TCCxxxx Linux

User Guide to Build HD Radio

Rev. 1.10 [A]
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1 INTRODUCTION

This document describes instructions for building and configuring the HD Radio in Telechips Automotive Linux SDK by using the Yocto Project environment. The Yocto Project is an open-source collaboration focused on embedded Linux OS development. For more information on Yocto Project, see the Yocto Project page: www.yoctoproject.org/. For Automotive Linux SDK build guide, refer to "*TCCxxxx Automotive Linux SDK-Getting Started*". [1]

Table 1.1 Available Chipset

Chipset
TCC803x
TCC805x

1.1 Feature

- ■ HD Radio Specification
    - ● HD1.0
    - ● HD1.0 + MRC
    - ● HD1.5
    - ● HD1.5 + MRC

- ■ Function
    - ● Multicasting (MPS/SPS)
    - ● PSD (Program Service Data)
    - ● SIG (Service Information Guide)
    - ● SIS (Service Information Service)
    - ● AAS (Advanced Application Services)
    - ● LOT (Large Object Transfer)
    - ● EA (Emergency Alert)
    - ● Fixed Audio Blending
    - ● AAA (Automatic Audio Alignment)
    - ● MRC (Maximum Ratio Combining)
    - ● Data Services for Background Scan
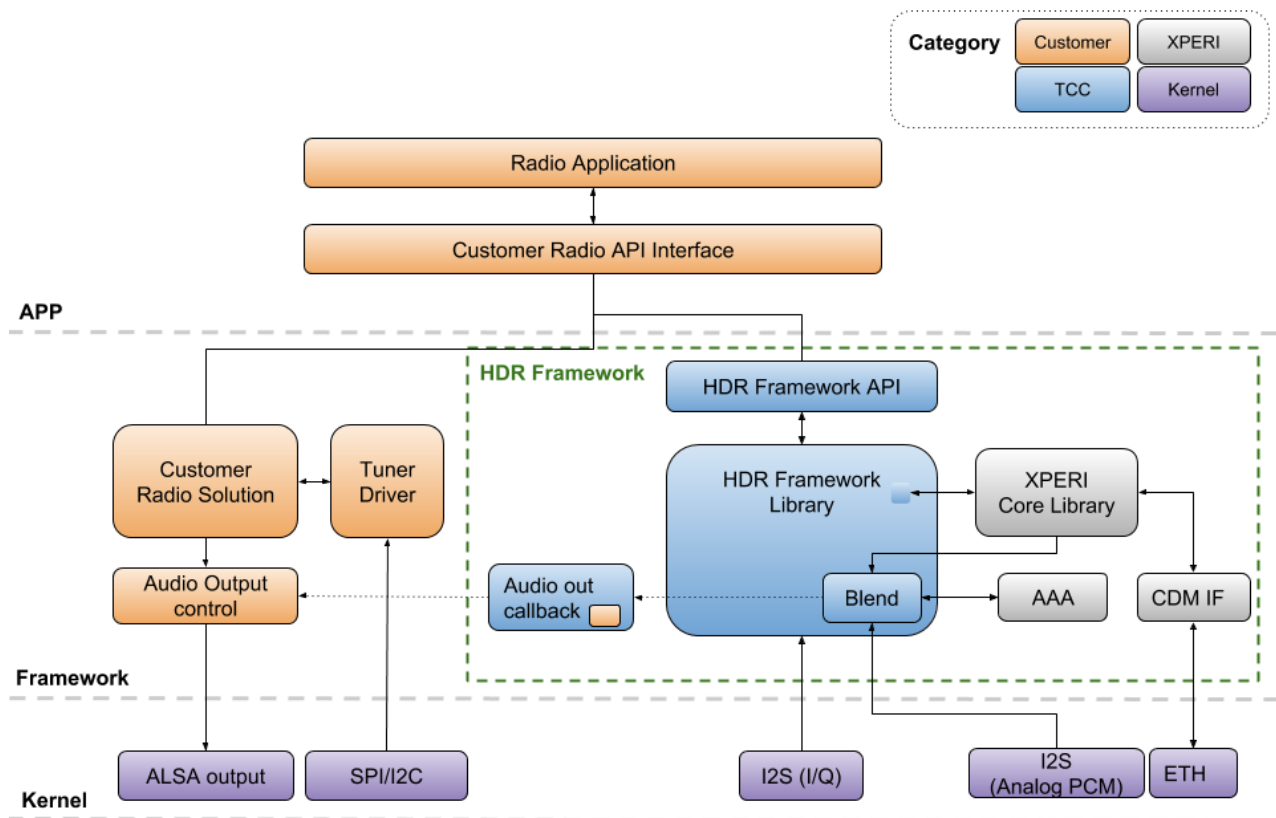
1.2 Block Diagram

Figure 1.1 Block Diagram of HD Radio Framework

1.3 Release Rule

libHDRadio.so.x.x.x, an HD Radio core library, is distributed to customers by XPERI. Refer to Figure 1.2.
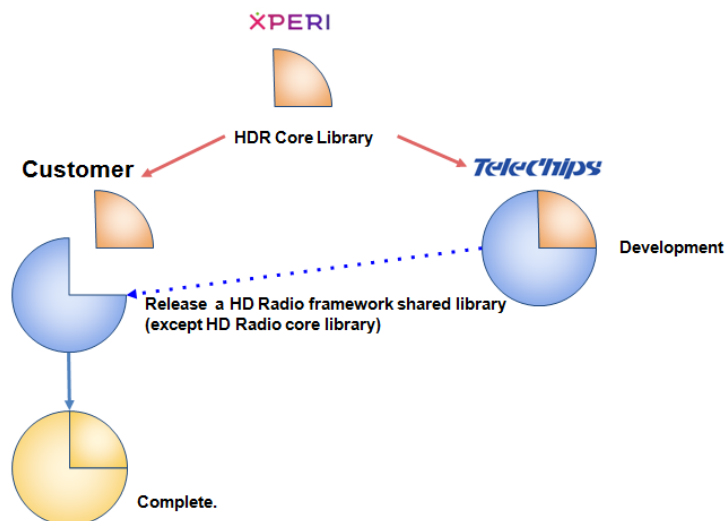

Figure 1.2 Release Rule of HD Radio Core Library

2   BEFORE YOU BEGIN

HD Radio is added as a function to a basic radio system called analog FM/AM, unlike other digital radio (DAB (Digital Audio Broadcasting), DRM (Digital Radio Mondiale), etc.). Therefore, the description in this document is based on the FM/AM system implemented by Telechips.

The followings should be prepared before build:
- Linux system & Yocto project
- Telechips Automotive Linux SDK
- HD Radio core library (libHDRadio.so.x.x.x) provided by XPERI
- Get access to HD Radio Git repositories from Telechips

HD Radio framework is released via the Telechips Git repository. Other Git repositories except the HD Radio framework are distributed to show HD Radio demonstration in the Telechips EVB (Evaluation Board). You should develop HD Radio only with a framework Git.

Table 2.1 Git Repositories for HD Radio

Name	Git Repository	Description
Recipe	ssh://git.telechips.com/linux_ivi/commercial/meta-hdradio.git	HD Radio recipes for Yocto project
Middleware	ssh://git.telechips.com/linux_ivi/commercial/tc-radio-hd-mw.git	Reference M/W for HD Radio (library)
HD Radio Framework	ssh://git.telechips.com/linux_ivi/commercial/tc-radio-hd.git ssh://git.telechips.com/linux_ivi/commercial/tc-radio-hd10mrc.git ssh://git.telechips.com/linux_ivi/commercial/tc-radio-hd15.git ssh://git.telechips.com/linux_ivi/commercial/tc-radio-hd15mrc.git	HD Radio Framework (library)
HAL	ssh://git.telechips.com/linux_ivi/commercial/tc-radio-hal.git	Reference HAL for HD Radio (library)
Tuner	ssh://git.telechips.com/linux_ivi/commercial/tc-radio-drv-silab.git	Reference tuner driver for HD Radio (library) Support tuners (Si47961, Si47951, Si47962, Si47952) for EVB
Peripheral	ssh://git.telechips.com/linux_ivi/commercial/tc-radio-drv-peri.git	Reference peripheral drivers for HD Radio (source)

Since HD Radio Git information is contained in the recipe files, only the recipe is downloaded and built in the Yocto build system.

Refer to Table 2.2 for branch names according to the chipset.

Table 2.2 Branch Name for Chipset

Chipset	Branch Name
TCC803x	v3.x
TCC805x	v4.x

3   HOW TO BUILD

After downloading Automotive Linux SDK, follow the steps below to build HD Radio.

1. Download HD Radio recipe in the Yocto project through the following Git commands.
   - v3.x: $ cd ./poky/meta-telechips/meta-ivi
   - v4.x: $ cd ./poky/meta-telechips
   - $ git clone ssh://git.telechips.com/linux_ivi/commercial/meta-hdradio.git –b v**x.x**

2. Set the HD Radio options of the recipe configuration.
   1) $ vi meta-hdradio/conf/layer.conf
   2) Select the HD Radio type as follows:

   ```
   SUPPORT_HDRADIO_TYPE = "hd"
   #SUPPORT_HDRADIO_TYPE = "hd10mrc"
   #SUPPORT_HDRADIO_TYPE = "hd15"
   #SUPPORT_HDRADIO_TYPE = "hd15mrc"
   ```

   3) Uncomment as follows:

   ```
   -  #HDRADIO_OPTION += "hdrcore"
   +  HDRADIO_OPTION += "hdrcore"
   ```

   Note: The following two options are for v4.x, <u>not</u> for v3.x.

   - The following is an option to install HD Radio GUI (Graphic User Interface) application. If this option is commented out, GUI is <u>not</u> installed. If not, the GUI is installed. CLI (Command Line Interface) is installed by default.

   ```
   SDR_APP_INSTALL ?= "HDRADIO"
   ```

   - The following is an option to install HD Radio on sub-core.
     If this option is commented out, HD Radio is installed on main-core. If not, the HD Radio is installed on sub-core.

   ```
   #SUBCORE_APPS += "hdradio"
   ```

3. Copy the HD Radio core library to the following path. If you do not copy the library distributed by XPERI to the location, a build error occurs.
   - The core library file name should be as follows: '**libHDRadio.so.x.x.x**'.
   - Path: poky/meta-telechips/meta-ivi/meta-hdradio/recipes-radio-hd/tc-radio-hd/tc-radio-hd/

4. Return to build directory.

5. Add meta-hdradio layer to conf/bblayers.conf before build.
   - $ vi conf/bblayers.conf
   - v3.x:

   ```
       .../poky/meta-telechips/meta-core \
       .../poky/meta-telechips/meta-qt5 \
       .../poky/meta-telechips/meta-ivi \
   +   .../poky/meta-telechips/meta-ivi/meta-hdradio \
   ```

   - v4.x:

   ```
       .../poky/meta-telechips/meta-core \
       .../poky/meta-telechips/meta-qt5 \
       .../poky/meta-telechips/meta-ivi \
   +   .../poky/meta-telechips/meta-hdradio \
   ```

6. Build Automotive Linux SDK.
   - $ bitbake automotive-linux-platform-image

4   MEASURES FOR ERROR

HD Radio framework threads use real-time priority. When running the CLI, the following error may occur.
- "An error occurred: Operation not permitted"

When this error occurs, add the following comment to the "/etc/sysctl.conf" file. Then, the CLI runs without error.
- "kernel.sched_rt_runtime_us = -1"

5   REFERENCES

[1]   Contact Telechips for more details: sales@telechips.com

6   REVISION HISTORY

Rev. 1.10: 2020-11-06

- Updated
  - Chapter 3
    - Location of v4.x recipe folder
    - Description for the HD Radio options setting

- Added
  - Chapter 4 Measures for Error

Rev. 1.00: 2020-11-04

- First version release

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