

RDK-C Firmware Upgrade with HTTP and TFTP support

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1.1. 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-0 and RPI-3 B+.

1.2. Yocto Build Steps

Refer below link to build camera image

Morty:

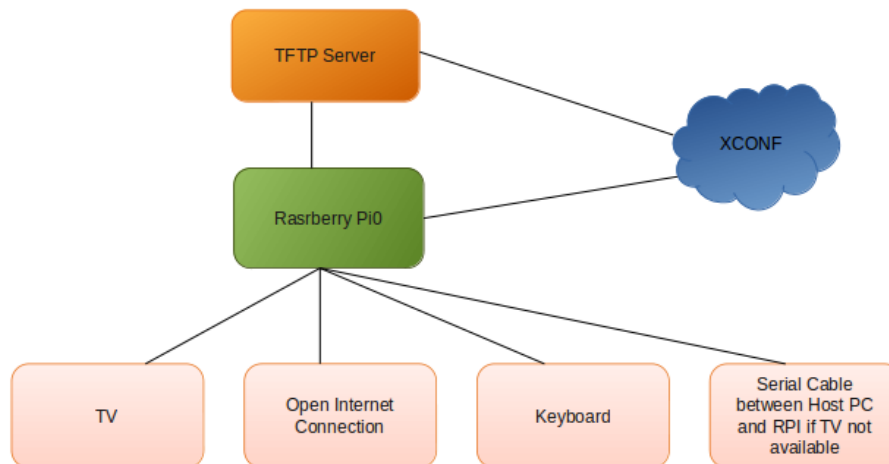
[RDK-C Build Instruction for RPI-0](#)

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

Dunfell:

[RDK-C rdk-next Yocto 3.1 dunfell build for Raspberrypi](#)

1.3. Test Setup Block Diagram for RPI RDK-C Firmware Upgrade



1.4. Firmware Upgrade Validation Procedure

1.4.1. 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.

Dunfell:

Before creating checksum file, need to decompress the .wic.bz2 camera image with the below command

```
$ bzip2 -dk camera_image
```

Example:

```
$ bzip2 -dk rdk-generic-camera-image_default_20201125081842.rootfs.wic.bz2
```

After decompression, we may get "rdk-generic-camera-image_default_20201125081842.rootfs.wic" this image. use this image to create checksum file and firmware upgrade.

md5sum checksum creation

```
Morty:
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

Dunfell:
md5sum "<imagefile_name>.rootfs.wic" > imagefile_name.txt

for Ex:
upgrading image file is rdk-generic-camera-image_default_20201125081842.rootfs.wic

md5sum "rdk-generic-camera-image_default_20201125081842.rootfs.wic" > rdk-generic-camera-
image_default_20201125081842.tx
```

STEP 3:

Create new folder for example "tftphome" 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:

Morty:

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

Dunfell:

Keep rdk-generic-camera-image_default_20201125081842.rootfs.wic and rdk-generic-camera-image_default_20201125081842.txt files in your tftphome 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/tftphome ( 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/tftphome" ( 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
```

1.4.2. XCONF Server Setup

1.4.2.1. 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>

1.4.2.2. 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 'Common' menu is open, highlighting 'Environments'. The main table displays 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 'Environment' edit form. The fields are filled with:

- Id: RDK-C_Test
- Description: RDK-Camera

Buttons for 'Save' and 'Cancel' are present at the bottom of the form.

1.4.2.3. 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.

This screenshot is identical to the one above, showing the XConf 'Environments' page with the 'Common' menu open and the table of existing environments.

STEP 2:

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

Model

Id: RDK-C_Test

Description: RPI0

Save Cancel

1.4.2.4. 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.

Models

Search by Id

+ Create Export All

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..

Add MAC List

Choose File Browse

Name: RDK-C_Test

Data: B8:27:EB:2E:72:2B

Save Cancel

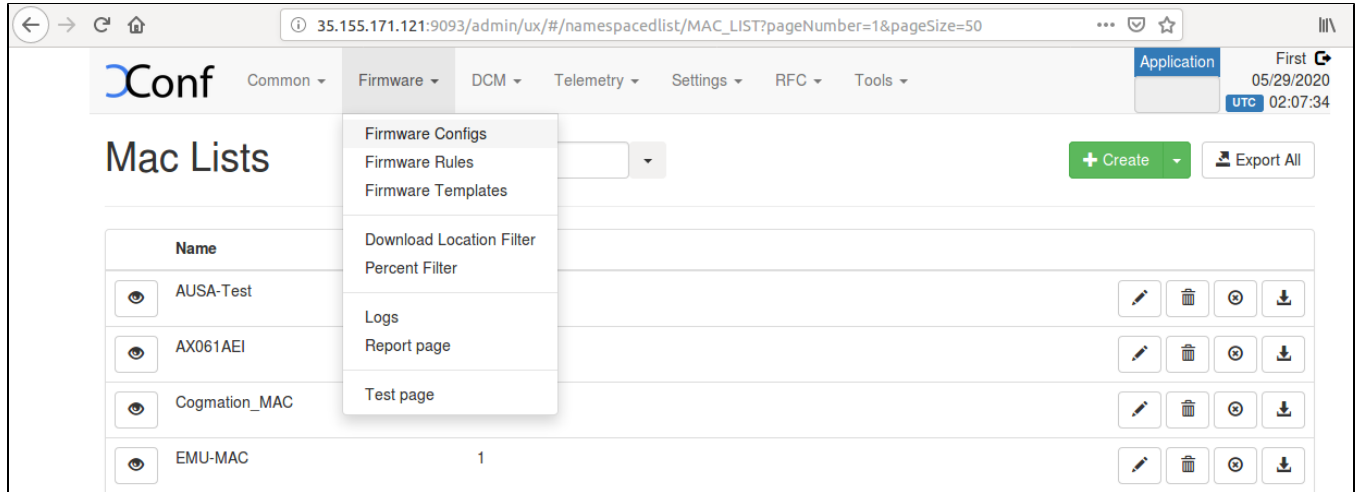
1.4.2.5. Create Firmware config

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

STEP 1:

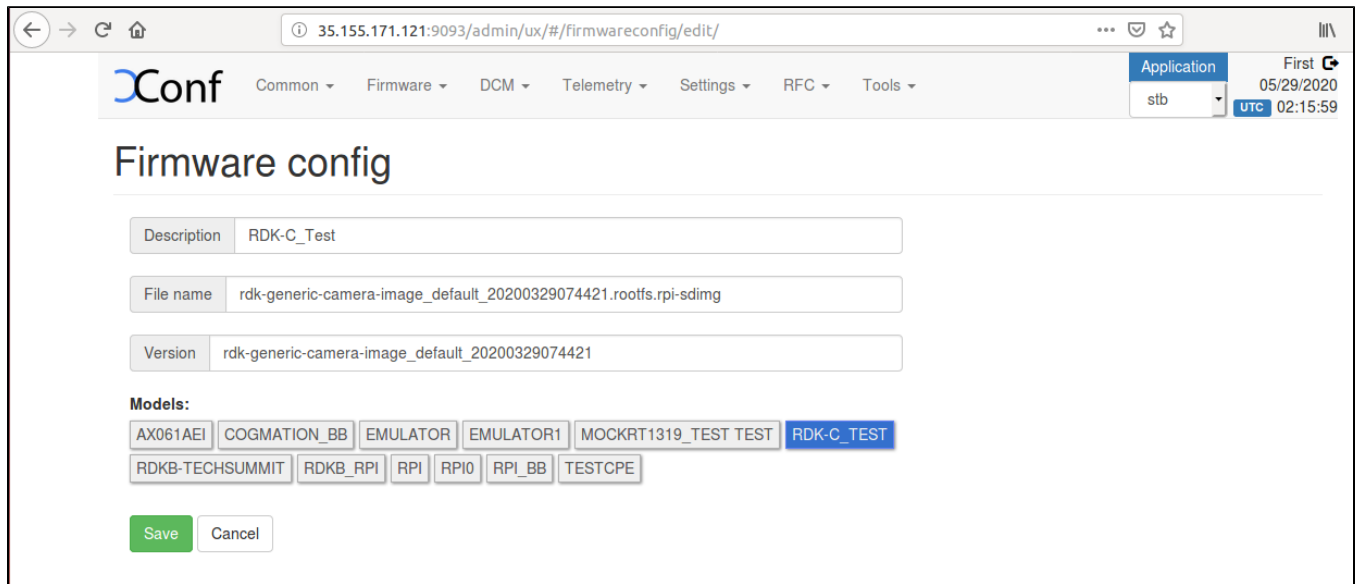
Select Firmware Configs option within common list to enter Firmware Configs page.

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



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.



1.4.2.6. 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.

The screenshot shows the XConf web interface at the URL `35.155.171.121:9093/admin/ux/#/firmwareconfig/all`. The 'Firmware' menu is open, showing options: Firmware Configs, Firmware Rules, Firmware Templates, Download Location Filter, Percent Filter, Logs, Report page, and Test page. The main table displays the following data:

Description	Supported Models	Actions
Cogmation_config	COGMATION_BB	[Edit] [Delete] [Download]
CPEfirmware	TESTCPE	[Edit] [Delete] [Download]
emulator_firmware	EMULATOR1	[Edit] [Delete] [Download]
Firmware_Camera	RPI0	[Edit] [Delete] [Download]

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.

The screenshot shows the 'Add Firmware Rule' page in the XConf web interface. The page prompts the user to 'Please Select a Template' and lists the following templates:

- ENV_MODEL_RULE
- IP_RULE
- IV_RULE
- MAC_RULE** (highlighted)
- MIN_CHECK_RULE

STEP 3:

After entered Firmware Rule page.If any estbmac if there under build condition then remove that estmac 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.

PROPERTIES

Name: RDK-C_Test Type: MAC_RULE

BUILD CONDITIONS

eStbMac IN_LIST RDK-C_Test

AND OR ☐ 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

1.4.2.7. Edit Download Location Round Robin Filter

1.4.2.7.1.1. With selection of HTTP Protocol

Server Set-up :

1. Install the apache2 http server in local pc
2. Add the below line in /etc/hosts (192.168.0.107(wan IP) <http://myfirmware.com>)
3. place the rpi image and checksum files in document root directory.

XCONF side :

1. Select Download Location filter under the firmware tab in XCONF UI
2. click the edit button
3. Enter the "Location (FQDN)" field is local/Public http server (fully qualified domain name) (ex : www.myfirmware.com)
4. Enter the "Location (full URL)" field is full location path of local/Public http server (ex : <http://www.myfirmware.com>)
5. Unclick the check box of Never use HTTP
6. Removed the model name from Rogue Models.
7. Removed the firmware version (If it's not updated earlier, please ignore this step).
8. click the save button.

RPI Target :

9. In DUT, please edit the following file with below format, If it's local http server
 - i) Open the /etc/hosts
 - ii) Add your local http server ip with DNS (Ex : 192.168.0.128 www.myfirmware.com)
 - iii) Save the file.

Note : Every reboot, You need to add the above three steps if it's local http server.

Download Location Round Robin Filter

HTTP

Location (FQDN):

www.myfirmware.com

Location (full HTTP location)

http://www.myfirmware.com

Never use HTTP:

☐

(if this box is checked TFTP location will always be used no matter what the STB sends)

Rogue models:

123\$321

ARMV7

ARRIS

AX061AEI

COGMATION_BB

DHA2332

EMULATOR

EMULATOR1

KLJDKLWLSDW:ASKFJSDLFJNKLDJSLKJFJDSAL:KFKLASDJGKLFJSADKLGJKLASDJGLKASJDKLGEWLKJFREWKLRLJKEWJRJWEKLRJLEWLRWJRLKWEJRKLE

MOCKRT1319_TEST TEST

PP_MODEL

QAMODEL

RDk-B

RDk-C_T

RDk-C_TEST

RDk-C_TEST1

RDk-C_TEST2

RDkB-TECHSUMMIT

RDkB_RPI

RDkB_RPI_SJ

RDkB_TURRIS

RDkC_FW_TEST

RDkV_RPI

RPI

RPI-3

RPI0

RPI_BB

RPI_MAK

RPI_RDKM

TDK-B

TESTCPE

XYZ123

YS4000

Firmware versions

Type here...

TFTP

IPv4 locations:

192.168.0.10

100

%

+

IPv6 locations:

+

1.4.2.7.1.2. Verify XConf server configuration

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

Using the below url to view the JSON Format result of http protocol ,
http://35.155.171.121:9092/xconf/swu/stb?eStbMac=<RPI MAC ADDRESS>&model=<model_name>&capabilities=RCDL&capabilities=supportsFullHttpUrl

JSONRaw DataHeaders

SaveCopyCollapse AllExpand All

Filter JSON

firmwareDownloadProtocol:

"http"

▼ firmwareFilename:

"rdk-generic-camera-image_default_20201125081842.rootfs.wic"

firmwareLocation:

"http://www.myfirmware.com"

firmwareVersion:

"rdk-generic-camera-image_default_20201125081842"

rebootImmediately:

false

1.4.2.7.1.3. Http Location folder:

Verify that image file and its respective md5 checksum file is present in the http folder:

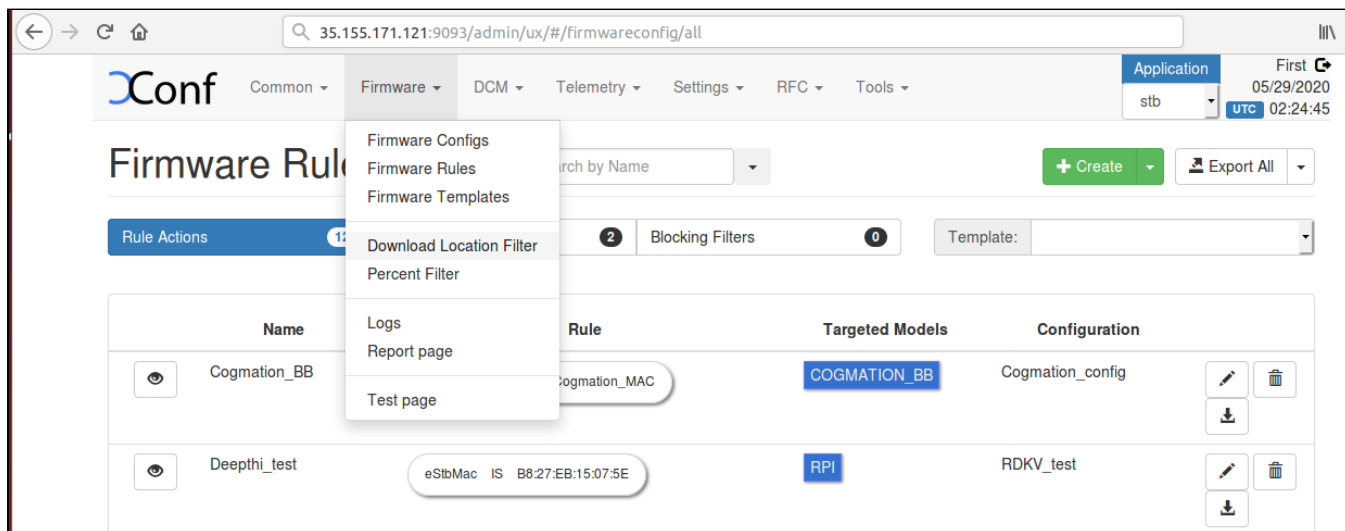
lts40009681@CHTSL20070:/var/www/html\$ ls
rdk-generic-camera-image_default_20210107140802.rootfs.wic.bz2
rdk-generic-camera-image_default_20210107140802.txt

1.4.2.7.1.4. With Selection of TFTP Protocol

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 Rogue 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 02:27:26 UTC

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:

1.4.2.7.1.5. 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=<RPI MAC ADDRESS>&model=<model_name>&capabilities=RCDL&capabilities=supportsFullHttpUrl`

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
  
```

1.4.3. 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

1.5. 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 ([Firmware Upgrade Support in R-Pi - RDK Camera - Design - M5 - 2020](#)) 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>

1.6. Limitations

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