

```
FG_NAME: Default
```

PV_NAME	SIZE (MB)	STATE	UDID
hdisk3	512000	ONLINE	33213600507680C8100BE8800000000001~
hdisk4	512000	ONLINE	33213600507680C8100BE8800000000001~
...etc...			

p109921 - Using the viosupgrade tool to move to VIOS 3.1

```
$ lsmmap -all
$ lsmmap -all -net
# lsseas -c
$ pv -list
$ lu -list
$ cluster -status
$ cluster -status -verbose
# lsdev -Cc adapter
# ifconfig -a
# netstat -nr
# hostname
# lspv
# lsdev -Cc disk

# for i in `lsdev -Cc disk | awk '{print $1}'`
do
echo $i
lsattr -El $i -a queue_depth -a reserve_policy
echo
done

$ cat config/ntp.conf
$ cat /etc/netsvc.conf
$ grep TZ /etc/environment
```

p109921 - Using the viosupgrade tool to move to VIOS 3.1

11. Repeat all of the steps above on the other VIOS node, vio4. Once this is complete, all nodes will report “Node Upgrade Status: 3.1.0.00 ON_LEVEL”.

```
[padmin@vio4]$ cluster -status
```

```
Cluster Name      State
powervc          OK
```

Node Name	MTM	Partition Num	State	Pool State
vio1	8284-1	1	OK	OK
vio2	8284-1	2	OK	OK
vio3	8284-2	1	OK	OK
vio4	8284-2	2	OK	OK

12. Re-install any other required software packages required for your VIOS SOE e.g. Puppet, ITM agents, other monitoring or backup software agents, Multipath drivers, etc.

p109921 - Using the viosupgrade tool to move to VIOS 3.1

```
[padmin@vio4]$ cluster -status -verbose
```

```
Cluster Name:          powervc
Cluster Id:            c33ad822f0c311e780030090fa7711d5
Cluster State:        OK
Repository Mode:      EVENT
Number of Nodes:      4
Nodes OK:              4
Nodes DOWN:           0
```

```
Pool Name:            aixsp
Pool Id:              000000000A34520C000000005A4D3B79
Pool Mirror State:    NOT_MIRRORED
```

```
Node Name:           vio1
Node Id:              c341aa8af0c311e780030090fa7711d5
Node MTM:             8284-1
Node Partition Num:  1
Node State:           OK
Node Repos State:    OK
Node Upgrade Status: 3.1.0.00 ON_LEVEL
```

```
Node Roles:
  Pool Name:          aixsp
  Pool Id:            000000000A34520C000000005A4D3B79
  Pool State:         OK
```

```
Node Name:           vio2
Node Id:              c592b512f0c411e780100090fa7711d5
Node MTM:             8284-1
Node Partition Num:  2
Node State:           OK
Node Repos State:    OK
Node Upgrade Status: 3.1.0.00 ON_LEVEL
```

```
Node Roles:          DBN
  Pool Name:          aixsp
  Pool Id:            000000000A34520C000000005A4D3B79
  Pool State:         OK
```

```
Node Name:           vio3
Node Id:              e86fa388f0c411e780170090fa7711d5
Node MTM:             8284-2
Node Partition Num:  1
Node State:           OK
Node Repos State:    OK
Node Upgrade Status: 3.1.0.00 ON_LEVEL
```

```
Node Roles:
  Pool Name:          aixsp
  Pool Id:            000000000A34520C000000005A4D3B79
  Pool State:         OK
```

```
Node Name:           vio4
Node Id:              094a437ef0c511e7801e0090fa7711d5
Node MTM:             8284-2
Node Partition Num:  2
Node State:           OK
Node Repos State:    OK
Node Upgrade Status: 3.1.0.00 ON_LEVEL
Node Roles:
  Pool Name:          aixsp
  Pool Id:            000000000A34520C000000005A4D3B79
  Pool State:         OK
```

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Note: If you need to access the old, 2.2.6.30, rootvg (to copy files/scripts) you can wake up the old rootvg by using the `alt_rootvg_op` command (don't forget to put it back to sleep when you are done!) e.g.

```
; Wake up old rootvg  
# alt_rootvg_op -W -d hdisk0  
  
; Put old rootvg to sleep  
# alt_rootvg_op -S -d hdisk0
```

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Log Files

When things go wrong!

Look here first...

The log files for viosupgrade are stored in `/var/adm/ras/ioslogs/` and `/home/ios/logs`.

Take a look at the log files and see if there are any clues.

```
/var/adm/ras/ioslogs/viosupg_global.log  
/home/ios/logs/restore_trace.out  
/home/ios/logs/viosupg_restore.log  
/home/ios/logs/viosupg_global.log  
/home/ios/logs/viosupg_status.log  
/home/ios/logs/backup_trace.out
```

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Known Issues

One of my customers updated their VIOS from 2.2.6.21 to 2.2.6.31. He was looking to use viosupgrade to move to 3.1. When he ran the viosupgrade command, he received an error.

```
$ ioslevel  
2.2.6.31
```

```
$ viosupgrade
```

Some error messages may contain invalid information for the Virtual I/O Server environment.

```
exec(): 0509-036 Cannot load program /home/ios/viosupgrade/perl5/bin/perl  
because of the following errors:  
    0509-150    Dependent module libperl.a(libperl.o) could not be loaded.  
    0509-022 Cannot load module libperl.a(libperl.o).  
    0509-026 System error: A file or directory in the path name doesnot exist.
```

```
$ viosupgrade
```

```
Can't locate warnings/register.pm in @INC (you may need to install the warnings::register module) (@INC contains:  
/home/ios/viosupgrade/perl5/lib/5.20.1/aix-thread-multi /home/ios/viosupgrade/perl5/lib/5.20.1/aix-thread-multi/CORE  
/home/ios/viosupgrade/perl5/lib/site_perl/5.20.1/aix-thread-multi /home/ios/viosupgrade/perl5/lib/site_perl/5.20.1/aix-thread-multi/CORE  
/home/ios/viosupgrade/perl5/lib/site_perl/5.20.1 /home/ios/viosupgrade/perl5/lib/5.20.1/aix-thread-multi /home/ios/viosupgrade/perl5/lib/5.20.1/aix-  
thread-multi /home/ios/viosupgrade/perl5/lib/5.20.1 /usr/opt/perl5/lib/site_perl/5.20.1/aix-thread-multi /usr/opt/perl5/lib/site_perl/5.20.1  
/usr/opt/perl5/lib/5.20.1/aix-thread-multi /usr/opt/perl5/lib/5.20.1 /usr/opt/perl5/lib/site_perl/5.8.8 /usr/opt/perl5/lib/site_perl .) at  
/home/ios/viosupgrade/perl5/lib/5.20.1/Class/Struct.pm line 8.  
BEGIN failed--compilation aborted at /home/ios/viosupgrade/perl5/lib/5.20.1/Class/Struct.pm line 8.  
Compilation failed in require at /usr/ios/sbin/viosupg.pl line 19.  
BEGIN failed--compilation aborted at /usr/ios/sbin/viosupg.pl line 19.
```

```
# ls -tlr /home/ios/viosupgrade/perl5/bin/perl  
-rwxr-xr-x  1 root    system    114530 Feb 11 2015  /home/ios/viosupgrade/perl5/bin/perl  
# /home/ios/viosupgrade/perl5/bin/perl  
exec(): 0509-036 Cannot load program /home/ios/viosupgrade/perl5/bin/perl because of the following errors:  
    0509-150    Dependent module libperl.a(libperl.o) could not be loaded.  
    0509-022 Cannot load module libperl.a(libperl.o).  
    0509-026 System error: A file or directory in the path name does not exist.
```

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Known Issues

And....

```
$ viosupgrade -l -q
```

Some error messages may contain invalid information for the Virtual I/O Server environment.

```
tar: 0511-188 Cannot create perl5/lib/5.20.1/aix-thread-multi/CORE/libperl.a: Cannot open or remove a file containing a running program.
tar: 0511-188 Cannot create perl5/lib/5.20.1/aix-thread-multi/auto/Data/Dumper/Dumper.so: Cannot open or remove a file containing a running program.
tar: 0511-188 Cannot create perl5/lib/5.20.1/aix-thread-multi/auto/Filter/Util/Call/Call.so: Cannot open or remove a file containing a running program.
tar: 0511-188 Cannot create perl5/lib/5.20.1/aix-thread-multi/auto/IO/IO.so: Cannot open or remove a file containing a running program.
tar: 0511-188 Cannot create perl5/lib/5.20.1/aix-thread-multi/auto/List/Util/Util.so: Cannot open or remove a file containing a running program.
tar: 0511-188 Cannot create perl5/lib/5.20.1/aix-thread-multi/auto/attributes/attributes.so: Cannot open or remove a file containing a running program.
tar: 0511-188 Cannot create perl5/lib/5.20.1/aix-thread-multi/auto/threads/shared/shared.so: Cannot open or remove a file containing a running program.
tar: 0511-188 Cannot create perl5/lib/5.20.1/aix-thread-multi/auto/threads/threads.so: Cannot open or remove a file containing a running program.
Artistic      README      bin          lib          lib64        link_perl_32 link_perl_64
```

The problem occurred because the perl installation was terminated abnormally. The logs showed that the perl installation received signal 2(SIGINT). As if someone had pressed control+c, while viosupgrade was running the first time.

```
-----
31326400 cli.c          273      abnormal child termination 131074 2   <<<<<< SIGINT                                     ^^
31326400 cli.c          2624     file_size = -1
31326400 cli.c          3521     ret = 0xff 255
31326400 cli.c          3522     >>>>>>>>> Exiting cliExecuteCommand <<<<<<<<<<<
31326400 viosupg.c        92       Unable to untar file: /usr/ios/tools/perl5.tar
31326400 viosupg.c        115     >>>>>>>>> Exiting viosupgrade <<<<<<<<<<<
31326400 cli.c          1795     >>>>>>>>> Exiting cliProcessCmd <<<<<<<<<<<
31326400 cli.c          3958     >>>>>>>>> Entering cliExit <<<<<<<<<<<
31326400 cli.c          3985     Unable to open file ".stderr.31326400" for reading
-----
```

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Known Issues

To resolve the issue. Remove everything in the viosupgrade perl directory (as shown below).

----- On a system where viosupgrade working fine -----

```
# ls
Artistic      README      bin          lib          lib64        link_perl_32 link_perl_64
# pwd
/home/ios/viosupgrade/perl5
```

----- On a system where the perl is partially installed -----

```
# cd /home/ios/viosupgrade/perl5
# ls
Artistic README  bin      lib
# hostname
p8-elku-v1.pok.stglabs.ibm.com
```

As an work around you can do the following:

```
1) rm -/home/ios/viosupgrade/perl5/bin/perl
```

then run the "viosupgrade" command, second iteration of "viosupgrade" will re-install perl again. if it works, then nothing needs to be done futher.

If you get some error as part of the above work around that says, "Cannot open or remove a file containing a running program" then you need to remove all the files inside "home/ios/viosupgrade/perl5" directory. See below.

```
# pwd
/home/ios/viosupgrade/perl5
# ls
Artistic      README      bin          lib          lib64        link_perl_32 link_perl_64
# rm -r *
# ls
# exit
$ viosupgrade
Missing mandatory option: '-l'.
Usage:
viosupgrade -l -i image_file -a mksysb_install_disk [-c] [-g filename]
viosupgrade -l -q
$ ls /home/ios/viosupgrade/perl5
Artistic      README      bin          lib          lib64        link_perl_32 link_perl_64
```

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Known Issues

Updating VIOS from 2.2.6.41 to 3.1.0.00

If you are updating from 2.2.6.41, you'll need to update to 3.1.0.21 using 3.1.0.21 media (from either the FLASH.iso or 2 iso's concat'ed together)

As per Nigel's note: https://www.ibm.com/developerworks/community/blogs/aixpert/entry/Upgrading_to_VIOS_3_1?lang=en

You will most likely receive a message that you have incorrect levels of media (after starting the viosupgrade process):

```
Please wait for completion..
Initiating VIOS configuration backup..
VIOS Configuration backup successful.
Fileset installation failed: 'bos.alt_disk_install'.
```

Thanks to Dominic Lancaster (IBM Lab Services) for the tip!

Looking at the logs of the VIOS being updated:

```
# cd /var/adm/ras/ioslogs ; ls -ltr
total 56
-rw-r--r-- 1 root staff 25054 Jul 12 15:17 viosupg_global.log

# cat viosupg_global.log
+-----+
BUILDDATE Verification ...
+-----+
Verifying build dates...
0503-465 installp: The build date requisite check failed for fileset bos.alt_disk_install.boot_images.
Installed fileset build date of 1913 is more recent than the selected fileset build date of 1845.
installp: Installation failed due to BUILDDATE requisite failure.
15532110 0 Fri Jul 12 14:09:54 2019 main::viosupg_mkysyb_operation 3233 Fileset installation failed: 'bos.alt_disk_install'.
15532110 0 Fri Jul 12 14:09:54 2019 main::viosupg_mkysyb_operation 3584 Running Cleanup..
```

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Known Issues

After VIOS install/upgrade, fix the paging space configuration. Depending on the version you will have 1 x 512MB and 1 x 1024MB or 2 x 1024MB on the same hdisk.

```
[root@viol1]# lspvs -a
```

Page Space	Physical Volume	Volume Group	Size	%Used	Active	Auto	Type	Chksum
paging00	hdisk1	rootvg	1024MB	0	no	no	lv	0
hd6	hdisk1	rootvg	512MB	4	yes	yes	lv	0

Get rid of paging00 and make hd6 at least 4GB.

You see this on previous levels of VIOS code. Has been a “feature” for years.

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Known Issues

Various issues relating to “network adapter” and “hdisk device” name reordering. Start with latest VIOS 2.2.6.XX level and request ifixes as required. Latest level (as of Sept 25th 2019, is 2.2.6.41).

IJ16989: VIOSUPGRADE FAILS TO RESTORE THE INTERFACE WHEN REARRANGED

<http://www-01.ibm.com/support/docview.wss?uid=isg1IJ16989>

IJ14352: NETWORK NOT WORKING AFTER VIOSUPGRADE APPLIES TO AIX 6100-09

<https://www-01.ibm.com/support/docview.wss?uid=isg1IJ14352>

IJ15486: NETWORK NOT WORKING AFTER VIOSUPGRADE

<https://www-01.ibm.com/support/docview.wss?uid=isg1IJ15486>

IJ15618: RDA SEG FAULT ON SEAS APPLIES TO AIX 7200-03

<https://www-01.ibm.com/support/docview.wss?uid=isg1IJ15618>

IJ18445: VIRTUAL ADAPTER CONFIGURED BEFORE SR ADAPTERS AFTER VIOSUPGRADE*

<https://www-01.ibm.com/support/docview.wss?crawler=1&uid=isg1IJ18445>

List of viosupgrade related fixes in 2.2.6.41:

- IJ09709 viosupgrade tool failed to trigger install
- IJ10297 subsequent viosupgrade fails after the first run
- IJ10549 Adding support for NVMe disk in viosupgrade tool.
- IJ10550 viosbr restore hungs if triggered via viosupgrade tool.
- IJ10697 viosupgrade fails to restore SEA for NIM altdisk installations
- IJ14352 Network not working after viosupgrade

Thanks to Danny Chung (IBM Lab Services) for the tip!

*VIOS 3.1 mkysb creation required

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Known Issues

The **sys0 maxuproc** attribute is reset to **256** if changed to a different value. For example, if you set maxuproc to 1024 and reboot the VIOS, maxuproc will be reset to 256 on boot. Also if you set maxuproc and then run **chdev**, it will also reset back to 256. There was a change made to cfgvios to set maxuproc attr to 256. That code needs to change to check the value first and set to 256 if and only if its set to a lower value. **APAR IJ20107** <https://www-01.ibm.com/support/docview.wss?uid=isg1IJ20107>.

e.g. "chdev" of vioslpm0 device. In the truss output you will observe maxuproc being set to 256.

```
# lsattr -El vioslpm0 -a src_lun_val
src_lun_val off Enable or disable NPIV disk validation for LPM True
```

```
# lsattr -El vioslpm0 -a src_lun_val
src_lun_val off Enable or disable NPIV disk validation for LPM True
```

```
# chdev -l sys0 -a maxuproc=1024
sys0 changed
```

```
# lsattr -El sys0 -a maxuproc
maxuproc 1024 Maximum number of PROCESSES allowed per user True
```

```
# chdev -l vioslpm0 -a src_lun_val=on
vioslpm0 changed
```

```
# lsattr -El sys0 -a maxuproc
maxuproc 256 Maximum number of PROCESSES allowed per user True
```

```
18809268:          \0 R\0 D\0 s\0 8\0 □ s y s 0\0 m a x u p r o c\0 2 5 6\0 R\0 D U
```

```
<< Truss output.
```

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Known Issues

The **backupios** command will ignore **nomedlib** option if media library does not reside in rootvg. As a result, backupios will attempt to backup the contents of the media library to **/home/ios/vgbackups**. Workaround is to specify the **nosvg** option e.g.

```
$ backupios -nosvg -nomedialib -mksysb -file /imgmnt/dc2vio13-mksysb.Sat
```

With the code as it stands, there seem to be two workarounds:

- 1) use backupios -nomedialib -nosvg. That will avoid backing up datavg into /home/ios/vgbackups, as well as exclude /home/ios/vgbackups from the "mksysb" file
- 2) Manually add "/home/ios/vgbackups/" to /etc/exclude.datavg. Then run backupios -nomedialib. It will then include /home/ios/vgbackup/datavg.data, but datavg.data will not include the VMLibrary.

APAR details:

IJ19978: BACKUPIOs -NOMEDIALIB ONLY EXCLUDES VMLIBRARY IF IT IS IN ROOTVG

<http://www.ibm.com/support/docview.wss?uid=isg1IJ19978>

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Useful Links

VIOS to NIM Mapping - Minimum NIM master levels for VIOS clients

<https://www14.software.ibm.com/webapp/set2/flrt/sas?page=viostable>

VIOS to NIM Mapping

Minimum NIM master levels for VIOS clients

Last updated: 19 December 2018

If using NIM to backup, install or update a VIOS partition, the NIM master must be greater than or equal to the levels shown below.

VIOS Release	VIOS Level	Minimum NIM master level		
VIOS 3.1.0	VIOS 3.1.0.10	7200-03-02		
VIOS 2.2.6	VIOS 2.2.6.32	AIX 6100-09-12	7100-05-03	7200-03-02
	VIOS 2.2.6.31	AIX 6100-09-12	7100-05-03	7200-03-01
	VIOS 2.2.6.21	AIX 6100-09-11	7100-05-02	7200-02-02
	VIOS 2.2.6.10	AIX 6100-09-10	7100-05-01	7200-02-01
	VIOS 2.2.6.0	AIX 6100-09-10	7100-05-00	7100-02-00

VIOS 3.1.1

— I/O performance, efficiency, scaling

- NPIV
 - Increase # of NPIV's per FC port (255, was 64). 32GB FC adapter. More NPIVs per port will provide better utilization, density, and efficiency.
 - NPIV Multi queue (VIOS server)
- iSCSI performance enhancements
 - Multiple initiators per VIOS, lock granularity, small xfer boost, efficient look-up algorithms, multi-threading / kprocs

— Resiliency & operational enhancements

- SSP network resiliency
 - Redundant network interfaces, built-in network failover
 - Alternate storage communication channel (SAN)
 - Cluster-wide outage avoidance improvements
 - Meta-root disk replica set handling

— Usability

- Improved VIOS Upgrade Tool options

— I/O stack improvements

- Storage command timeout improvements
- High speed Network adapter performance
- FC device labels

VIOSUPGRADE – VIOS 3.1.1 Enhancements

- Restore config files by default after the Installation
 - /etc/hosts, /etc/resolv.conf files will be restored. If `-e <file_res>` option is passed, we expect the user to pass /etc/hosts as a resource.
 - Required for hostname resolution for cluster restore
 - Planning to restore user desired config files after the installation
- Identify additional software installed.
 - Identify additional software installed in the system which is not currently present in mksysb image – Currently limited to Multipath software such as sddpcm
- Removing the limitation that the VIOS object name should be same as VIOS hostname in NIM
 - viosupgrade tool to search with available VIOS definitions
- Specify Disk location code instead of disk name for NIM bosinst resource
- NIM Logs in Snap svCollect
- VIOS Maintenance Tool
- Accept ISO image as a input to viosupgrade command
 - Remove the current limitation of accepting only mksysb image for the installation
 - Accept ISO images (if available through digital/optical media) as a input for viosupgrade command

p109921 - Using the viosupgrade tool to move to VIOS 3.1

Useful Links

Upgrading to VIOS 3.1

https://www.ibm.com/developerworks/community/blogs/aixpert/entry/Upgrading_to_VIOS_3_1?lang=en

A Closer Look at the IBM PowerVM 3.1 Update

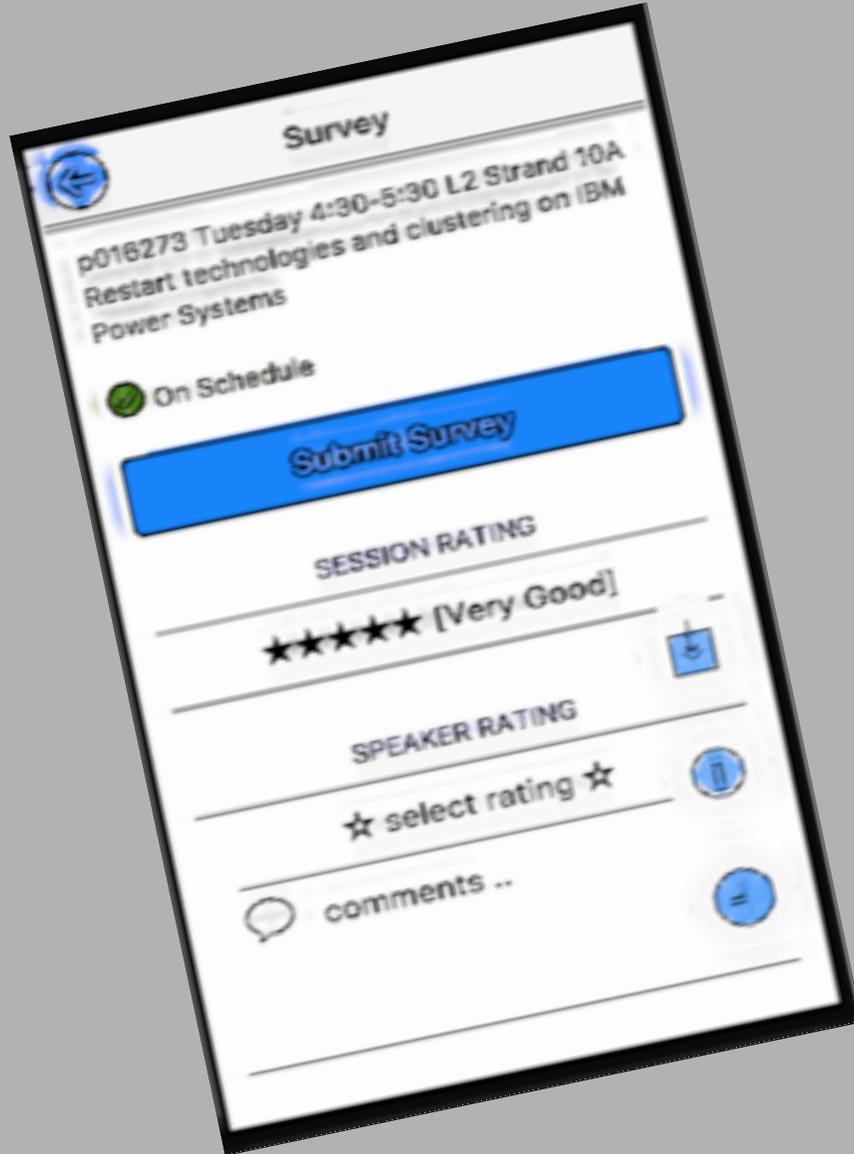
<http://ibmsystemsmag.com/aix/administrator/virtualization/a-closer-look-at-the-ibm-powervm-3-1-update/>

PowerVM Installation and Upgrade Experience

http://ibmsystemsmag.com/aix/administrator/virtualization/powervm-installation-and-upgrade-experience/#disqus_thread

WARNING! The information in this link is WRONG! https://www.ibm.com/support/knowledgecenter/9009-41A/p9hcg/p9hcg_viosupgrade.htm. Mentions (3.1.1) features NOT yet available to customers. Ignore until 3.1.1 GA in November 2019.

Thank you!



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Please complete the Session Evaluation!