

Yocto 3.1 Build Procedure for rdk-generic-mediaclient-image - 2020 - M5

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Introduction

This manual describes the rdk-generic-mediaclient-image build procedure for Yocto 3.1 builds. This will upgrade the default build system used in RDK Video, from morty(2.2) to dunfell(3.1). In addition to upgrades to opensource packages, Yocto 3.1 also contain Long term Support release feature. The current version lacks the variety of features available in the dunfell. The upgraded build tools will be used to generate rdk-generic-mc-image for Raspberrypi reference platform.

Yocto 3.1 Upgradation support the following:

- Yocto BSP layer for meta-raspberrypi.
- OpenEmbedded and Yocto Dunfell.
- Linux kernel 4.19.
- Version upgrades for bitbake, gstreamer and other oe/wpe recipes.
- Playing a given stream using gst-launch command.
- rmfApp Support.
- Controlling apps using appmanager.

Each component in RDK is a standalone repository with its own individual build tools producing a library or set of binaries. When we upgrade the OE layers to the newer versions, we need to make necessary changes in the RDK layers which use these components, to avoid build failures.

Host Setup

The OpenEmbedded build system should be able to run on Ubuntu 18.04 distribution/other compatible linux distribution with the following versions for Git, tar, and Python.

- Git 1.8.3.1 or greater
- tar 1.27 or greater
- Python 3.4.0 or greater
- Coreutils(E.g realpath)

Note: You should also have about 50 Gbytes of free disk space for building images.

The essential packages you need for a supported Ubuntu or Debian distribution are shown in the following command:

```
$ sudo apt-get install gawk wget git-core diffstat unzip texinfo gcc-multilib \
build-essential chrpath socat cpio python python3 python3-pip python3-pexpect \
xz-utils debianutils iputils-ping python3-git python3-jinja2 libegl1-mesa libsdl1.2-dev \
pylint3 xterm bmap-tools
```

Repo Setup

In order to use Yocto build system, the repo tool must be properly installed on the machine.

To install Repo make sure you have a /bin directory in your home directory and that it is included in your path

Repo Setup Steps

```
$ mkdir ~/bin
$ PATH=~/bin:$PATH
Download the repo tool and ensure that it is executable
$ curl http://commondatastorage.googleapis.com/git-repo-downloads/repo > ~/bin/repo
$ chmod a+x ~/bin/repo
```

Note: it is also recommended to put credentials in ~/.netrc when interacting with repo.

A sample `~/.netrc` file is illustrated below

<code>.netrc</code>
<code>machine code.rdkcentral.com</code> <code>login YOUR_USERNAME</code> <code>password YOUR_PASSWORD</code>

Executing System

To tackle the build issues from moving one version to another, we have decided to split the problem into different subtasks. So instead of building a complete image at one go, we have planned for the generation of following images:

- core-minimal-image for Raspberrypi
- wpe-westeros-image
- rdk-generic-image for hybrid and mediaclient
- rdk-generic-wpe-image for hybrid and mediaclient

These images need to be tested against different configurations in cmf, to ensure that nothing has broken the existing system.

In order to provide a smooth transition without disturbing the existing branch, we have created a branch called `yocto-dunfell-upgrade` for non-OE layers and another branch called `RDK/yocto-dunfell-upgrade` for OE layers.

Right now we are in the process of resolving build/parse errors. The main source for errors can be classified into 4 categories.

--> Incompatible license with RDK.

--> Trying to apply older patches into newer version of recipes.

--> Recipe version changes due to dependency.

--> If there is a license upgrade to a new recipe which is not compatible with RDK terms then we need to stick to the older version.

Going forward no more RDK specific BSP layer(meta-cmf-raspberrypi for instance) will be available and RDK specific changes will be brought under dynamic layer in SoC/OEM layer. Hence the important recipes and append files will be kept in the SoC/OEM layer in future.

Some of the build errors and its root cause is described in the below table. We will keep updating the table as we encounter more errors.

recipe	layer	error/warning	root cause	action
N/A	N/A	Layer should set LAYERSERIES_COMPAT in its conf/layer.conf file to list the core layer names it is compatible with.	Newer version of bitbake throws warning if we don't set LAYERSERIES_COMPAT in its conf/layer.conf in the respective layers.	Set LAYERSERIES_COMPAT_<layer name> = "dunfell" in all layers. E.g LAYERSERIES_COMPAT_rdk = "dunfell" for meta-rdk layer.
N/A	meta-rdk-ext	bb.data_smart.ExpansionError: Failure expanding variable AVAILABLE_LICENSES[:=], expression was \${@' '.join(available_licenses(d))} which triggered exception FileNotFoundError: [Errno 2] No such file or directory.	There is no directory called licenses in the corresponding meta layer.	Need to create a licenses directory under the meta-layer and add RDK license file to it
N/A	meta-rdk-restricted meta-rdk-video meta-rdk-ext meta-rdk-contains meta-rdk	Error due to the usage of base_contains in multiple recipes.	base_contains is deprecated.	use bb.utils.contains instead of deprecated base_contains in the respective recipes.
N/A	N/A	Error due to the usage of some of the functions in pythonnative.bbclass in multiple recipes.	pythonnative.bbclass is not available in newer version.	Add meta-python2 layer to get support for legacy python code(E.g pythonnative.bbclass)

openssl.inc	meta-rdk	Error due to the usage of base_conditional in multiple recipes.	base_conditional is deprecated.	use oe.utils.conditional instead of deprecated base_conditional in the respective recipes.
openssl-0.9.inc image_container_generator.bbclass rdk.conf	meta-rdk-ext			
uclibc.inc	meta-rdk-ext	Error due to the usage of oe_filter_out in multiple recipes.	oe_filter_out is deprecated.	use oe.utils.str_filter_out instead of deprecated oe_filter_out in the respective recipes.
gssdp_0.14.10.bb	meta-rdk-ext	Could not include required file recipes-connectivity/gupnp/gssdp.inc in gssdp_0.14.10.bb	The required file is not present in the location.	Replace "require" directive to "include" to specify a loose dependency.
rdk-generic-broadband-dev-image.bb rdk-generic-hybrid-dev-image.bb rdk-generic-mediaclient-dev-image.bb	meta-rdk	Errors due to required files not being present in yocto 3.1 (dunfell) oe layers.	Those file are not available in newer version of Yocto.	Replace "require" directive to "include" to specify a loose dependency.
rmfhalheaders_git.bb	meta-rdk-video	Error while parsing LIC_FILES_CHKSUM in rmfhalheaders	The recipe uses "files://" instead "file://" in LIC_FILES_CHKSUM field	Update the LIC_FILES_CHKSUM field accordingly.
busybox_%bbappend	meta-rdk-ext	Error in busybox as busybox_1.31.1.bb :do_patch: failed with exit code '1'	Build error in do_package task due to some of the older patches available	The following patches are removed from busybox recipe for dunfell build 1. udhcp.patch 2. 0001-networking-add-ip-neigh-command.patch 3. ip6_neigh_show_Crash.patch
glib-networking_2.54.1.bb rdk.conf	meta-rdk-ext meta-rdk	Glib-networking require gnutls >= 3.4.6	gnutls 3.3.x is the last branch which supports nettle 2.7.1. So it is not possible to increase the version,	Used glib-networking-2.54.1 instead of updating gnutls.
gststreamer1.0-plugins-bad.inc	meta-rdk-ext	Error while inheriting bluetooth.bbclass	bluetooth.bbclass is not available in newer version of yocto	inherit bluetooth on a conditional basis as shown below: inherit gettext \${@bb.utils.contains('DISTRO_CODENAME', 'dunfell', ' ', 'bluetooth', d)}
glib-2.0_2.62%bbappend	meta-rdk-ext	Error reported for glib-2.0-native-1_2.62.4-r0 patch	Unable to apply the 2nd hunk due to version changes.	rebased RDK patch to glib 2.62.4
openssl_1.1.0g.bb	meta-rdk-ext	Error while fetching openssl_1.1.0g	Recipe version 1.1.0 is moved to a different location.	SRC_URI updated with the new changes.
systemd_216.bb	meta-rdk-ext	Error while parsing systemd_216 legacy recipe	Circular dependency problem with systemd_216.	Skip this recipe by specifying the COMPATIBLE_HOST in bb file as shown below: COMPATIBLE_HOST_dunfell = "null"
netsrvmgr_git.bbappend	meta-cmf-video	Error due to invalid version of netsrvmgr.	SRCREV expects a valid revision on dunfell framework.	SRCREV for netsrvmgr set to AUTOREV

iptables_%_bbappend	meta-rdk-ext	Error while installing iptables	sysint provides it's own iptables systemd service file which gives a conflict on do_rootfs()	Remove systemd service in the bbappend file to avoid conflict as shown below: do_install_append_client() { rm \${D}\${systemd_system_unitdir}/\${PN}.service } SYSTEMD_SERVICE_\${PN}_remove_client = "\${PN}.service"
dropbear_%_bbappend	meta-rdk-ext	Patch error while building dropbear-2019.78	Older version of patches were giving build error.	Rebase patches to build on dunfell.
openssl_1.0.2o.bb	meta-rdk-ext	Circular dependency problems with openssl 1.0.2o for dunfell builds.	Higher versions of the recipes are available for newer builds.	Skip this recipe by specifying the COMPATIBLE_HOST in bb file as shown below: COMPATIBLE_HOST_dunfell = "null"
setup-environment	meta-rdk	dunfell codename not reflected in DISTRO_CODENAME.	Bitbake version is not updated for dunfell branch.	Update DISTRO_CODENAME based on the bitbake version in setip-environment script E.g:- 1.44.*[1.46.*) _DISTRO_CODENAME="dunfell"
RDK	meta-cmf	ExpansionError: Failure expanding variable AVAILABLE_LICENSES[:=], expression was \${@' ':join(available_licenses(d))} which triggered exception FileNotFoundError: [Errno 2] No such file or directory:	RDK licence file not present in the preferred location.	Add RDK licence file to the licenses directory in the corresponding layer.
qtbaser-native_5.1.1.bbappend	meta-cmf-qt5	qtbaser-native: fix build error due to gcc 9.x	qtbaser native pkg throws build error due to gcc 9.2.	The following patch file is available in the repo to resolve the issue: 0001-RDK-27410-qtbaser-native-build-error-due-to-gcc-versi.patch We need to conditionally enable this for dunfell builds.
logrotate_%_bbappend	meta-rdk-ext	Sysint trying to install logrotate.service, logrotate.timer but it is already installed by logrotate.	as sysint provides logrotate's systemd service, actual recipe's service gives conflict	As sysint installs RDK specific logrotate's systemd service file, we can remove them as shown below: SYSTEMD_SERVICE_\${PN}_remove = " \ \${BPN}.service \ \${BPN}.timer \ " do_install_append() { rm \${D}\${systemd_system_unitdir}/\${BPN}.service rm \${D}\${systemd_system_unitdir}/\${BPN}.timer } }
dnsmasq_%_bbappend	meta-rdk-ext	Postinstall scriptlets of ['systemd'] failed.	As systemd in dunfell provides resolv.conf, no need to install again from dnsmasq.	Removed resolv.conf from do_install for dunfell
qtbaser_5.1.1.bbappend	meta-cmf-qt5	Declaration conflict for qopengl's GLdouble because of this qt base throws build error.	GLdouble is typedefed as GLfloat in qopengl.h this leads to a conflict with the earlier definition of GLdouble as double.	We can typedef GLdouble to double.
msgpack-c_2.1.1.bb	meta-rdk-ext	Error about 'copying an object of non-trivial type' in msgpack-c.	Typecasting is missing while using memcpy().	Insteadof using std::memcpy(&o, &v, sizeof(v)), we can typecast the object as shown below std::memcpy(static_cast<void*>(&o), &v, sizeof(v))
wpe-webkit.inc	meta-rdk-ext	dunfell build throws do_package_qa error as libWPEWebKit.so requires libTTSCClient.so	Unable to satisfy runtime dependency libTTSCClient.so	Add tts package in the RDEPENDS for wpe-webkit
ledmgr-extended-noop_git.bb	meta-rdk-video	fatal error: sysMgr.h: No such file or directory	sysMgr.h file not available in the sysroot directory.	Add iarmmgrs in the DEPENDS of meta-rdk-video/recipes-extended/ledmgr/ledmgr-extended-noop_git.bb

aamp_git.bb	meta-rdk-video	irMgr.h not found	irMgr.h file not available in the sysroot directory.	Add iarmmgrs in the DEPENDS of meta-cmf-video/recipes-extended/aamp/aamp_git.bb append
wrp-c_1.0.bb	meta-rdk-ext	error: 'strncpy' output truncated before terminating nul copying 23 bytes from a string of the same length.	Use of strncpy for coping.	Replace strncpy with memcpy.
ledmgr_git.bb	meta-rdk-video	yocto dunfell framework throws do_package_qa() filedeps error while building the packages.	required runtime dependencies are missing.	Add devicesettings in RDEPENDS of meta-rdk-video/recipes-extended/ledmgr/ledmgr_git.bb
tr69hostif_git.bb	meta-rdk-video	yocto dunfell framework throws do_package_qa() filedeps error while building the packages.	required runtime dependencies are missing.	Add devicesettings in RDEPENDS of meta-rdk-video/recipes-thirdparty/tr69/tr69hostif_git.bb
bluetooth-core	N/A	fatal error: bluetooth/audio/a2dp-codecs.h: No such file or directory	a2dp codec macros are changed in newer bluez version (5.54) from oe-core dunfell branch.	We can add definitions for MIN_BITPOOL and MAX_BITPOOL in btrCore_avMedia.c as shown below #ifndef MIN_BITPOOL #define MIN_BITPOOL SBC_MIN_BITPOOL #endif #ifndef MAX_BITPOOL #define MAX_BITPOOL SBC_MAX_BITPOOL #endif
bluetooth_mgr	N/A	undefined reference error for bluetooth-mgr	bluetooth-mgr main.c calls sd_notify() API but not linked libsystemd.so which is causing undefined reference error	Update AM_LDFLAGS with -lsystemd to resolve undefined reference error.
bluetooth_mgr	N/A	memcpy issue for MediaElementListInfo.	Improper structure size was mentioned in the memcpy.	Replace sizeof (BTRMGR_IARMMediaElementListInfo_t) with sizeof (BTRMGR_MediaElementListInfo_t) in the following function in btmgr_iarm_external_interface.c memcpy (mediaElementListInfo, &mediaElementList.m_mediaTrackListInfo, sizeof (BTRMGR_IARMMediaElementListInfo_t))
bluetooth-core	N/A	Error due to incorrect to use of AdapterInfo struct.	appropriate structure is not mentioned in sizeof().	Replace sizeof(stBTDeviceInfo) in the following function with sizeof (stBTAdapterInfo) in btCore_dbus_bluez5.c memset(&stBTAdapterInfo, 0, sizeof (stBTDeviceInfo))
fog	N/A	Error when HLSPlaylistsDownload.ccp in fogcli calls 'SHA1' API	-lcrypto not included in the Makefile	Update fogcli_LDFLAGS in Makefile.am with -lcrypto.
sectionfilter-hal-noop_git.bb	meta-rdk-video	Error due to missing dependencies in sectionfilter-hal	dunfell framework expects all possible dependencies to be mentioned in DEPENDS.	Update sectionfilter-hal-noop_git.bb DEPENDS with jansson.
sys-utils_git.bb	meta-rdk-video	package_qa error while building sys-utils_git.bb	dunfell framework expects to mention all runtime deps to avoid package_qa error.	Add devicesettings in the RDEPENDS field of sys-utils_git.bb
iarmmgrs_git.bbappend	meta-cmf-video	package_qa error while building iarmmgrs_git.bb	hybrid specific runtime deps overriding basic runtime deps which causes package_qa error.	Use append instead of simple assignment for the runtime dependency for iarmmgrs as shown below: RDEPENDS_\${PN}_append_hybrid = " virtual/mfrib"
cairo_%.bbappend	meta-rdk-ext	Conflict due to patches available in other layers while patching cairo.	meta-wpe also maintains cairo patches that makes conflict while apply.	apply patches conditionally based on meta-wpe as shown below: SRC_URI_append = " \${@file://cairo-egl-device-create-for-egl-surface.patch} if 'wpe-layer' not in d.getVar('BBFILE_COLLECTIONS').split() else " \${@file://0008-add-noaa-compositor.patch} if 'wpe-layer' not in d.getVar('BBFILE_COLLECTIONS').split() else " "

xupnp	N/A	error: too many arguments to function 'gupnp_context_new'.	Based on the gupnp version the we need to call gupnp_context_new and gupnp_root_device_new functions.	Fix is available in the following commit: REFPLTV-473
rmfgeneric_git.bb	meta-rdk-video	rmfgeneric throws do_package() error says dwarfsrfiles exit with error code for librbi.a.	This issue comes only when RBI is enabled (--enable-rbi) for hybrid.	Issue canbe resolved by adding INHIBIT_PACKAGE_DEBUG_SPLIT_hybrid = "1" in rf=rmfgeneric_git.bb
procps_%bbappend wpe-webkit.inc	meta-rdk-ext	Build failure due to missing dependencies.	dunfell build expects all possible dependencies in place.	Fix is available in the following commit: 39396 : REFPLTV-473
tr69agent	N/A	error: storage size of 'ctx' isn't known	The build is failing due to openssl 1.0 and 1.1 compatibility issues.	Fix is available in the following commit: 39371 : REFPLTV-473
tr69agent_git.bb tr69hostif_git.bb	meta-rdk-video	configure: error: Package requirements (libproc >= 3.2.8) were not met: No package 'libproc' found Consider adjusting the PKG_CONFIG_PATH environment variable if you installed software in a non-standard prefix. Alternatively, you may set the environment variables PROCPS_CFLAGS and PROCPS_LIBS to avoid the need to call pkg-config.	--enable-latest-procps OECONF option was only enabled in morty builds.	--enable-latest-procps OECONF option can be added to dunfell builds as well by editing the respective recipes as shown below: EXTRA_OECONF_append_dunfell = " --enable-latest-procps"
tr69	N/A	--enable-morty name conflict while building tr69hostif from dunfell framework.	--enable-morty name conflicts by enabling on dunfell builds.	Fix is available in the following commit: 39342 : REFPLTV-412
tr69hostif	N/A	aclocal: error: couldn't open directory 'cfg': No such file or directory	latest autotools version expects m4 macro directory.	We can fix this issue by replacing AC_CONFIG_MACRO_DIR([cfg]) with AC_CONFIG_MACRO_DIR([m4]) in configure.ac for tr69hostif.
bluetooth-core	N/A	building bluetooth-core on gcc 9.x throws below errors -Werror=stringop-overflow= -Werror=stringop-truncation -Werror=format-truncation= on below files src/btrCore.c src/bt-iface/btrCore_dbus_bluez.c	gcc 9.x enables more string operations flags that throw errors on compilation.	Fix is available in the following commit: 39257 : REFPLTV-412
bluetooth-core	N/A	Build failure due to incorrect structure definition.	appropriate structure is not mentioned in sizeof() while memsetting the same.	Replace sizeof(stBTDeviceInfo) with sizeof (stBTAdapterInfo) in the following function in btrCore_dbus_bluez5.c memset(&stBTAdapterInfo, 0, sizeof (stBTDeviceInfo))
power-state-monitor	N/A	Build failure due to directfb header file inclusion while building power-state-monitor from dunfell framework.	directfb depends is no more from recipe so, no need of directfb headers / API in the src.	Remove #include <directfb.h> from powerStateMonitorMain.c
dibbler_%bbappend	meta-rdk-ext	Dibbler issues: patch doesn't apply, couldn't install script file which resulted in packaging errors.	patch already incorporated into src.	We can remove the following patch from the bbappend file for dunfell builds: 0001-DELIA-19972-Dibbler-client-crash-in-checkDecline.patch
mediaframework	N/A	aclocal: error: couldn't open directory 'cfg': No such file or directory	latest autotools version expects m4 macro directory.	We can fix this issue by replacing AC_CONFIG_MACRO_DIR([cfg]) with AC_CONFIG_MACRO_DIR([m4]) in configure.ac for mediaframework.

Currently, all the changes are being pushed in these branches. Once it is merged, you will be able to follow the build instructions without any error.

Yocto Build Steps

To build, follow below instructions

Build Steps

```
$ mkdir <workspace dir>
$ cd <workspace dir>
$ repo init -u https://code.rdkcentral.com/r/manifests -b yocto-dunfell-upgrade -m rdkv-asp-nosrc.xml
$ repo sync -j4 --no-clone-bundle
$ MACHINE=raspberrypi-rdk-mc source meta-cmf-raspberrypi/setup-environment
$ bitbake rdk-generic-mediaclient-image
```

Flashing Procedure

Following command can be used to flash the RPI image to sd card using linux machine . bmap tool should be available in linux

Flash command

```
bzip2 -d <path to ImageName.wic.bz2>
sudo -E bmaptool copy --nobmap <path to ImageName.wic> <path to SD card space>
```

Example:

```
$ bzip2 -d rdk-generic-mediaclient-image-raspberrypi-rdk-mc.wic.bz2
$ sudo -E bmaptool copy --nobmap rdk-generic-mediaclient-image-raspberrypi-rdk-mc.wic /dev/sdc
```

Known Issues and Limitations

1. Certain services like dsmgr.service and netsrvmgr.service are crashing and as a result of this sysint is triggering a reboot. To avoid this issue we need to disable the above-mentioned services after a remote login using systemctl command.
2. Audio is not working with gst-launch command
3. rmfApp prompt is not getting displayed after playing video using launch/play command. So we need to hard close the video using Ctrl + C combination.
4. appmanager application is exiting automatically even if it is running in background.
5. pxscene browser is not launching.