



ASR9000 IOS XR Release 4.2.0 Upgrade Procedure

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Upgrade Summary Table

Release	Check Logging Buffer	Requires Upgrade Pie	FPD Upgrade
3.9.x	Yes	Yes	Mandatory
4.0.x	No	No	Mandatory
4.1.0	No	No	Mandatory
4.2.0	No	No	Mandatory

For the latest upgrade documents please refer to the following page:

http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html

In Cisco ASR 9000 Series Router starting in software release 4.0.0, the minimum configurable logging buffered size was increased to 307200. Any configuration with a value less than 307200 will fail to upgrade to Release 4.2.0 from 3.9.x.

- Run the "**show configuration failed startup**" command on startup to display the failed configuration.
- Workaround: Prior to upgrading to Release 4.2.0 from 3.9.x, configure the logging buffer size to a value of 307200 or greater (**logging buffered 307200**).

1. Obtain Required PIE Files

ASR9K Mini is mandatory. The upgrade package is mandatory, if upgrading from a release prior to 4.0.x. Perform all the upgrade operations in **admin mode** only. The upgrade pie must be activated along with the mini pie, in one single activate command. **The upgrade package asr9k-upgrade-p-4.2.0 is used ONLY during upgrade and once upgrade is completed (router boots with newer version), the upgrade pie must be deactivated and removed before the install commit.** Additional packages listed below are also needed depending on the router configuration and required features.

PIE File Description	PIE Filename	Package Name
ASR9K Mini Package (os-mpi, base, admin, fwdg, lc, rout, diags, fpd, scfclient)	asr9k-mini-p.pie-4.2.0	disk0:asr9k-mini-p-4.2.0
Upgrade Package	asr9k-upgrade-p.pie-4.2.0	disk0:asr9k-upgrade-p-4.2.0
Multicast Package	asr9k-mcast-p.pie-4.2.0	disk0:asr9k-mcast-p-4.2.0
Manageability Package	asr9k-mgbl-p.pie-4.2.0	disk0:asr9k-mgbl-p-4.2.0
MPLS Package	asr9k-mpls-p.pie-4.2.0	disk0:asr9k-mpls-p-4.2.0
Security Package	asr9k-k9sec-p.pie-4.2.0	disk0:asr9k-k9sec-p-4.2.0
Video Package	asr9k-video-p.pie-4.2.0	disk0:asr9k-video-p-4.2.0
Optics Package	asr9k-optic-p.pie-4.2.0	disk0:asr9k-optic-p-4.2.0
Documentation Package	asr9k-doc-p.pie-4.2.0	disk0:asr9k-doc-p-4.2.0

Note 1: Release 4.0.0 onwards, Composite Mini Package name *comp-asr9k-mini.pie-x.x.x* changed to *asr9k-mini-p.pie-x.x.x*.

Note 2: Release 4.0.0 onwards, Video Package name *asr9k-adv-video.pie-x.x.x* changed to *asr9k-video-p.pie-x.x.x*.

Note 3: Check for permission required for *asr9k-k9sec-p.pie*.

Note 4: Release 3.9.1 onwards, Field Programmable Device Package [*asr9k-fpd.pie-x.x.x*] and diagnostics package [*asr9k-diags-x.x.x*] are part of Composite Mini Package [*asr9k-mini-p.pie-x.x.x* and *asr9k-mini-p.vm-x.x.x*].

Note 5: Release 3.9.1 onwards, Documentation Package [*asr9k-doc.pie-x.x.x*] is part of the package bundle posted on CCO.

Note 6: Release 4.0.0 onwards, Documentation Package name *asr9k-doc.pie-x.x.x* changed to *asr9k-doc-p.pie-x.x.x*

Note 7: Release 4.0.0 onwards, Optics Package name *asr9k-optic-p.pie-x.x.x* was added.

2. Install Mandatory SMUs

No mandatory SMU required for 4.2.0 to 3.9.x, 4.0.x or 4.1.x downgrade.

Rel.4.1.0 Mandatory SMU:

CSCtr26695 is mandatory SMU in 4.1.0

SMU Filename	asr9k-p-4.1.0.CSCtr26695.pie
DSTS	CSCtr26695
Affected images	4.1.0
SMU Package Name	<boot device> asr9k-p-4.1.0.CSCtr26695.pie
Problem Summary	NP lockup
SMU Install Impact	Traffic loss – recommend to install during package upgrade to 4.1.0
SMU Install Procedure	<p>Add SMU: router(admin)#install add <path>/ asr9k-p-4.1.0.CSCtr26695.pie sync</p> <p>Activate SMU: router(admin)#install activate disk0:asr9k-p-4.1.0.CSCtr26695-1.0.0 sync</p> <p>Commit SMU: router(admin)#install commit</p>

Rel.4.1.2 Mandatory SMU:

CSCty67156 is the mandatory SMU for upgrading to 4.2.0.

SMU Filename	asr9k-p-4.1.2.CSCty67156
DSTS	CSCty67156
Affected images	4.1.2
SMU Package Name	<boot device> asr9k-p-4.1.2.CSCty67156.pie
Problem Summary	RSP Sync
SMU Install Impact	Image upgrade – install on systems with 4.1.2 planning to upgrade to 4.2.0
SMU Install Procedure	<p>Add SMU: router(admin)#install add <path>/ asr9k-p-4.1.2.CSCty67156.pie sync</p> <p>Activate SMU: router(admin)#install activate disk0: asr9k-p-4.1.2.CSCty67156.pie sync</p> <p>Commit SMU: router(admin)#install commit</p>

3. Check System Stability

The following commands should be executed to verify basic system stability before the upgrade/downgrade:

<code>(admin)# show platform</code>	[verify that all Nodes are in "IOS XR RUN" state, SPAs in "OK" state, Fan Tray and Power Modules are in "READY" state.]
<code>show redundancy</code>	[verify that Active & Standby RSP are available and in "ACTIVE role" & "is ready" states]
<code>show interface summary</code>	[verify that all interfaces are "UP"]
<code>show install active</code>	[verify that the proper set of packages are active]
<code>cfs check/clear configuration inconsistency</code>	[verify/fix configuration file system in exec and admin mode]

Note 1: before upgrade/downgrade, check for the tftp reachability

4. Perform Pre-Upgrade Tasks

1) Sufficient disk space is required to perform the upgrade.

Use ' **show filesystem** ' command to check the actual disk0 size:

```
RP/0/RSP0/CPU0:router(admin)# show filesystem | inc disk0:

Wed Sep 8 22:48:39.603 PDT

      Size(b)      Free(b)      Type  Flags  Prefixes
-----
1644150784  1196390400  flash-disk      rw  disk0:
1644150784   874095104  dumper-lnk      rw  qsm/dumper_disk0:
```

A minimum **500MB** free disk0: disk space is required for the upgrade.

When preparing for the upgrade to the next version of the operating system, the old, non-operational version should be removed.

Note 1: *If you have already loaded the installation files for the new operating system version onto the router, the "install remove inactive" will delete these files. Therefore, only load the new packages (via "install add") after removing the inactive packages.*

Note 2: *In order to provide as much room as possible on the disk0, one can remove old files from the disk0. This may include files, which the operator has placed on the disk device such as .pie files or temporary directory that have been created.*

Before removing old versions of the operating system and old SMU files, use the admin-command:

```
(admin)# install commit
```

After ensuring all active packages are 'committed', then issue the following command from admin mode:

```
(admin)# install remove inactive
```

Note 3: *The "install remove inactive test sync" commands can be used first to show which packages will be removed from the disk.*

Note 4: In addition to checking the installation disk device, the bootflash device on the ASR9K RSPs should also be checked. Bootflash device should not be used to save user specific files or configurations. Extraneous files such as configs files should be removed from bootflash. To check the free space of the bootflash use the following command:

```
dir bootflash: location 0/RSP0/CPU0
```

2) Copy the running-configuration and admin-configuration to a temporary storage location. This could be on a remote TFTP server or a device such as the harddisk: or compactflash: present on the RSP.

```
RP/0/RSP0/CPU0:router#copy running-config tftp://...running_config.txt
```

```
RP/0/RSP0/CPU0:router#admin
```

```
RP/0/RSP0/CPU0:router(admin)#copy running-config tftp://...admin-running_config.txt
```

```
RP/0/RSP0/CPU0:router(admin)#exit
```

3) Verify Mgmt LAN access to the router

```
RP/0/RSP0/CPU0:router# ping <tftp_server_address>
```

Note 5: If unable to reach the Mgmt LAN or TFTP_SERVER, please check the Mgmt Port states and route configuration for Mgmt LAN.

4) Disable disk mirroring, if in use

Disable disk mirroring feature (eg: `RP/0/RSP0/CPU0:router(config)#no mirror location 0/rsp0/cpu0 disk0:disk1:`), if enabled on the router, before going to next step. Disk mirroring can increase the upgrade time.

Note 6: Enable Disk Mirroring again, once IOS XR upgrade procedure is complete.

5. Upgrade to IOS XR Release 4.2.0

Note 1: All install operations should be done in admin mode.

Note 2: Check System Stability [See **Section 3** for details].

1) Add the required pies to disk:

```
RP/0/RSP0/CPU0:router(admin)#install add <source>/<path>/<pie-1>
<source>/<path>/<pie-2> ... <source>/<path>/<pie-n> sync
```

Note 3: The <source> can be one of disk0:, disk1:, tftp:, ftp: or rcp:

Note 4: ASR9K Mini is mandatory and Upgrade Packages is Mandatory (must be activated when the mini is activated) when upgrading from a release prior to 4.0.x; use of any of the optional packages [listed in **Section 1**] will vary as per customer's requirements. For example, asr9k-mcast-p.pie-4.2.0 is needed for Multicast features. Also note upgrade to 4.2.0 from 4.0.x, 4.1.x do not require upgrade pie.

Note 5: The above step must be repeated for each pie file, or all required pies can be added together in a single "install add .." command. To add all pies using a single command, list all of the pies (including their source) within the "install add .." command in the following manner:

```
RP/0/RSP0/CPU0:router(admin)# install add <source-path>/asr9k-mini-p.pie-4.2.0 <source-
path>/asr9k-upgrade-p.pie-4.2.0 <source-path>/asr9k-mcast-p.pie-4.2.0 <source-
path>/asr9k-mgbl-p.pie-4.2.0 <source-path>/asr9k-mpls-p.pie-4.2.0 <source-path>/asr9k-
k9sec-p.pie-4.2.0 <source-path>/asr9k-video-p.pie-4.2.0 <source-path>/asr9k-doc-p.pie-
4.2.0 <source-path>/asr9k-optic-p.pie-4.2.0 sync
```

Below is an example of add packages to disk command:

```
RP/0/RSP0/CPU0:router(admin)# install add tftp://223.255.254.245/tftpserver/images/asr9k-
mini-p.pie-4.2.0 tftp://223.255.254.245/tftpserver/images/asr9k-upgrade-p.pie-4.2.0
tftp://223.255.254.245/tftpserver/images/asr9k-mcast-p.pie-4.2.0
tftp://223.255.254.245/tftpserver/images/asr9k-mgbl-p.pie-4.2.0
tftp://223.255.254.245/tftpserver/images/asr9k-mpls-p.pie-4.2.0
tftp://223.255.254.245/tftpserver/images/asr9k-k9sec-p.pie-4.2.0
tftp://223.255.254.245/tftpserver/images/asr9k-video-p-4.2.0
tftp://223.255.254.245/tftpserver/images/asr9k-doc-p.pie-4.2.0
tftp://223.255.254.245/tftpserver/images/asr9k-optic-p.pie-4.2.0 sync
```

```
Install operation 84 completed successfully
```

Note 6: The use of 'sync' option will prevent the user from executing any other command during the install operation, and is recommended.

Note 7: Source Path of packages can be specified just once rather than for each package, using 'source' keyword. This simplifies the command:

```
RP/0/RSP0/CPU0:router(admin)# install add source <source-path> asr9k-mini-p.pie-4.2.0
asr9k-upgrade-p.pie-4.2.0 asr9k-mcast-p.pie-4.2.0 asr9k-mgbl-p.pie-4.2.0 asr9k-mpls-p.pie-
4.2.0 asr9k-k9sec-p.pie-4.2.0 asr9k-video-p.pie-4.2.0 asr9k-doc-p.pie-4.2.0 asr9k-optic-p.pie-
4.2.0 sync
```

Note 8: Under idle conditions, this command may take at least 35 minutes to complete, during which the router will be fully functional.

Note 9: In case there are any other optional packages installed with prior release, new package list [4.2.0 Release packages] should match or supersede the prior release package list [except for *fpd.pie* for 3.9.1 Release onwards, that is now bundled in Mini package], and need to be added using the above-mentioned command. Otherwise all the conflicting optional packages have to be deactivated before the upgrade/downgrade [followed by 'install commit' operation]. Side effect of this is loss of the configuration supported by the pie.

Note 10: tar file can also be used to add the packages to the local disk of router

```
RP/0/RSP0/CPU0:router (admin)# install add tar <source-path>/<tar-file>
```

- 2) List the inactive packages list using 'show install inactive summary' command

Example :

```
RP/0/RSP0/CPU0:router(admin)# show install inactive summary
Default Profile:
SDRs:
  Owner
Inactive Packages:
disk0:asr9k-mini-p-4.2.0
disk0:asr9k-upgrade-p-4.2.0
disk0:asr9k-mcast-p-4.2.0
disk0:asr9k-mgbl-p-4.2.0
disk0:asr9k-mpls-p-4.2.0
disk0:asr9k-video-p-4.2.0
disk0:asr9k-k9sec-p-4.2.0
disk0:asr9k-optic-p-4.2.0
disk0:asr9k-doc-p-4.2.0
```

- 3) Using the list of inactive packages from previous step, select and test the activation using the CLI:

```
RP/0/RSP0/CPU0:router(admin)# install activate <source> :<pie-1> <source> :<pie-2> ...
<source> :<pie-n> test sync
```

Example:

```
RP/0/RSP0/CPU0:router(admin)# install activate disk0:asr9k-mini-p-4.2.0 disk0:asr9k-
upgrade-p-4.2.0 disk0:asr9k-doc-p-4.2.0 disk0:asr9k-mcast-p-4.2.0 disk0:asr9k-mgbl-p-4.2.0
disk0:asr9k-k9sec-p-4.2.0 disk0:asr9k-mps-p-4.2.0 asr9k-video-p-4.2.0 asr9k-optic-p-4.2.0
sync test
```

Note 11: Testing the activation will give you a preview of the activation. No actual changes will be made when 'test' option is used.

Note 12: Any config that is incompatible with the new version being activated will be identified. The 'show configuration removed' command can be used to view what will be removed as result of the software upgrade.

Note 13: Such removed config can be reapplied using the 'load config removed <config>.cfg' command from config mode after the upgrade has been completed.

4) Activate inactive packages added in step 1 using command:

```
RP/0/RSP0/CPU0:router(admin)# install activate <source> :<pie-1> <source> :<pie-2> ...
<source> :<pie-n> sync
```

Example :

```
RP/0/RSP0/CPU0:router (admin)# install activate disk0:asr9k-mini-p-4.2.0 disk0:asr9k-
upgrade-p-4.2.0 disk0:asr9k-doc-p-4.2.0 disk0:asr9k-mcast-p-4.2.0 disk0:asr9k-mgbl-p-4.2.0
disk0:asr9k-k9sec-p-4.2.0 disk0:asr9k-mps-p-4.2.0 disk0:asr9k-video-p-4.2.0 disk0:asr9k-
optic-p-4.2.0 sync
```

Note 14: The output of 'install add' command executed in step 1 OR output of 'show install inactive summary' in step2, provides the list of names of packages to be used in 'install activate <package>..' command.

Note 15: The use of 'sync' option will prevent the user from executing any other command during the install operation.

Note 16: The Router will reload at the end of activation to start using the new packages. This reload operation will impact traffic for small duration.

Note 17: Under idle conditions, this operation may take at least 20 minutes to complete.

Note 18: A wild card option is available and can also be used during packages activation.

```
RP/0/RSP0/CPU0:router (admin)# install activate disk0 :*4.2.0* sync
```

*Warning message: The following packages are specified multiple times could be observed.

5) Check to see if there were any failed startup config.

```
RP/0/RSP0/CPU0:router# show configuration failed startup
```

6) Verify system stability through commands described under **Check System Stability** [See **Section 3** for details]. If system issues are detected or if the upgrade needs to be backed out for any reason, please follow the steps described in **Downgrade** [See **Section 8** for details] to rollback the software to the starting point.

7) **If the upgrade pie was required, perform install deactivate the upgrade package (asr9k-upgrade-p-4.2.0) and install remove the upgrade package. (This step is required if upgrading from a release prior to 4.0.0.)**

```
RP/0/RSP0/CPU0:router (admin)# install deactivate disk0:asr9k-upgrade-p-4.2.0
```

```
RP/0/RSP0/CPU0:router (admin)# install remove disk0:asr9k-upgrade-p-4.2.0
```

Note: On removing the upgrade pie, the router's output will state that all pies will be removed like shown below:

```
RP/0/RSP0/CPU0:RO2(admin)#install remove disk0:asr9k-upgrade-p-4.2.0 sync
RP/0/RSP0/CPU0:Jul 9 06:44:22.771 : instdir[206]: %INSTALL-INSTMGR-6-INSTALL_OPE
RATION_STARTED : Install operation 3 '(admin) install remove disk0:asr9k-upgrad
e-p-4.2.0 synchronous' started by user 'root'
Install operation 3 '(admin) install remove disk0:asr9k-upgrade-p-4.2.0
synchronous' started by user 'root' via CLI at 06:44:22 UTC Sat Jul 09 2011.
Info: This operation will remove the following packages:
Info: disk0:asr9k-doc-4.2.0
Info: disk0:asr9k-adv-video-4.2.0
Info: disk0:asr9k-k9sec-4.2.0
Info: disk0:asr9k-diags-4.2.0
Info: disk0:asr9k-mgbl-4.2.0
Info: disk0:asr9k-mcast-4.2.0
Info: disk0:asr9k-mpls-4.2.0
Info: disk0:asr9k-rout-4.2.0
Info: disk0:asr9k-fwdg-4.2.0
Info: disk0:asr9k-lc-4.2.0
Info: disk0:asr9k-admin-4.2.0
Info: disk0:asr9k-upgrade-p-4.2.0
```

These are dummy pies and will not cause any issue. We can go ahead with the removal.

8) Commit the newly activated software and verify:

```
RP/0/RSP0/CPU0:router (admin)# install commit
```

```
RP/0/RSP0/CPU0:router (admin)# show install committed summary
```

- 9) Check for which firmware files need to be upgraded:

```
RP/0/RSP0/CPU0:router(admin)#show hw-module fpd location all
```

Note 19: Refer to Section 6 for FPD Upgrade Procedure.

- 10) Clear configuration inconsistencies from admin and exec mode

```
RP/0/RSP0/CPU0:router(admin)#clear configuration inconsistency
```

```
RP/0/RSP0/CPU0:router#clear configuration inconsistency
```

Note 20: After software upgrade to 4.2.0 onwards, user might see licensing related error message; please refer to the 4.2.0 Release Notes for information.

6. CPLD2 Upgrade for 2nd Generation Based Linecards

Important Notes:

1. A redundant RSP is required in order to perform CPLD2 upgrade.
2. A console cable is required to connect to the RSP console port and all commands below must be exercised via the console window.

2nd Generation Based Linecards

A9K-24x10GE-TR or -SE

A9K-2x100GE-TR or -SE

A9K-MOD80-TR or -SE

A9K-MOD160-TR or -SE

Need for Upgrading the CPLD2

CPLD2 fpga in A9K-RSP-4G/8G needs minimum version 1.18 for 2nd generation based linecards. CPLD2 version 1.18 will prevent RSP from switchover when the 2nd generation linecard is being reset. If CPLD2 version is lower than 1.18, there is a possibility for the RSP to switchover when the 2nd generation linecard is being reset. This upgrade is optional if the node contains only the first generation based linecards.

CPLD2 upgrade is done using a special FPD upgrade command. (CLI & procedure is listed below). The upgrade takes place from the Active RSP to the Standby RSP. The Standby RSP should be kept in the ROMMON state until the upgrade is completed. It will take approximately 125 minutes and during this period system will be running with single RSP. Approximately it will take 5 hours for both the RSP cards to upgrade CPLD2.

How to check for the CPLD2 version

- 1) Check the XR software bundle contains the CPLD2 version 1.18. Release 4.2.0 is bundled with version 1.18.

```
RP/0/RSP0/CPU0:RS02#admin show fpd package | begin RSP
=====
                                Field Programmable Device Package
=====
Card Type      FPD Description      Type Subtype  SW      Min Req  Min Req
=====  =====  =====  =====  =====  =====
A9K-RSP-2G     Can Bus Ctrl(CBC) RSP2  lc  cbc      1.02      0.00     0.1
                CPUCtrl RSP2          lc  cpld2    1.18      0.00     0.1
                IntCtrl RSP2          lc  fpga2    1.15      0.00     0.1
                ClkCtrl RSP2          lc  fpga3    1.23      0.00     0.1
                UTI RSP2              lc  fpga4    3.08      0.00     0.1
                PUNT RSP2             lc  fpga1    1.05      0.00     0.1
                HSBI RSP2             lc  hsbi     4.00      0.00     0.1
                ROMMONB RSP2          lc  rommon   1.05      0.00     0.1
-----
A9K-RSP-4G     Can Bus Ctrl (CBC) RSP2  lc  cbc      1.02      0.00     0.1
                CPUCtrl RSP2          lc  cpld2    1.18      0.00     0.1
```

IntCtrl RSP2	lc	fpga2	1.15	0.00	0.1
ClkCtrl RSP2	lc	fpga3	1.23	0.00	0.1
UTI RSP2	lc	fpga4	3.08	0.00	0.1
PUNT RSP2	lc	fpga1	1.05	0.00	0.1
HSBI RSP2	lc	hsbi	4.00	0.00	0.1
ROMMONB RSP2	lc	rommon	1.05	0.00	0.1

2) Check the version installed in your board. "show hw-module fpd location <>" will **not** show CPLD2 version. This is applicable for both Active & Standby RSP.

```
RP/0/RSP0/CPU0:RS02#show platform
Node                Type                State                Config State
-----
0/RSP0/CPU0         A9K-RSP-4G(Active)  IOS XR RUN          PWR,NSHUT,MON
0/RSP1/CPU0         A9K-RSP-4G(Standby) IOS XR RUN          PWR,NSHUT,NMON
0/2/CPU0            A9K-8T/4-E         IOS XR RUN          PWR,NSHUT,MON
0/3/CPU0            A9K-2T20GE-E       IOS XR RUN          PWR,NSHUT,MON
RP/0/RSP0/CPU0:RS02#
RP/0/RSP0/CPU0:RS02#
RP/0/RSP0/CPU0:RS02#show hw-module fpd location 0/RSP1/CPU0

===== Existing Field Programmable Devices =====
Location  Card Type  HW Version Type Subtype Inst  Current SW Upg/
=====  =====  =====  =====  =====  =====  =====  =====
0/RSP1/CPU0  A9K-RSP-4G  1.0  lc  fpga3  0  1.23  No
                                lc  fpga1  0  1.05  No
                                lc  fpga2  0  1.15  No
                                lc  cbc    0  1.02  No
                                lc  fpga4  0  3.08  No
                                lc  hsbi   0  4.00  No
                                lc  rommon 0  1.05  No
=====
```

3) To identify the current CPLD2 Version for the standby RSP, Do the following:

```
RP/0/RSP0/CPU0:RS02#run attach 0/RSP1/CPU0
attach: Starting session 1 to node 0/RSP1/CPU0
#
# dump -l 0xDE000004 8
de000004  00000001 00000011 .....
#
# exit
Terminating attach to node 0/RSP1/CPU0..
RP/0/RSP0/CPU0:RS02#
```

NOTE:
The output is in hexa decimal format. Above capture shows 0x1 & 0x11, this indicates the current version on the Standby RSP is 1.17 (Major.Minor)

Procedure for Upgrading CPLD2 in RSP

CPLD2 upgrade needs special command. It is different from normal XR FPD upgrade command. This upgrade will take approximately 125 mins for each RSP.

- 1) Before upgrade configure auto reset disabled for standby RSP in admin mode.

```
RP/0/RSP0/CPU0:RS02#admin
RP/0/RSP0/CPU0:RS02(admin)#conf t
RP/0/RSP0/CPU0:RS02(admin-config)#hw-module reset auto disable location 0/RSP1/CPU0
RP/0/RSP0/CPU0:RS02(admin-config)#commit
RP/0/RSP0/CPU0:RS02(admin-config)#end
RP/0/RSP0/CPU0:RS02(admin)#exit
RP/0/RSP0/CPU0:RS02#admin show running-config | i reset
Wed Nov 30 19:45:49.527 UTC
Building configuration...
hw-module reset auto disable location 0/RSP1/CPU0
```

- 2) Change configuration-register setting in admin mode to keep RSP in rommon after reload.

```
RP/0/RSP0/CPU0:RS02(admin)# config-register boot-mode rom-monitor location <Standby RSP>
Successfully set config-register to 0x8100 on node 0/RSP1/CPU0
```

- 3) Bring down the Standby RSP to ROMMON state.

```
RP/0/RSP0/CPU0:RS02#
RP/0/RSP0/CPU0:RS02#admin reload location 0/RSP1/CPU0
```

Preparing system for backup. This may take a few minutes especially for large configurations.

[Done]

Proceed with reload? [confirm]

```
RP/0/RSP0/CPU0:RS02#
```

```
RP/0/RSP0/CPU0:RS02#show platform
```

Node	Type	State	Config State
0/RSP0/CPU0	A9K-RSP-4G(Active)	IOS XR RUN	PWR, NSHUT, MON
0/RSP1/CPU0	A9K-RSP-4G(Standby)	ROMMON	PWR, NSHUT, NMON
0/2/CPU0	A9K-8T/4-E	IOS XR RUN	PWR, NSHUT, MON
0/3/CPU0	A9K-2T20GE-E	IOS XR RUN	PWR, NSHUT, MON

```
RP/0/RSP0/CPU0:RS02#
```

- 4) Note down the 'nodeid' of the standby RSP using 'nodeid_uit'. Here it is 0x11. The output varies based on the chassis type.

```
RP/0/RSP0/CPU0:RS02#run nodeid_uit
Beginning Node ID Unit Test Procedure
```

```
-----
0/RSP0/CPU0      (0_RSP0_CPU0) - 0x00000001    0/RSP0/CPU0 - 0x80000001
0/RSP1/CPU0      (0_RSP1_CPU0) - 0x00000011    0/RSP1/CPU0 - 0x80000011
0/0/CPU0         (0_0_CPU0)    - 0x00000821    0/0/CPU0    - 0x80000821
0/1/CPU0         (0_1_CPU0)    - 0x00000831    0/1/CPU0    - 0x80000831
0/2/CPU0         (0_2_CPU0)    - 0x00000841    0/2/CPU0    - 0x80000841
0/3/CPU0         (0_3_CPU0)    - 0x00000851    0/3/CPU0    - 0x80000851
0/FT0/SP         (0_FT0_SP)    - 0x000004a0    0/FT0/SP    - 0x800004a0
0/FT1/SP         (0_FT1_SP)    - 0x000004b0    0/FT1/SP    - 0x800004b0
0/BPID0/SP       (0_BPID0_SP)  - 0x00001190    0/BPID0/SP  - 0x80001190
```

```

0/PM0/SP          (0_PM0_SP)      - 0x00000e00    0/PM0/SP          - 0x80000e00
0/PM1/SP          (0_PM1_SP)      - 0x00000e10    0/PM1/SP          - 0x80000e10
0/PM2/SP          (0_PM2_SP)      - 0x00000e20    0/PM2/SP          - 0x80000e20
-----

```

```

Node ID Test Sequence Complete.
RP/0/RSP0/CPU0:RS02#

```

5) 'pldupg_cpld2' is the command to upgrade CPLD2 in RSP.

```
RP/0/RSP0/CPU0:RS02#run pldupg_cpld2
```

```
Usage "pldupg_cpld2 <node_id> [force]"
```

6) CPLD2 upgrade will take approximately 125 minutes. During this time, standby RSP will be down and system will be UP with only active RSP.

NOTE: Always use force option to upgrade CPLD2.

```

RP/0/RSP0/CPU0:RS02#
RP/0/RSP0/CPU0:RS02#run pldupg_cpld2 0x00000011 force
Thu Dec 1 05:52:03.587 UTC
% WARNING:   - This FPD upgrade action will interrupt normal operation of the target
module,      and result in substantial card downtime during the entire period of FPD
upgrade.    - If necessary, ensure that appropriate action has been taken to redirect
target module's traffic before starting the upgrade operation.  - Also ensure that
sanity checking for the target module is disabled before you start this upgrade, so
as to not interrupt the FPD upgrade operation.  This can be accomplished via the use
of the following CLI command "(admin-config) hw-module reset auto disable location
<target>".
Continue? [confirm]

```

Starting the upgrade/download of following FPD:

```

=====
Location      Type Subtype Upg/Dng   Current   Upg/Dng
              Type Subtype Version   Version
=====
0/RSP1/CPU0 lc  cpld2  upg      -1.-1     1.18
-----

```

Starting to upgrade cpld2 subtype image from -1.-1 to 1.18 for this card on location 0/RSP1/CPU0

```

Starting upgrade, estimated upgrade time 125 mins ...
RP/0/RSP0/CPU0:Dec 1 05:52:04.663 : shelfmgr[371]: %PLATFORM-SHELFMGR-6-
NODE_STATE_CHANGE : 0/RSP1/CPU0 A9K-RSP-4G state:ROMMON
RP/0/RSP0/CPU0:Dec 1 05:52:51.090 : pldupg_cpld2[65773]: pld upgrade in progress,
time elapsed approx 0:47 mins ...
RP/0/RSP0/CPU0:Dec 1 05:53:36.094 : pldupg_cpld2[65773]: pld upgrade in progress,
time elapsed approx 1:32 mins ...
RP/0/RSP0/CPU0:Dec 1 05:54:21.094 : pldupg_cpld2[65773]: pld upgrade in progress,
time elapsed approx 2:17 mins ...
RP/0/RSP0/CPU0:Dec 1 05:54:34.744 : shelfmgr[371]: %PLATFORM-SHELFMGR-6-
NODE_NORESET : Node 0/RSP1/CPU0 is in NMON state, Cancel reset request
RP/0/RSP0/CPU0:Dec 1 05:55:06.106 : pldupg_cpld2[65773]: pld upgrade in progress,
time elapsed approx 3:02 mins ...
RP/0/RSP0/CPU0:Dec 1 05:55:51.119 : pldupg_cpld2[65773]: pld upgrade in progress,
time elapsed approx 3:47 mins ...
<SNIP>
RP/0/RSP0/CPU0:Dec 1 07:56:53.873 : pldupg_cpld2[65773]: pld upgrade in progress,
time elapsed approx 124:49 mins ...

```

RP/0/RSP0/CPU0:Dec 1 07:57:00.197 : pldupg_cpld2[65773]: Time spent programming = approx 124:56 mins

Successfully upgraded cpld2 subtype image for this card on location 0/RSP1/CPU0

RP/0/RSP0/CPU0:RS02#

If there is a failure reported in the upgrade process, repeat the same command to retry the upgrade process again.

7) Now reset the config register of the upgraded RSP to allow it to boot IOS-XR.

On the upgraded RSP, do the following:

rommon B8 >confreg

```

Configuration Summary
(Virtual Configuration Register: 0x100)
enabled are:
console baud: 9600
boot: the ROM Monitor

do you wish to change the configuration? y/n [n]: y
enable "diagnostic mode"? y/n [n]: n
change console baud rate? y/n [n]: n
change the boot characteristics? y/n [n]: y
enter boot type:
0 = ROM Monitor
2 = MBI Validation Boot Mode
[0]: 2
    
```

```

Configuration Summary
(Virtual Configuration Register: 0x102)
enabled are:
console baud: 9600
boot: MBI Boot

do you wish to change the configuration? y/n [n]: n
    
```

You must reset or power cycle for new config to take effect

rommon B9 >
rommon B9 >**reset**

RP/0/RSP0/CPU0:RS02#

RP/0/RSP0/CPU0:RS02#show platform

Node	Type	State	Config State
0/RSP0/CPU0	A9K-RSP-4G(Active)	IOS XR RUN	PWR, NSHUT, NMON
0/RSP1/CPU0	A9K-RSP-4G(Standby)	IOS XR RUN	PWR, NSHUT, NMON
0/2/CPU0	A9K-8T/4-E	IOS XR RUN	PWR, NSHUT, MON
0/3/CPU0	A9K-2T20GE-E	IOS XR RUN	PWR, NSHUT, MON

RP/0/RSP0/CPU0:RS02#

Check CPLD2 Version (0x1 and 0x12 indicates CPLD2 version 1.18):

```
RP/0/RSP0/CPU0:RS02#run attach 0/RSP1/CPU0
attach: Starting session 1 to node 0/RSP1/CPU0
# dump -l 0xDE000004 8
de000004  00000001 00000012 .....
# exit
Terminating attach to node 0/RSP1/CPU0..
```

8) Check whether standby RSP comes to STANDBY role and NSR-ready.

```
RP/0/RSP0/CPU0:RS02#show redundancy
Redundancy information for node 0/RSP0/CPU0:
=====
Node 0/RSP0/CPU0 is in ACTIVE role
Node Redundancy Partner (0/RSP1/CPU0) is in STANDBY role
Standby node in 0/RSP1/CPU0 is ready
Standby node in 0/RSP1/CPU0 is NSR-ready
Node 0/RSP0/CPU0 is in process group PRIMARY role
Process Redundancy Partner (0/RSP1/CPU0) is in BACKUP role
Backup node in 0/RSP1/CPU0 is ready
Backup node in 0/RSP1/CPU0 is NSR-ready
```

Group	Primary	Backup	Status
dsc	0/RSP0/CPU0	0/RSP1/CPU0	Ready
dlrsc	0/RSP0/CPU0	0/RSP1/CPU0	Ready
central-services	0/RSP0/CPU0	0/RSP1/CPU0	Ready
v4-routing	0/RSP0/CPU0	0/RSP1/CPU0	Ready
netmgmt	0/RSP0/CPU0	0/RSP1/CPU0	Ready
v6-routing	0/RSP0/CPU0	0/RSP1/CPU0	Ready

```
Reload and boot info
-----
A9K-RSP-4G reloaded Thu Dec  1 03:25:42 2011: 15 hours, 25 minutes ago
Active node booted Thu Dec  1 03:25:42 2011: 15 hours, 25 minutes ago
Standby node boot Thu Dec  1 16:17:07 2011: 2 hours, 34 minutes ago
Standby node last went not ready Thu Dec  1 16:20:00 2011: 2 hours, 31 minutes ago
Standby node last went ready Thu Dec  1 16:21:00 2011: 2 hours, 30 minutes ago
There have been 0 switch-overs since reload

Active node reload "Cause: User initiated forced reload all"
Standby node reload "Cause: MBI-HELLO reloading node on receiving reload notification"
```

```
RP/0/RSP0/CPU0:RS02#
```

9) Enable auto reset option on standby RSP in admin mode.

```
RP/0/RSP0/CPU0:RS02(admin)#conf t
RP/0/RSP0/CPU0:RS02(admin-config)#no hw-module reset auto disable location 0/RSP1/CPU0
RP/0/RSP0/CPU0:RS02(admin-config)#commit
RP/0/RSP0/CPU0:RS02(admin-config)#end
```

10) Perform “redundancy switchover” and repeat the same process for new standby RSP.

```
RP/0/RSP0/CPU0:RS02#redundancy switchover
Thu Dec  1 18:56:20.701 UTC
Proceed with switchover 0/RSP0/CPU0 -> 0/RSP1/CPU0? [confirm]
Initiating switch-over.
```

Recovery Procedure If Upgrade Fails

1. If CPLD upgrade failed for the first time standby RSP may stay in BRINGDOWN state, try again to upgrade CPLD for the second time.
2. If CPLD upgrade fails for the second time, and RSP doesn't come to 'IOS XR RUN' state then raise a RMA request with logs captured during the upgrade.

7. 4.2.0 FPD Upgrade

After running the install commit command on upgrade to 4.2.0 software, run the “[show hw-module fpd location all](#)” command to check which firmware files need to be upgraded, by inspecting the Upg/Dng column. If there is any ‘Yes’ marked, upgrade is required.

Note 1: In Cisco ASR 9000 Series Router starting in software release 4.0.1; we support following,

- *Parallel FPD Upgrade on ASR9K*
 - **FPD upgrade behavior prior 4.0.1:** FPD upgrade process is done in a serial fashion (looping through the nodes one by one) which can result in a very large time to upgrade an entire multi chassis.
 - **FPD upgrade behavior starting 4.0.1:** The enhancement is made to make “[upgrade hw-module fpd all location all](#)” command trigger the upgrade on all the line cards in the chassis in parallel instead of doing the upgrades in a serial fashion. This will result in shorter time to upgrade an entire multi chassis.
 - This will be default behavior starting 4.0.1; user has nothing to configure
- *Auto FPD Upgrade on ASR9K*
 - Starting 4.0.1; user can configure this option, it will allow automatic fpd upgrade from 4.0.1 to 4.2.0
 - Following shows how to config for Auto FPD Upgrade

```
RP/0/RSP0/CPU0:router1(admin)#conf
```

```
RP/0/RSP0/CPU0:router1(admin-config)#fpd auto-upgrade
```

```
RP/0/RSP0/CPU0:router1(admin-config)#commit
```

Steps to Upgrade FPD firmware [R4.2.0]:

- 1) While running 4.2.0 Software Version on ASR9K router, Run the “[show hw-module fpd location all](#)” command to check which firmware files need to be upgraded.

```
RP/0/RSP0/CPU0:router(admin)# show hw-module fpd location all
```

```

=====
Existing Field Programmable Devices
=====

```

Location	Card Type	HW Version	Type	Subtype	Inst	Current SW Version	Upg Dng?
0/RSP0/CPU0	A9K-RSP-4G	4.8	lc	fpga3	0	1.18	Yes
			lc	fpga1	0	1.05	No
			lc	fpga2	0	1.15	No
			lc	cbc	0	1.02	No
			lc	fpga4	0	3.08	No

			lc	hsbi	0	4.00	No
			lc	rommon	0	1.02	Yes

0/RSP0/CPU0	ASR-9010-FAN	1.0	lc	cbc	1	4.00	No

0/RSP0/CPU0	ASR-9010-FAN	1.0	lc	cbc	2	4.00	No

... Snipped ...

Note 1: In the output above, the column 'Upg Dng?' points to the down-rev firmware software versions, which need to be upgraded.

- 2) Issue the following command to check the latest version of all FPGA/ROMMON/CPLDs:

```
RP/0/RSP0/CPU0:router(admin)#show fpd package
```

For "show fpd package" example output to display latest FPD version, please refer to **Section 13 [Appendix A]**

- 3) Issue the following command to upgrade fpd:

```
RP/0/RSP0/CPU0:router(admin)#upgrade hw-module fpd all location all
```

Note 2: Except CBC update, router reload is required after running the "upgrade hw-module fpd all location all" command, to make the changes in effect.

Note 3: No reload is required after running the upgrade hw-module fpd cbc location all command. The new CBC firmware will be active. The software automatically resets the local CAN Bus.

- 4) This step is applicable only to RSP440 systems and if there are fpgas on RSP440 which need to be upgraded
- a. If it is a single RSP440 system
 - i. Bring the RSP into ROMMON
 - ii. Issue the following command on the ROMMON prompt
`reset -h`
 - iii. Boot the RSP from the ROMMON prompt
 - b. If it's a dual RSP440 system
 - i. Reload the standby RSP
`hw-module reload location <standby rsp loc>`
 - ii. Once the standby RSP is up, do a switchover
`redundancy switchover`
 - iii. Once new active and standby RSPs are up, reload the new standby
`hw-module reload location <standby rsp loc>`

8. Mandatory SMUs for Downgrade

No mandatory SMU required for 4.2.0 to 3.9.x or 4.0.x or 4.1.x downgrade.

Rel.4.1.0 Mandatory SMU:

CSCtr26695 is mandatory SMU in 4.1.0

SMU Filename	asr9k-p-4.1.0.CSCtr26695.pie
DDTS	CSCtr26695
Affected images	4.1.0
SMU Package Name	<boot device> asr9k-p-4.1.0.CSCtr26695.pie
Problem Summary	NP lockup
SMU Install Impact	Traffic loss – recommend to install during package upgrade to 4.1.0
SMU Install Procedure	<p>Add SMU: router(admin)#install add <path>/ asr9k-p-4.1.0.CSCtr26695.pie sync</p> <p>Activate SMU: router(admin)#install activate disk0:asr9k-p-4.1.0.CSCtr26695-1.0.0 sync</p> <p>Commit SMU: router(admin)#install commit</p>

9. Downgrade from IOS XR Release 4.2.0

Note 1: All install operations should be done in admin mode.

Note 2: Check System Stability [See **Section 3** for details].

Note 3: As `fpd.pie` is part of mini package in 3.9.1 release onwards (prior or 3.9.1 release, it was a separate package), when downgrading from 4.2.0/4.1.x/4.0.x/3.9.1 to any previous release, `fpd.pie` need to be activated along with down-version (3.7.x and 3.9.0) packages.

Note 4: Downgrade requires at least equal number of matching packages. For example, if an upgraded release had Mini Package and Mcast Package activated, software downgrade path will require same number of packages (Mini and Mcast Package). In addition, FPD package is required to be part of downgrade command (as per **Note 3**). Otherwise, any additional packages need to be deactivated first (example: `asr9k-adv-video.pie` and/or `asr9k-doc.pies`).

Note 5: Before downgrade to 3.9.x or 4.0.x or 4.1.x, the Mandatory upgrade package (`asr9k-upgrade-p-4.2.0`) needs to be deactivated and removed.

Note 6: Before downgrade to 3.9.x or 4.0.x or 4.1.x, the Doc pie package (`asr9k-doc-p-4.2.0`) needs to be deactivated and removed.

Note 7: Before downgrade to 3.9.x or 4.0.x or 4.1.x, we recommend to backup any installed 4.2.0 Software licenses.

Note 8: Before downgrade to 3.9.x or 4.0.x or 4.1.x, any installed newly supported 4.2.0 line card/SPAs need to be removed.

Below is a list of the new HW Linecards, SPAs in 4.2.0:

- A9K-24x10GE-SE, A9K-24x10GE-TR
- A9K-MOD80-TR, A9K-MOD80-SE, A9K-MOD160-TR, A9K-MOD160-SE
- A9K-MPA-2x10GE, A9K-MPA-4x10GE, A9K-MPA-20x1GE
- A9K-2x100GE-SE, A9K-2x100GE-TR

Note 9: Before downgrade to 3.9.x, the Video package (`asr9k-video-p-4.2.0`) needs to be deactivated and any related config removed (`vidmon`).

Note 10: Before downgrade to 3.9.x, the Optics package (`asr9k-optic-p-4.2.0`) needs to be deactivated.

Note 11: Downgrade to 3.9.x with A9K-RSP-8G is not supported.

1) List the available package to downgrade:

```
RP/0/RSP0/CPU0:router(admin)#install activate ?
```

2) If you previously executed "install remove" command to permanently remove any packages after upgraded in 4.0.1 release, please run the following command to re-add the relevant packages to disk0 :

```
RP/0/RSP0/CPU0:router (admin)# install add <device or tftp>/<path> /<3.9.x.pie> sync
```

3) Activate to the downgrade revision package:

Activate all of the packages you need to downgrade to, which also available listed in step 1:

Or

Activate all of the packages added in step 2:

```
RP/0/RSP0/CPU0:router(admin)# install activate disk0:comp-asr9k-mini-3.9.x disk0:asr9k-mcast-3.9.x disk0:asr9k-mgbl-3.9.x disk0:asr9k-k9sec-3.9.x disk0:asr9k-mpls-3.9.x disk0:asr9k-fpd-3.9.x sync
```

Or

```
RP/0/RSP0/CPU0:router(admin)# install activate disk0:comp-asr9k-mini-4.0.x disk0:asr9k-mcast-4.0.x disk0:asr9k-mgbl-4.0.x disk0:asr9k-k9sec-4.0.x disk0:asr9k-mpls-4.0.x sync
```

Note 12: The output of 'install add' command executed in step 2 provides the list of names of packages to be used in "install activate .." command.

Note 13: The use of "sync" option will prevent the user from executing any other command during the install operation.

Note 14: The router will reload at the end of activation to start using the new packages.

Note 15: Under idle conditions, this operation may take at least 20 minutes to complete.

Note 16: A wild card option is available during packages activation.

```
RP/0/RSP0/CPU0:router(admin)# install activate disk0:*3.9.x*
```

OR

```
RP/0/RSP0/CPU0:router(admin)# install activate disk0:*4.0.x*
```

**Warning message: The following packages are specified multiple times: may be observed.*

- 4) Check to see if there were any failed startup config.

```
RP/0/RSP0/CPU0:router# show configuration failed startup
```

- 5) Verify system stability through commands described under **Check System Stability** [See **Section 3** for details]. If system issues are detected or if the upgrade needs to be backed out for any reason, please follow the steps described in **Downgrade** [See **Section 8** for details] to rollback the software to the starting point.

- 6) After router downgraded to 3.9.x or 4.0.x or 4.1.x, commit the newly activated software, and verify

```
RP/0/RSP0/CPU0:router(admin)#install commit
```

```
RP/0/RSP0/CPU0:router (admin)# show install committed summary
```

10. Downgrade using Install Rollback Option

- 1) List the available rollback points:

```
RP/0/RSP0/CPU0:router(admin)# show install rollback ?
```

- 2) Identify the rollback point by executing the following show command and analyzing the software configuration at the rollback point:

```
RP/0/RSP0/CPU0:router(admin)# show install rollback <rollback point>
```

Note 1: A valid rollback point number must be specified. The output will show list of active packages for that rollback point.

- 3) Test the rollback operation using the 'test' option. Testing the rollback operation can give you a preview of the rollback.

```
RP/0/RSP0/CPU0:router (admin)# install rollback to <rollback point> sync test
```

Note 2: The output will detect if any incompatible config exist. In such cases, 'show configuration removed' command can be used to view what will be removed as result of the software downgrade.

Note 3: Removed config can be reapplied at a later time using the 'load config removed <config>.cfg' command from config mode.

The following is a sample output:

```
Warning: SDR Owner: No incompatible configuration will be removed due to the
Warning: 'test' option
```

```
Info: SDR Owner: Detected incompatibility between the activated software
Info: and router running configuration.
Info: SDR Owner: Removing the incompatible configuration from the running
Info: configuration.
Info: SDR Owner: Saving removed configuration in file '20060316131636.cfg'
Info: on node 'RSP/0/0/CPU0:'
Info: Use the "show configuration removed 20060316131636.cfg" command to
Info: view the removed config.
Info: NOTE: You must address the incompatibility issues with the
Info: removed configuration above and re-apply it to the running
Info: configuration as required. To address these issues use the
Info: "load configuration removed 20060316131636.cfg" and "commit"
Info: commands.
```

Use the command suggested in the above example to display the config that will potentially be removed after the downgrade.

- 4) Perform the rollback operation using command:

```
RP/0/RSP0/CPU0:router(admin)# install rollback to <rollback point> sync
```

Note 4: Based on the set of packages being activated and deactivated as part of the rollback operation, one or more nodes may be reloaded. Please be patient as this operation could take some time.

Note 5: If you previously executed 'install remove' command to permanently remove any packages in the rollback configuration then the rollback operation will not proceed. To resolve this issue, please run the following command to re-add the relevant packages and SMUs to disk :

```
RP/0/RSP0/CPU0:router(admin)# install add <device or tftp>/<path>/<pie> sync
```

Note 6: The use of 'sync' option will prevent the user from executing any other command during the install operation.

- 5) In case of any un-expected config loss restore the original configuration that was backed up in **Perform Pre-Upgrade Tasks** [See **Section 4 Step 2** for details].

Restore the exec-configuration as follows

```
RP/0/RSP0/CPU0:router #config
RP/0/RSP0/CPU0:router (config)#load <source/exec-config-filename>
```

```
Verify any rejected exec configuration
RP/0/RSP0/CPU0:router(config)#show configuration failed
RP/0/RSP0/CPU0:router(config)#commit
```

Restore the admin-configuration as follows

```
RP/0/RSP0/CPU0:router#admin
RP/0/RSP0/CPU0:router(admin)#config
RP/0/RSP0/CPU0:router(admin-config)#load <source/admin-config-filename>
```

```
Verify any rejected admin configuration
RP/0/RSP0/CPU0:router(admin-config)#show configuration failed
RP/0/RSP0/CPU0:router(admin-config)#commit
RP/0/RSP0/CPU0:router(admin-config)#exit
```

- 6) Verify system stability through commands described in **Check System Stability** [See **Section 3** for details].

- 7) Install commit the newly activated software, and verify.

```
RP/0/RSP0/CPU0:router (admin)# install commit
```

```
RP/0/RSP0/CPU0:router (admin)# show install committed summary
```

- 8) Force downgrade fpd (detailed in next **Section 10**)

11. Optional FPD Downgrade

Note 1: Shipped versions of ROMMON from manufacturing should supersede any previously released versions in software. See the comment from the firmware compatibility matrix. Always use the latest version of ROMMON. Specifically, do not force downgrade ROMMON versions.

Note 2: All FPGA, PLD, and ROMMON versions are fully backward compatible. There is no requirement to force downgrade firmware when downgrading software.

After running the install commit command on downgrade to 4.1.x or 4.0.x or 3.9.x software version, run the “show hw-module fpd location all” command to check for firmware files. In case FPD downgrade is absolutely needed; to downgrade fpd firmware to meet 3.9.x or 4.0.x or 4.1.x needs use fpd command with force option.

To downgrade FPD firmware:

- 1) Run the “show hw-module fpd location all” command to check current firmware files.

Note 3: fpd.pie should be already active on the system if downgrade steps are followed. Step 2 to step 4 becomes optional if 3.9.0 fpd.pie is active on the system.

Note 4: To downgrade FPD firmware rel 3.9.1 onwards skip to step 5.

- 2) Add package “asr9k-fpd.pie-3.9.0” (if you have not added in **Section 8**, step 2) :

```
RP/0/RSP0/CPU0:router(admin)#install add <device or tftp>/<path>/asr9k-fpd.pie-3.9.0 sync
```

- 3) Activate package added in step 2:

```
RP/0/RSP0/CPU0:router(admin)#install activate disk0:asr9k-fpd.pie-3.9.0 sync
```

- 4) **Check System Stability** [See **Section 3** for details].

- 5) Commit the newly activated software, and verify

```
RP/0/RSP0/CPU0:router(admin)#install commit
```

```
RP/0/RSP0/CPU0:router (admin)# show install committed summary
```

- 6) Issue the following command to downgrade fpd:

```
RP/0/RSP0/CPU0:router(admin)#upgrade hw-module fpd all force location all
```

Note 5: Except CBC, router reload is requested after running the “upgrade hw-module fpd all force location all” command.

12. Post-Upgrade / Post-Downgrade Procedure

- 1) Verify the active package list after upgrade, using command:

```
RP/0/RSP0/CPU0:SAM2(admin)#show install active summary
Default Profile:
SDRs:
  Owner
Active Packages:
  disk0:asr9k-mini-p-4.2.0
  disk0:asr9k-optic-4.2.0
  disk0:asr9k-doc-p-4.2.0
  disk0:asr9k-k9sec-p-4.2.0
  disk0:asr9k-video-p-4.2.0
  disk0:asr9k-mpls-p-4.2.0
  disk0:asr9k-mgbl-p-4.2.0
  disk0:asr9k-mcast-p-4.2.0
```

- 2) Disk cleanup (optional)

Once software upgrade or downgrade has been completed, disk space can be recovered by removing any inactive packages that are no longer needed (if the packages are required at a later time, they can be re-added):

- Obtain the list of inactive packages and note the names of packages that are not needed:

```
RP/0/RSP0/CPU0:router(admin)#show install inactive summary
```

- Remove the unnecessary inactive packages:

```
RP/0/RSP0/CPU0:router(admin)# install remove disk0:<package_name1>
disk0:<package_name2> .. disk0:<pkg_nameN> sync
```

or

```
RP/0/RSP0/CPU0:router(admin)#install remove inactive sync
```

Note 1: The use of 'sync' option will prevent the user from executing any other command during the install operation.

- 3) Verify/fix configuration file system (mandatory)

```
RP/0/RSP0/CPU0:router(admin)#cfs check
```

- 4) Upgrade firmware (mandatory)

ROMMON, CBC, HSBI, CPLD, and FPGA firmware needs to be upgraded after the 4.2.0 image installation on the system. For detailed upgrade procedure please refer "*IOS XR Firmware Upgrade Guide*" document which can be accessed at:

http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html

13. Caveats

- 1) In Cisco ASR 9000 Series Router Software Release 4.0.0, the minimum configurable logging buffered size has been increased to 307200. Any configuration with a value less than 307200 fails to upgrade to Release 4.2.0.

–Run the **show configuration failed startup** command on startup to display the failed configuration.

–Workaround: Prior to upgrading to Release 4.2.0, set the logging buffer size to a value of 307200 or greater (**logging buffered 307200**).

- 2) **CSCtr75841**: 411: Cannot downgrade to 410 image due to doc pie

This problem also occurs when downgrade to 4.1.0 or prior releases.

The fix is in 4.2.0 but not in 4.1.0. In IOS XR 4.2.0, Doc pie package has the dependency on based OS package. In IOS XR 4.1.0 or prior releases, there's no such dependency therefore when downgrade to 4.1.0 or prior releases – an incompatibility is found.

If upgrade to later release such as 4.2, this problem won't occur.

Workaround: Deactivate 4.2.0 doc pie before downgrade.

14. Appendix

Reference #1 – 4.2.0 software “show version” output:

```

RP/0/RSP0/CPU0:RO2(admin)#show version

Cisco IOS XR Software, Version 4.2.0[Default]
Copyright (c) 2011 by Cisco Systems, Inc.

ROM: System Bootstrap, Version 1.05(20101118:025914) [ASR9K ROMMON],

RO2 uptime is 7 minutes
System image file is "bootflash:disk0/asr9k-os-mpi-4.2.0/0x100000/mbiasr9k-rp.vm"

cisco ASR9K Series (MPC8641D) processor with 4194304K bytes of memory.
MPC8641D processor at 1333MHz, Revision 2.2
ASR-9010 AC Chassis

4 Management Ethernet
40 GigabitEthernet
4 TenGigE
4 DWDM controller(s)
4 WANPHY controller(s)
219k bytes of non-volatile configuration memory.
975M bytes of compact flash card.
33994M bytes of hard disk.
1605616k bytes of disk0: (Sector size 512 bytes).
1605616k bytes of disk1: (Sector size 512 bytes).
--More-- LC/0/7/CPU0:Dec 23 10:56:11.793 : obfl_agent-lc[268]: %PLATFORM-OBFL-3-ERR_CREATE :
Failed to create the OBFL uptime record

Configuration register on node 0/RSP0/CPU0 is 0x102
Boot device on node 0/RSP0/CPU0 is disk0:
Package active on node 0/RSP0/CPU0:
asr9k-ce, V 4.2.0[00], Cisco Systems, at disk0:asr9k-ce-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-fpd, V 4.2.0[00], Cisco Systems, at disk0:asr9k-fpd-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-cpp, V 4.2.0[00], Cisco Systems, at disk0:asr9k-cpp-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-scfclient, V 4.2.0[00], Cisco Systems, at disk0:asr9k-scfclient-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:asr9k-diags-supp-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-fwding, V 4.2.0[00], Cisco Systems, at disk0:asr9k-fwding-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-base, V 4.2.0[00], Cisco Systems, at disk0:asr9k-base-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-os-mpi, V 4.2.0[00], Cisco Systems, at disk0:asr9k-os-mpi-4.2.0
  Built on Mon Dec 19 08:24:01 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

```

```
iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

Configuration register on node 0/RSP1/CPU0 is 0x8102
Boot device on node 0/RSP1/CPU0 is disk0:
Package active on node 0/RSP1/CPU0:
asr9k-ce, V 4.2.0[00], Cisco Systems, at disk0:asr9k-ce-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-fpd, V 4.2.0[00], Cisco Systems, at disk0:asr9k-fpd-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-cpp, V 4.2.0[00], Cisco Systems, at disk0:asr9k-cpp-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-scfclient, V 4.2.0[00], Cisco Systems, at disk0:asr9k-scfclient-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:asr9k-diags-supp-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-fwding, V 4.2.0[00], Cisco Systems, at disk0:asr9k-fwding-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-base, V 4.2.0[00], Cisco Systems, at disk0:asr9k-base-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-os-mpi, V 4.2.0[00], Cisco Systems, at disk0:asr9k-os-mpi-4.2.0
  Built on Mon Dec 19 08:24:01 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

Boot device on node 0/0/CPU0 is mem:
Package active on node 0/0/CPU0:
asr9k-ce, V 4.2.0[00], Cisco Systems, at disk0:asr9k-ce-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

asr9k-cpp, V 4.2.0[00], Cisco Systems, at disk0:asr9k-cpp-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
```

```
By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
asr9k-scfclient, V 4.2.0[00], Cisco Systems, at disk0:asr9k-scfclient-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
asr9k-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:asr9k-diags-supp-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
asr9k-fwding, V 4.2.0[00], Cisco Systems, at disk0:asr9k-fwding-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
asr9k-base, V 4.2.0[00], Cisco Systems, at disk0:asr9k-base-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
asr9k-os-mpi, V 4.2.0[00], Cisco Systems, at disk0:asr9k-os-mpi-4.2.0
  Built on Mon Dec 19 08:24:01 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
Boot device on node 0/7/CPU0 is mem:
Package active on node 0/7/CPU0:
asr9k-ce, V 4.2.0[00], Cisco Systems, at disk0:asr9k-ce-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
asr9k-cpp, V 4.2.0[00], Cisco Systems, at disk0:asr9k-cpp-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
asr9k-scfclient, V 4.2.0[00], Cisco Systems, at disk0:asr9k-scfclient-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
asr9k-diags-supp, V 4.2.0[00], Cisco Systems, at disk0:asr9k-diags-supp-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
asr9k-fwding, V 4.2.0[00], Cisco Systems, at disk0:asr9k-fwding-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
asr9k-base, V 4.2.0[00], Cisco Systems, at disk0:asr9k-base-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
asr9k-os-mpi, V 4.2.0[00], Cisco Systems, at disk0:asr9k-os-mpi-4.2.0
  Built on Mon Dec 19 08:24:01 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
iosxr-ce, V 4.2.0[00], Cisco Systems, at disk0:iosxr-ce-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie
```

```
iosxr-diags, V 4.2.0[00], Cisco Systems, at disk0:iosxr-diags-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-routing, V 4.2.0[00], Cisco Systems, at disk0:iosxr-routing-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-fwding, V 4.2.0[00], Cisco Systems, at disk0:iosxr-fwding-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

iosxr-infra, V 4.2.0[00], Cisco Systems, at disk0:iosxr-infra-4.2.0
  Built on Mon Dec 19 08:22:13 UTC 2011
  By iox-bld2 in /auto/srcarchive6/production/4.2.0/all/workspace for pie

RP/0/RSP0/CPU0:RO2(admin)#
```

Reference #2 – 4.2.0 “show fpd package” example output:

RP/0/RSP0/CPU0:RO2(admin)#show fpd package

```
=====
                          Field Programmable Device Package
                          =====
```

Card Type	FPD Description	Type	Subtype	SW Version	Min Req SW Ver	Min Req HW Vers

A9K-40GE-B	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.06	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	Bridge LC2	lc	fpgal	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-4T-B	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.08	0.00	0.1
	LCClkCtrl LC2	lc	cpld3	0.03	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	PHY LC2	lc	fpga3	14.44	0.00	0.1
	Bridge LC2	lc	fpgal	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-8T/4-B	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.08	0.00	0.1
	LCClkCtrl LC2	lc	cpld3	0.03	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	PHY LC2	lc	fpga3	14.44	0.00	0.1
	Bridge LC2	lc	fpgal	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-2T20GE-B	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.11	0.00	0.1
	LCClkCtrl LC2	lc	cpld3	0.10	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.16	0.00	0.1
	Bridge LC2	lc	fpgal	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-40GE-E	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.06	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	Bridge LC2	lc	fpgal	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-4T-E	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1

	PHYCtrl LC2	lc	cpld2	0.08	0.00	0.1
	LCclkCtrl LC2	lc	cpld3	0.03	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	PHY LC2	lc	fpga3	14.44	0.00	0.1
	Bridge LC2	lc	fpgal	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-8T/4-E	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.08	0.00	0.1
	LCclkCtrl LC2	lc	cpld3	0.03	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	PHY LC2	lc	fpga3	14.44	0.00	0.1
	Bridge LC2	lc	fpgal	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-2T20GE-E	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.11	0.00	0.1
	LCclkCtrl LC2	lc	cpld3	0.10	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.16	0.00	0.1
	Bridge LC2	lc	fpgal	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-8T-B	Can Bus Ctrl (CBC) LC3	lc	cbc	6.02	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cpld2	0.08	0.00	0.1
	LCclkCtrl LC3	lc	cpld3	0.03	0.00	0.1
	DB CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.11	0.00	0.1
	Serdes Upgrade LC3	lc	fpga3	14.44	0.00	0.1
	Raven LC3	lc	fpgal	1.02	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1

A9K-8T-B	Can Bus Ctrl (CBC) LC3	lc	cbc	6.02	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cpld2	0.08	0.00	0.1
	LCclkCtrl LC3	lc	cpld3	0.03	0.00	0.1
	DB CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.11	0.00	0.1
	Raven LC3	lc	fpgal	1.02	0.00	0.1
	HSBI LC3	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1

A9K-16T/8-B	Can Bus Ctrl (CBC) LC3	lc	cbc	6.02	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cpld2	0.04	0.00	0.1
	LCclkCtrl LC3	lc	cpld3	0.01	0.00	0.1
	DB CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.01	0.00	0.1
	Serdes Upgrade LC3	lc	fpga3	14.44	0.00	0.1
	Raven LC3	lc	fpgal	1.02	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1

A9K-16T/8-B	Can Bus Ctrl (CBC) LC3	lc	cbc	6.02	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cpld2	0.04	0.00	0.1
	LCclkCtrl LC3	lc	cpld3	0.01	0.00	0.1
	DB CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.01	0.00	0.1
	Raven LC3	lc	fpgal	1.02	0.00	0.1
	HSBI LC3	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1

A9K-8T-E	Can Bus Ctrl (CBC) LC3	lc	cbc	6.02	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cpld2	0.08	0.00	0.1
	LCclkCtrl LC3	lc	cpld3	0.03	0.00	0.1
	DB CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.11	0.00	0.1
	Serdes Upgrade LC3	lc	fpga3	14.44	0.00	0.1
	Raven LC3	lc	fpgal	1.02	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1

A9K-8T-E	Can Bus Ctrl (CBC) LC3	lc	cbc	6.02	0.00	0.1
	CPUCtrl LC3	lc	cp1d1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cp1d2	0.08	0.00	0.1
	LCclkCtrl LC3	lc	cp1d3	0.03	0.00	0.1
	CPUCtrl LC3	lc	cp1d4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.11	0.00	0.1
	Raven LC3	lc	fpga1	1.02	0.00	0.1
	HSBI LC3	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1

A9K-16T/8-E	Can Bus Ctrl (CBC) LC3	lc	cbc	6.02	0.00	0.1
	CPUCtrl LC3	lc	cp1d1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cp1d2	0.04	0.00	0.1
	LCclkCtrl LC3	lc	cp1d3	0.01	0.00	0.1
	DB CPUCtrl LC3	lc	cp1d4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.01	0.00	0.1
	Serdes Upgrade LC3	lc	fpga3	14.44	0.00	0.1
	Raven LC3	lc	fpga1	1.02	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1

A9K-16T/8-E	Can Bus Ctrl (CBC) LC3	lc	cbc	6.02	0.00	0.1
	CPUCtrl LC3	lc	cp1d1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cp1d2	0.04	0.00	0.1
	LCclkCtrl LC3	lc	cp1d3	0.01	0.00	0.1
	DB CPUCtrl LC3	lc	cp1d4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.01	0.00	0.1
	Raven LC3	lc	fpga1	1.02	0.00	0.1
	HSBI LC3	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1

A9K-40GE-L	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cp1d1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cp1d2	0.06	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	Bridge LC2	lc	fpga1	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-4T-L	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cp1d1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cp1d2	0.08	0.00	0.1
	LCclkCtrl LC2	lc	cp1d3	0.03	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	Serdes Upgrade LC2	lc	fpga3	14.44	0.00	0.1
	Bridge LC2	lc	fpga1	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-8T/4-L	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cp1d1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cp1d2	0.08	0.00	0.1
	LCclkCtrl LC2	lc	cp1d3	0.03	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	Serdes Upgrade LC2	lc	fpga3	14.44	0.00	0.1
	Bridge LC2	lc	fpga1	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-2T20GE-L	Can Bus Ctrl (CBC) LC2	lc	cbc	2.02	0.00	0.1
	CPUCtrl LC2	lc	cp1d1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cp1d2	0.11	0.00	0.1
	LCclkCtrl LC2	lc	cp1d3	0.10	0.00	0.1
	Tomcat LC2	lc	fpga2	0.16	0.00	0.1
	Bridge LC2	lc	fpga1	0.43	0.00	0.1
	HSBI LC2	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1

A9K-8T-L	Can Bus Ctrl (CBC) LC3	lc	cbc	6.02	0.00	0.1
	CPUCtrl LC3	lc	cp1d1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cp1d2	0.08	0.00	0.1
	LCclkCtrl LC3	lc	cp1d3	0.03	0.00	0.1
	CPUCtrl LC3	lc	cp1d4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.11	0.00	0.1
	Raven LC3	lc	fpga1	1.02	0.00	0.1
	HSBI LC3	lc	hsbi	3.00	0.00	0.1

	ROMMONB LC3	lc	rommon	1.03	0.00	0.1
A9K-16T/8-L	Can Bus Ctrl (CBC) LC3	lc	cbc	6.02	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cpld2	0.04	0.00	0.1
	LCclkCtrl LC3	lc	cpld3	0.01	0.00	0.1
	DB CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.01	0.00	0.1
	Raven LC3	lc	fpga1	1.02	0.00	0.1
	HSBI LC3	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1
A9K-SIP-700	Can Bus Ctrl (CBC) LC5	lc	cbc	3.05	0.00	0.1
	CPUCtrl LC5	lc	cpld1	0.15	0.00	0.1
	QFPUPBridge LC5	lc	fpga2	5.14	0.00	0.1
	NPUXBarBridge LC5	lc	fpga1	0.23	0.00	0.1
	HSBI LC5	lc	hsbi	3.00	0.00	0.1
	ROMMONB LC5	lc	rommon	1.03	0.00	0.1
A9K-SIP-500	Can Bus Ctrl (CBC) LC5	lc	cbc	3.05	0.00	0.1
	CPUCtrl LC5	lc	cpld1	0.15	0.00	0.1
	QFPUPBridge LC5	lc	fpga2	5.14	0.00	0.1
	NPUXBarBridge LC5	lc	fpga1	0.23	0.00	0.1
	ROMMONB LC5	lc	rommon	1.03	0.00	0.1
A9K-RSP-2G	Can Bus Ctrl (CBC) RSP2	lc	cbc	1.02	0.00	0.1
	CPUCtrl RSP2	lc	cpld2	1.18	0.00	0.1
	IntCtrl RSP2	lc	fpga2	1.15	0.00	0.1
	ClkCtrl RSP2	lc	fpga3	1.23	0.00	0.1
	UTI RSP2	lc	fpga4	3.08	0.00	0.1
	PUNT RSP2	lc	fpga1	1.05	0.00	0.1
	HSBI RSP2	lc	hsbi	4.00	0.00	0.1
	ROMMONB RSP2	lc	rommon	1.05	0.00	0.1
A9K-RSP-4G	Can Bus Ctrl (CBC) RSP2	lc	cbc	1.02	0.00	0.1
	CPUCtrl RSP2	lc	cpld2	1.18	0.00	0.1
	IntCtrl RSP2	lc	fpga2	1.15	0.00	0.1
	ClkCtrl RSP2	lc	fpga3	1.23	0.00	0.1
	UTI RSP2	lc	fpga4	3.08	0.00	0.1
	PUNT RSP2	lc	fpga1	1.05	0.00	0.1
	HSBI RSP2	lc	hsbi	4.00	0.00	0.1
	ROMMONB RSP2	lc	rommon	1.05	0.00	0.1
A9K-RSP-8G	Can Bus Ctrl (CBC) RSP2	lc	cbc	1.02	0.00	0.1
	CPUCtrl RSP2	lc	cpld2	1.18	0.00	0.1
	IntCtrl RSP2	lc	fpga2	1.15	0.00	0.1
	ClkCtrl RSP2	lc	fpga3	1.23	0.00	0.1
	UTI RSP2	lc	fpga4	3.08	0.00	0.1
	PUNT RSP2	lc	fpga1	1.05	0.00	0.1
	HSBI RSP2	lc	hsbi	4.00	0.00	0.1
	ROMMONB RSP2	lc	rommon	1.05	0.00	0.1
A9K-24x10GE-SE	Can Bus Ctrl (CBC) LC6	lc	cbc	19.108	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.01	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.00	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	1.01	0.00	0.0
	ROMMONB LC6	lc	rommon	1.21	0.00	0.0
A9K-2x100GE-SE	Can Bus Ctrl (CBC) LC4	lc	cbc	21.107	0.00	0.1
	DB IO FPGA1	lc	cpld1	1.01	0.00	0.0
	MB CPUCtrl	lc	fpga2	1.02	0.00	0.0
	PortCtrl	lc	fpga3	1.01	0.00	0.0
	Imux	lc	fpga4	1.00	0.00	0.0
	Emux	lc	fpga5	1.01	0.00	0.0
	100GIGMAC	lc	fpga6	23.00	0.00	0.0
	ROMMONB LC4	lc	rommon	1.22	0.00	0.0
A9K-MOD80-SE	Can Bus Ctrl (CBC) LC4	lc	cbc	20.113	0.00	0.1
	DB Ctrl	lc	fpga2	0.05	0.00	0.0
	MB CPUCtrl	lc	fpga4	0.06	0.00	0.0
	ROMMONB LC4	lc	rommon	1.21	0.00	0.1
A9K-MOD160-SE	Can Bus Ctrl (CBC) LC4	lc	cbc	20.113	0.00	0.1
	DB Ctrl	lc	fpga2	0.05	0.00	0.0
	MB CPUCtrl	lc	fpga4	0.06	0.00	0.0
	ROMMONB LC4	lc	rommon	1.21	0.00	0.1

A9K-24x10GE-TR	Can Bus Ctrl (CBC) LC6	lc	cbc	19.108	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.01	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.00	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	1.01	0.00	0.0
	ROMMONB LC6	lc	rommon	1.21	0.00	0.0
A9K-2x100GE-TR	Can Bus Ctrl (CBC) LC4	lc	cbc	21.107	0.00	0.1
	DB IO FPGA1	lc	cpld1	1.01	0.00	0.0
	MB CPUCtrl	lc	fpga2	1.02	0.00	0.0
	PortCtrl	lc	fpga3	1.01	0.00	0.0
	Imux	lc	fpga4	1.00	0.00	0.0
	Emux	lc	fpga5	1.01	0.00	0.0
	100GIGMAC	lc	fpga6	23.00	0.00	0.0
	ROMMONB LC4	lc	rommon	1.22	0.00	0.0
A9K-MOD80-TR	Can Bus Ctrl (CBC) LC4	lc	cbc	20.113	0.00	0.1
	DB Ctrl	lc	fpga2	0.05	0.00	0.0
	MB CPUCtrl	lc	fpga4	0.06	0.00	0.0
	ROMMONB LC4	lc	rommon	1.21	0.00	0.1
A9K-MOD160-TR	Can Bus Ctrl (CBC) LC4	lc	cbc	20.113	0.00	0.1
	DB Ctrl	lc	fpga2	0.05	0.00	0.0
	MB CPUCtrl	lc	fpga4	0.06	0.00	0.0
	ROMMONB LC4	lc	rommon	1.21	0.00	0.1
A9K-8T-TEST	Can Bus Ctrl (CBC) LC17	lc	cbc	17.213	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	0.03	0.00	0.0
	ROMMONB LC6	lc	rommon	1.04	0.00	0.0
ASR-9010-FAN	Can Bus Ctrl (CBC) FAN	lc	cbc	4.00	0.00	0.1
ASR-9006-FAN	Can Bus Ctrl (CBC) FAN	lc	cbc	5.00	0.00	0.1
A9K-BPID2-10-SLOT	Can Bus Ctrl (CBC) BP2	lc	cbc	7.103	0.00	0.1
A9K-BPID2-6-SLOT	Can Bus Ctrl (CBC) BP2	lc	cbc	7.103	0.00	0.1
A9K-ISM-100	Can Bus Ctrl (CBC) LC6	lc	cbc	18.05	0.00	0.1
	CPUCtrl LC6	lc	cpld1	0.01	0.00	0.1
	Maintenance LC6	lc	fpga2	2.00	0.00	0.1
	Amistad LC6	lc	fpga1	0.29	0.00	0.20
	ROMMONB LC6	lc	rommon	1.02	0.00	0.1
SPA-4XT3/E3	SPA E3 Subrate FPGA	spa	fpga2	1.04	0.00	0.0
	SPA T3 Subrate FPGA	spa	fpga3	1.04	0.00	0.0
	SPA I/O FPGA	spa	fpga1	1.01	0.00	0.0
	SPA ROMMON	spa	rommon	2.12	0.00	0.0
SPA-4XCT3/DS0	SPA T3 Subrate FPGA	spa	fpga2	0.11	0.00	0.100
	SPA T3 Subrate FPGA	spa	fpga2	1.04	0.00	0.200
	SPA I/O FPGA	spa	fpga1	2.08	0.00	0.100
	SPA ROMMON	spa	rommon	2.12	0.00	0.100
SPA-1XCHSTM1/OC3	SPA T3 Subrate FPGA	spa	fpga2	1.04	0.00	0.0
	SPA I/O FPGA	spa	fpga1	1.08	0.00	0.0
	SPA ROMMON	spa	rommon	2.12	0.00	0.0
SPA-1XCHOC3-CE-ATM	SPA OC3 Subrate FPGA	spa	fpga2	2.23	0.00	0.0
	SPA I/O FPGA	spa	fpga1	2.23	0.00	2.0
	SPA ROMMON	spa	rommon	1.04	0.00	0.0
SPA-1XCHOC48/DS3	SPA I/O FPGA	spa	fpga2	1.00	0.00	0.49
	SPA I/O FPGA	spa	fpga3	1.00	0.00	0.52
	SPA I/O FPGA	spa	fpga1	1.36	0.00	0.49
	SPA ROMMON	spa	rommon	2.02	0.00	0.49
SPA-2XCHOC12/DS0	SPA FPGA2 swv1.00	spa	fpga2	1.00	0.00	0.0
	SPA FPGA swv1.36	spa	fpga1	1.36	0.00	0.49
	SPA ROMMON swv2.2	spa	rommon	2.02	0.00	0.49
A9K-MPA-20X1GE	EP I/O FPGA	spa	fpga3	0.08	0.00	0.0
A9K-MPA-2X10GE	EP I/O FPGA	spa	fpga6	0.09	0.00	0.0
A9K-MPA-4X10GE	EP I/O FPGA	spa	fpga6	0.09	0.00	0.0

SPA-8XOC12-POS	SPA FPGA swv1.0	spa fpga1	1.00	0.00	0.5
SPA-8XCHT1/E1	SPA I/O FPGA	spa fpga1	2.08	0.00	0.0
	SPA ROMMON	spa rommon	2.12	0.00	0.140
SPA-OC192POS-XFP	SPA FPGA swv1.2 hwv2	spa fpga1	1.02	0.00	2.0
SPA-2XOC48POS/RPR	SPA FPGA swv1.0	spa fpga1	1.00	0.00	0.0
SPA-4XOC48POS/RPR	SPA FPGA swv1.0	spa fpga1	1.00	0.00	0.0
SPA-8XOC3-POS	SPA FPGA swv1.0	spa fpga1	1.00	0.00	0.5
SPA-2XOC12-POS	SPA FPGA swv1.0	spa fpga1	1.00	0.00	0.5
SPA-4XOC12-POS	SPA FPGA swv1.0	spa fpga1	1.00	0.00	0.5
SPA-10X1GE-V2	SPA FPGA swv1.10	spa fpga1	1.10	0.00	0.0
SPA-5X1GE-V2	SPA FPGA swv1.10	spa fpga1	1.10	0.00	0.0
SPA-1X10GE-L-V2	SPA FPGA swv1.9	spa fpga1	1.09	0.00	0.0
SPA-4XOC3-POS-V2	SPA FPGA swv1.0	spa fpga1	1.00	0.00	0.5
SPA-1X10GE-WL-V2	SPA FPGA swv1.9	spa fpga1	1.09	0.00	0.0
SPA-1XOC3-ATM-V2	SPA FPGA swv1.2	spa fpga1	2.02	0.00	0.0
SPA-2XOC3-ATM-V2	SPA FPGA swv1.2	spa fpga1	2.02	0.00	0.0
SPA-3XOC3-ATM-V2	SPA FPGA swv1.2	spa fpga1	2.02	0.00	0.0
SPA-1XOC12-ATM-V2	SPA FPGA swv1.2	spa fpga1	2.02	0.00	0.0

RP/0/RSP0/CPU0:RO2 (admin) #