

Firmware Upgrade validation in RPI-3 target

- [Introduction](#)
- [Yocto Build Steps](#)
- [Image Flash Procedure](#)
- [Firmware Upgrade Validation Procedure](#)
 - [TFTP Server Setup](#)
 - [XCONF Server Setup](#)
 - [XConf URL](#)
 - [Create Environments](#)
 - [Create Model](#)
 - [Create MAC List](#)
 - [Create Firmware config](#)
 - [Create Firmware Rule](#)
 - [Edit Download Location Round Robin Filter](#)
 - [Verify XConf server configuration](#)
 - [RPI-Board](#)
- [Conclusion](#)
- [Limitations](#)

Introduction

The Firmware upgrade will upgrade higher or lower version of the current image in RPI target with the help of Xconf server and Local TFTP server.

This page dedicated to bringing up and validation of Firmware upgrade in RPI 3B+ target.

Yocto Build Steps

Refer below link to build camera image

[RDK-C Build Instruction for RPI-3](#)

Image Flash Procedure

Image Flash step

```
$ sudo dd if="Image Name" of="Device Name" bs=4M
```

Example:

```
sudo dd if=rdk-generic-camera-image_default_20200130060729.rootfs.rpi-sdimg of=/dev/sdb bs=4M
```

Firmware Upgrade Validation Procedure

TFTP Server Setup

STEP 1:

Install xinetd and tftpd-hpa application in your local PC to setup tftp server by using below command

TFTP Server Installation Step

```
sudo apt-get install xinetd  
sudo apt-get install tftpd-hpa
```

STEP 2:

Create checksum file for your upgrading image.

md5sum checksum creation

```
md5sum "<imagefile_name>.rootfs.rpi-sdimg" > imagefile_name.txt
```

for Ex:

```
upgrading image file is rdk-generic-camera-image_default_20200329074421.rootfs.rpi-sdimg
md5sum "rdk-generic-camera-image_default_20200329074421.rootfs.rpi-sdimg" > rdk-generic-camera-
image_default_20200329074421.txt
```

STEP 3:

Create new folder for example "tftp-home" in your PC home directory to maintain checksum file and upgrading image file.

Keep upgrading image file and checksum file in your created folder.

For Ex:

Keep rdk-generic-camera-image_default_20200329074421.rootfs.rpi-sdimg and rdk-generic-camera-image_default_20200329074421.txt files in your tftp-home folder.

STEP 4:

Check tftp file is there or not in /etc/xinetd.d/ directory. if it is not there then create tftp file under this /etc/xinetd.d/ directory and add below content.

vi /etc/xinetd.d/tftp

TFTP File Content

```
service tftp
{
    protocol          = udp
    port              = 69
    socket_type        = dgram
    wait              = yes
    user               = nobody
    server             = /usr/sbin/in.tftpd
    server_args        = -c -v -s /home/xyz/tftp-home ( Give upgrading file and checksum file maintained directory )
    disable            = no
}
```

STEP 5:

Verify /etc/default/tftpd-hpa file content

vi /etc/default/tftpd-hpa

tftp-hpa File Content

```
# /etc/default/tftpd-hpa

TFTP_USERNAME="tftp"
TFTP_DIRECTORY="/home/xyz/tftp-home" ( Give upgrading file and checksum file maintained directory )
TFTP_ADDRESS="0.0.0.0:69"
TFTP_OPTIONS="--secure"
```

STEP 6:

Start tftp server and xinetd server

```
sudo service tftpd-hpa restart
sudo /etc/init.d/xinetd restart
```

XCONF Server Setup

XConf URL

Enter XConf server wiki page with below URL to create Environment, Model, Mac list, Firmware config, Firmware rule and Download Location Round Robin Filter.

XConf URL

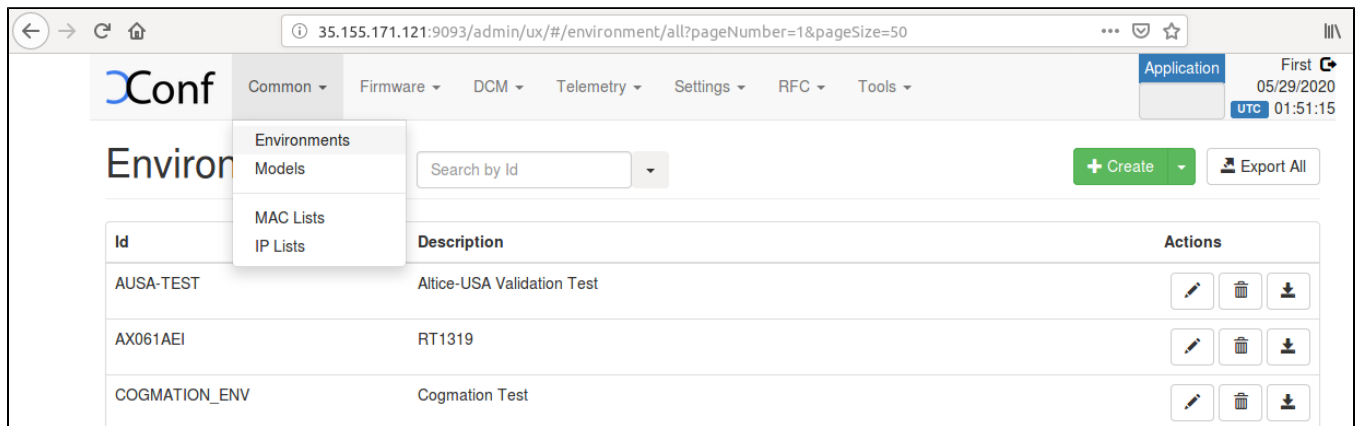
<http://35.155.171.121:9093/admin/ux>

Create Environments

STEP 1:

Select Environments option within common list to enter Environments page.

After entered Environments page press create button to add your device environment detail.

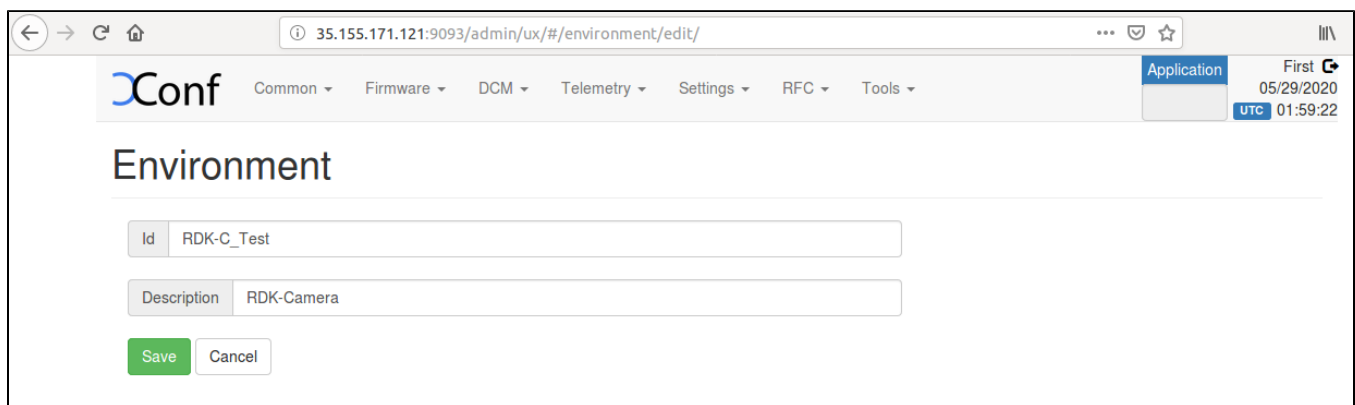


The screenshot shows the XConf web interface. The top navigation bar includes 'Common', 'Firmware', 'DCM', 'Telemetry', 'Settings', 'RFC', and 'Tools'. The 'Common' menu is open, showing 'Environments', 'Models', 'MAC Lists', and 'IP Lists'. The 'Environments' page is displayed, featuring a search bar labeled 'Search by Id' and a '+ Create' button. Below the search bar is a table with the following data:

Id	Description	Actions
AUSA-TEST	Alice-USA Validation Test	[Edit] [Delete] [Download]
AX061AEI	RT1319	[Edit] [Delete] [Download]
COGMATION_ENV	Cogmation Test	[Edit] [Delete] [Download]

STEP 2:

Give ID and Description to setup Environment for your device and save that details in xconf server..



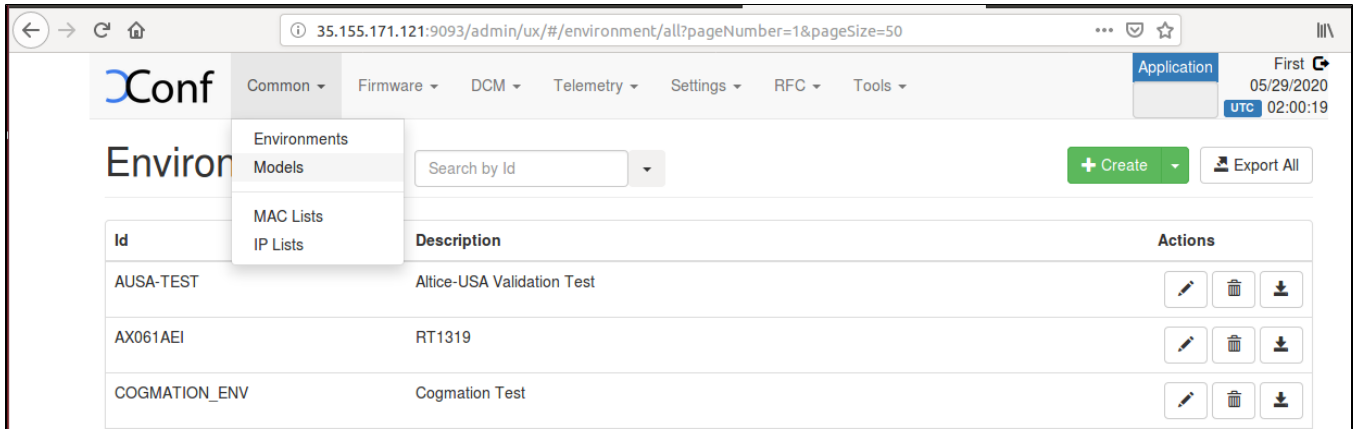
The screenshot shows the XConf web interface for editing an environment. The top navigation bar is the same as in the previous screenshot. The 'Environment' page is displayed, featuring two input fields: 'Id' with the value 'RDK-C_Test' and 'Description' with the value 'RDK-Camera'. Below the input fields are 'Save' and 'Cancel' buttons.

Create Model

STEP 1:

Select Models option within common list to enter Models page.

After entered Models page press create button to add your device model detail.

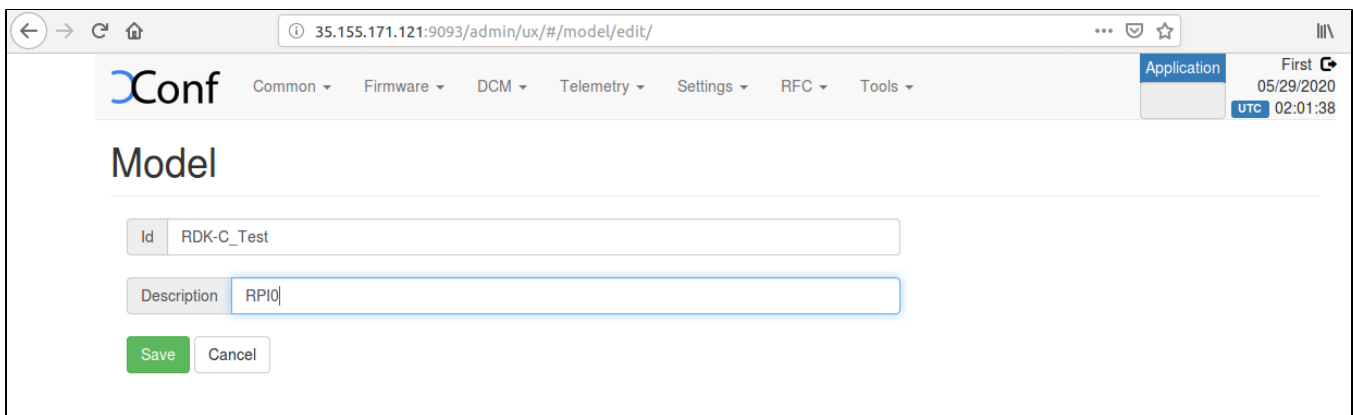


The screenshot shows the XConf web interface. The 'Common' dropdown menu is open, and 'Models' is selected. The 'Environments' page is displayed, showing a table of models. The table has columns for 'Id', 'Description', and 'Actions'. The data rows are:

Id	Description	Actions
AUSA-TEST	Alice-USA Validation Test	[Edit] [Delete] [Download]
AX061AEI	RT1319	[Edit] [Delete] [Download]
COGMATION_ENV	Cogmation Test	[Edit] [Delete] [Download]

STEP 2:

Give ID and Description to setup Model for your device and save that details in xconf server..



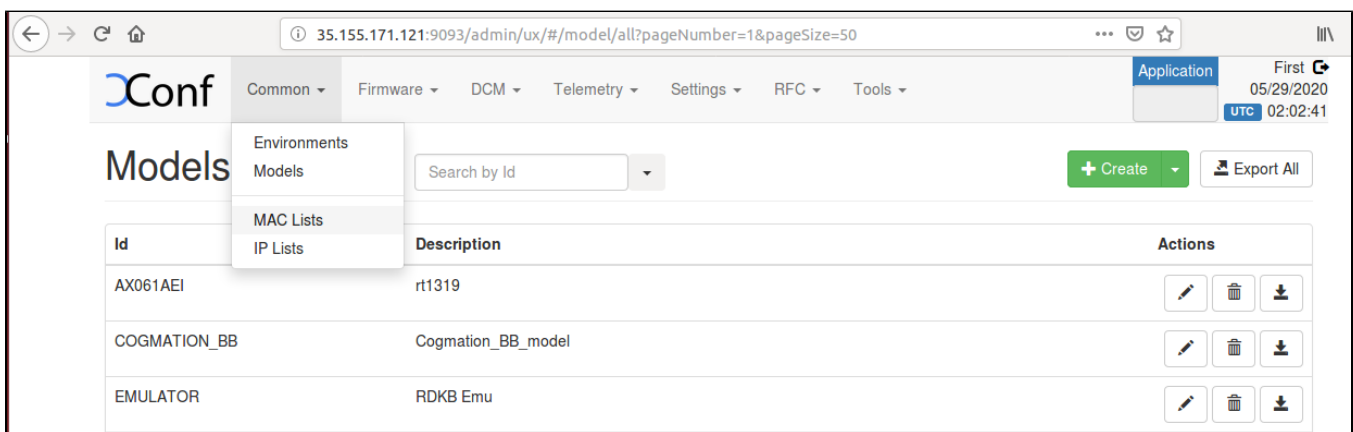
The screenshot shows the XConf web interface for editing a model. The 'Id' field contains 'RDK-C_Test' and the 'Description' field contains 'RPI0'. The 'Save' button is highlighted.

Create MAC List

STEP 1:

Select MAC Lists option within common list to enter MAC Lists page.

After entered MAC Lists page press create button to add your device MAC detail.



The screenshot shows the XConf web interface. The 'Common' dropdown menu is open, and 'MAC Lists' is selected. The 'Models' page is displayed, showing a table of models. The table has columns for 'Id', 'Description', and 'Actions'. The data rows are:

Id	Description	Actions
AX061AEI	rt1319	[Edit] [Delete] [Download]
COGMATION_BB	Cogmation_BB_model	[Edit] [Delete] [Download]
EMULATOR	RDKB Emu	[Edit] [Delete] [Download]

STEP 2:

Give Name and Data to set MAC detail for your device and save that details in xconf server..

The screenshot shows the 'Add MAC List' form in the XConf web interface. The browser address bar shows the URL: 35.155.171.121:9093/admin/ux/#/namespacedlist/edit//CREATE/MAC_LIST. The XConf logo is in the top left, and navigation tabs include Common, Firmware, DCM, Telemetry, Settings, RFC, and Tools. The 'Application' tab is selected, showing a date of 05/29/2020 and time of 02:07:13 UTC. The form has two main sections: 'Name' and 'Data'. The 'Name' section has a text input field containing 'RDK-C_Test'. The 'Data' section has a text input field with the placeholder 'Please enter item' and a blue '+' button. Below the 'Data' field, there is a grey box containing the MAC address 'B8:27:EB:2E:72:2B' with a close button. At the bottom of the form are 'Save' and 'Cancel' buttons.

Create Firmware config

Ensure application type is stb. If the application type is xhome then change application into stb.

STEP 1:

Select Firmware Configs option within common list to enter Firmware Configs page.

After entered Firmware Configs page press create button to add your device firmware configuration detail.

The screenshot shows the 'Mac Lists' page in the XConf web interface. The browser address bar shows the URL: 35.155.171.121:9093/admin/ux/#/namespacedlist/MAC_LIST?pageNumber=1&pageSize=50. The XConf logo is in the top left, and navigation tabs include Common, Firmware, DCM, Telemetry, Settings, RFC, and Tools. The 'Firmware' tab is selected, and a dropdown menu is open showing options: Firmware Configs, Firmware Rules, Firmware Templates, Download Location Filter, Percent Filter, Logs, Report page, and Test page. The 'Firmware Configs' option is highlighted. The main content area shows a table with the following data:

Name	
AUSA-Test	
AX061AEI	
Cogmation_MAC	
EMU-MAC	1

At the top right of the table, there are buttons for '+ Create' and 'Export All'. Each row in the table has a set of icons for editing, deleting, and other actions.

STEP 2:

Give Description,File name (Upgrading image name),Version(Upgrading image name without .rootfs.rpi.sdimg) and select your model name and save the details in xconf server.

← → ↻ 🏠 35.155.171.121:9093/admin/ux/#/firmwareconfig/edit/ ... 📶 ⭐

XConf Common ▾ Firmware ▾ DCM ▾ Telemetry ▾ Settings ▾ RFC ▾ Tools ▾

Application: stb First: 05/29/2020 UTC 02:15:59

Firmware config

Description: RDK-C_Test

File name: rdk-generic-camera-image_default_20200329074421.rootfs.rpi-sdimg

Version: rdk-generic-camera-image_default_20200329074421

Models:

AX061AEI COGMATION_BB EMULATOR EMULATOR1 MOCKRT1319_TEST TEST **RDK-C_TEST** RDKB-TECHSUMMIT RDKB_RPI RPI RPI0 RPI_BB TESTCPE

Save Cancel

Create Firmware Rule

STEP 1:

Select Firmware Rule option within common list to enter Firmware Rule page.

After entered Firmware Rule page press create button to add your device firmware Rule detail.

← → ↻ 🏠 35.155.171.121:9093/admin/ux/#/firmwareconfig/all

XConf Common ▾ Firmware ▾ DCM ▾ Telemetry ▾ Settings ▾ RFC ▾ Tools ▾

Application: stb First: 05/29/2020 UTC 02:16:54

Firmware config

Search by Model ▾

Create ▾ Export All

	Description	Supported Models	Actions
👁	Cogmation_config	COGMATION_BB	✎ 🗑 ⬇
👁	CPEfirmware	TESTCPE	✎ 🗑 ⬇
👁	emulator_firmware	EMULATOR1	✎ 🗑 ⬇
👁	Firmware_Camera	RPI0	✎ 🗑 ⬇

STEP 2:

After entered firmware Rule page you can see list of template.

Choose MAC_RULE in this list of Template to add your device MAC list in Firmware Configuration.

← → ↻ 🏠 35.155.171.121:9093/admin/ux/#/firmwareconfig/all

XConf Common ▾ Firmware ▾ DCM ▾ Telemetry ▾ Settings ▾ RFC ▾ Tools ▾

Application: stb ▾ First: 05/29/2020 UTC 02:22:05

Add Firmware Rule

Please Select a Template

ENV_MODEL_RULE
IP_RULE
IV_RULE
MAC_RULE
MIN_CHECK_RULE

STEP 3:

After entered Firmware Rule page. If any estbmac is there under build condition then remove that estbmac before add your device specific Firmware rules.

← → ↻ 🏠 35.155.171.121:9093/admin/ux/#/firmwareconfig/all

XConf Common ▾ Firmware ▾ DCM ▾ Telemetry ▾ Settings ▾ RFC ▾ Tools ▾

Application: stb ▾ First: 05/29/2020 UTC 02:22:05

Add Firmware Rule

PROPERTIES

Name: RDK-C_Test Type: MAC_RULE

BUILD CONDITIONS

eStbMac IN_LIST ✕

☐ not eStbMac IN_LIST +

Please provide value for each condition in the rule:
click condition, enter fixedArg value, then click Plus button to save that condition.
Note: Key value in condition can't be modified. It's not allowed to add new conditions.

STEP 4:

Add your device specific eStbMac under build condition option.

Select your firmware config under Action option and save your Firmware rule in XConf server.

35.155.171.121:9093/admin/ux/#/firmwarerule/add/RULE/

ConfCommonFirmwareDCMTelemetrySettingsRFCTools

ApplicationstbFirst05/29/2020UTC02:20:26

Add Firmware Rule

PROPERTIES

Name

RDK-C_Test

Type

MAC_RULE

BUILD CONDITIONS

eStbMacIN_LISTRDK-C_Test

ANDOR

☐ not

IS

+

Please provide value for each condition in the rule:
click condition, enter fixedArg value, then click Plus button to save that condition.
Note: Key value in condition can't be modified. It's not allowed to add new conditions.

ACTION

Action Type

RULE

NoOp

false

☐

Firmware Config

Cogmation_config

Save

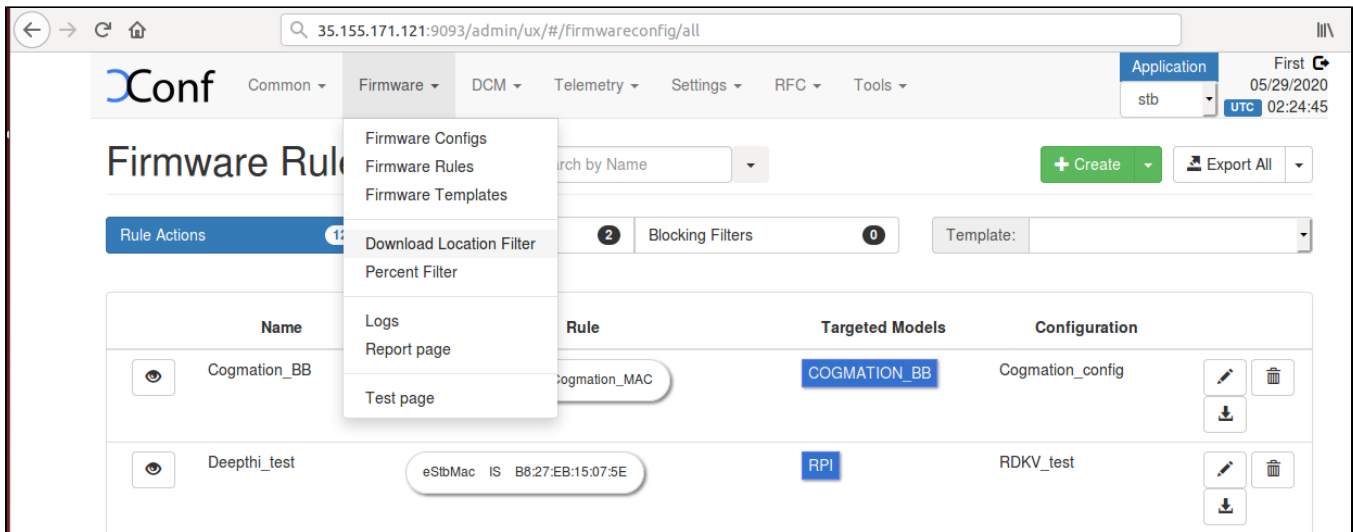
Cancel

Edit Download Location Round Robin Filter

STEP 1:

Select Download Location Filter option within common list to enter Download Location Filter page.

After entered Download Location Filter page press create button to add your Download Location detail.



STEP 2:

After entered Download Location Round Robin filter press edit button to edit your image downloading details.

Enable Never use HTTP and select your Rongue model.

Give TFTP server running IP address to download image.

35.155.171.121:9093/admin/ux/#/roundrobinfilter/edit

XConf Common Firmware DCM Telemetry Settings RFC Tools

Application: stb First: 05/29/2020 UTC 02:27:26

Download Location Round Robin Filter

HTTP

Location (FQDN):

Location (full HTTP locaiton):

Never use HTTP: ☒ (if this box is checked TFTP location will always be used no matter what the STB sends)

Rogue models:

AX061AEI COGMATION_BB EMULATOR EMULATOR1 MOCKRT1319_TEST TEST **RDK-C_TEST** RDKB-TECHSUMMIT

RDKB_RPI RPI RPI0 RPI_BB TESTCPE

Firmware versions

TFTP

IPv4 locations:

IPv6 locations:

Verify XConf server configuration

Verify that XConf Server configuration displays the Json response from the mentioned URL:

<http://<Xconf Server IP:port no.>/xconf/swu/stb?eStbMac=<MAC address of Rpi board>>

For Ex: <http://35.155.171.121:9092/xconf/swu/stb?eStbMac=B8:27:EB:2E:72:2B>

35.155.171.121:9092/xconf/swu/stb?eStbMac=B8:27:EB:2E:72:2B

JSON Raw Data Headers

Save Copy Collapse All Expand All

```

firmwareDownloadProtocol: "tftp"
firmwareFilename: "rdk-generic-camera-image_default_20200329074421.rootfs.rpi-sdimg"
firmwareLocation: "192.168.1.102"
firmwareVersion: "rdk-generic-camera-image_default_20200329074421"
rebootImmediately: false
  
```

RPI-Board

1. Flash the RDKC image supported for Firmware upgrade feature in the Rpi and verify the 2 partitions(ex. mmcblk0p1, mmcblk0p2) present under dev folder (use command `ls /dev`)
2. Device auto-reboots and verify there are 2 more additional partitions are created (ex. mmcblk0p3, mmcblk0p4).
3. Open `/etc/include.properties` file and verify the CLOUDURL parameter where XConf Server URL is configured
4. Verify the image version (`cat /version.txt`) displays the flashed image version
5. Open `/rdklogs/logs/swupdate.log` to verify the communication from RPI board with XConf Server and the download status
6. Verify the tftp download is happening by noticing the change of file size using below command: `ls /extblock/tftpimage/imagewndls -sh` (use this command frequently to verify the file size change)
7. Once image download completed, the Rpi board will auto reboot and come up with downloaded image
8. Verify the version of booted image which shows the downloaded image version

Conclusion

Please find the summary on firmware upgrade explained above

- Build the image RDK-C Image.
- Ensure 8GB sd-card is available for flashing
- Flash the build image to sd-card
- Setup xconf server ready with rules and download location for RPI device
- Place the upgrading image and checksum file in tftp server
- Boot the flashed image

Note :

1. RPI will go for reboot while booting for the first time, since two more partition needs to be created which requires reboot. Depends on the image present in xconf and RPI, further reboot will happen for upgrade. Please refer to design ([RDK-C : Firmware Upgrade](#)) for how firmware upgrade works with bank switching

2. SD card should be zero filled formatted before starting the firmware upgrade procedure. DriveWipe software is used for this. Please refer the you-tube video link for the SD card full format process.

<https://youtu.be/CZhsVBEMYuk>

Limitations

RPI will support only tftp protocol . No http protocol support is provided yet.