MT7986 Build SOP

2022/1/27

Document Revision History

Revision	Date	Author (Optional)	Description
1.0	2021-7-9	Micheal Su	Official release
1.1	2021-7-19	Micheal Su	Add for build NAND uboot
1.2	2021-8-2	Micheal Su	1. Add Panther Bootloader and SDK Image Layout chapter 2. Add for upgrade BL2 and FIP in uboot
1.3	2021-8-6	Micheal Su	Add config for support Secure Boot
1.4	2021-9-17	Micheal Su	Fix uboot image folder name
1.5	2021-9-30	Micheal Su	Change to CONFIDENTIAL C format
1.6	2021-11-30	Micheal Su	Add for build eMMC uboot
1.7	2021-12-30	Micheal Su	Modify for v7.6.2.0 MP release
1.8	2022-1-14	Micheal Su	Modify Appendix B for specific feeds commit ID
1.8.1	2022-1-27	Code Sung	Modify for v7.6.2.3 AX4200 Alpha release
1.8.2	2022-3-29	Code Sung	Modify for v7.6.4.0 AX4200 MP release

Outline

- Compile Environment Requirement
- Panther Bootloader and SDK Image Layout
- Build BL2/FIP image
- Build SDK and WiFi Package
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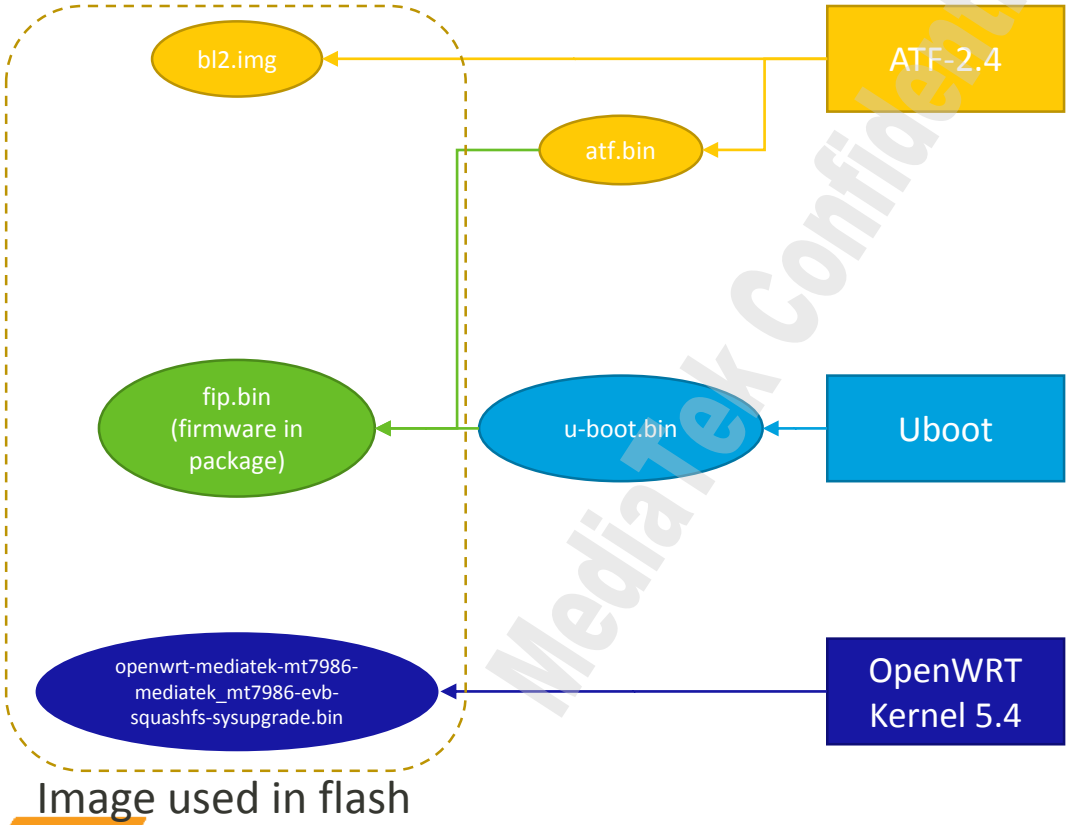
  - Appendix B : How to sync. to specific commit ID of feeds

Compile Environment Requirement

- **Use Ubuntu 18.04**
- **Install below tarball**
  - **#OpenWRT**
    - RUN apt-get install -y uuid-dev
  - **#Toolchain**
    - RUN apt-get install -y gcc-aarch64-linux-gnu
    - RUN apt-get install -y clang-6.0

Panther Bootloader and SDK Image Layout



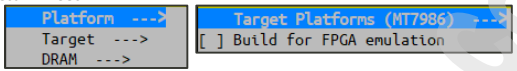
- **ATF-2.4**
  - **Panther's preloader is integrated in ATF. ATF will build atf-bl2, which is Panther's preloader.**
  - **ATF also build atf.bin which is ATF-BL31**
- **Uboot**
  - **Uboot build u-boot.bin, and atf will combind uboot image and atf-bl31 together as fip.bin**
- **OpenWRT**
  - **With Linux Kernel-5.4**

Build BL2/FIP image

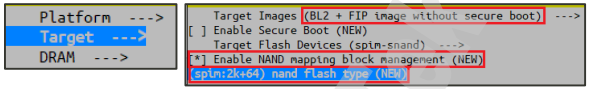
- **Build Uboot**
  - **Untar Uboot uboot-${date code}-${commit ID}.tar.xz and compile it**
  - **For example :**
    - CMD:~/$> tar -jxvf Uboot-upstream-20220114.tar.bz2
    - CMD:~/$> cd Uboot-upstream/
    - CMD:~/Uboot-upstream$> make mt7986_spim_nand_rfb_defconfig
      Note :
      - if NOR flash, please use mt7986_spim_nor_rfb_defconfig
      - if Secure Boot, please use mt7986_spim_nand_sb_rfb_defconfig
      - if MT7986A eMMC flash, please use mt7986a_emmc_rfb_defconfig
      - if MT7986B eMMC flash, please use mt7986b_emmc_rfb_defconfig
    - CMD:~/ Uboot-upstream$> make CROSS_COMPILE=/usr/bin/aarch64-linux-gnu-
  - **Uboot's output image, i.e. u-boot.bin location is in Uboot-upstream/**

Build BL2/FIP image

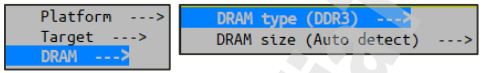
- **Build ATF**
  - **Untar ATF atf-${date code}-${commit ID}.tar.xz and compile it**
  - **For example :**
    - CMD:~/$> tar -Jxvf atf-20220114-95c4e1886.tar.xz
    - CMD:~/$> cd atf-20220114-95c4e1886/
    - CMD:~/atf-20220114-95c4e1886$> make menuconfig
      - Select “MT7986”



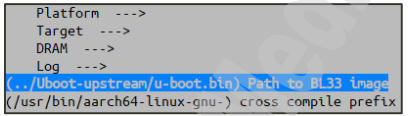
      - Select “BL2 + FIP image without secure boot” for Target Image, “spim-snand” and enable NMBM. Also modify nand flash type according to your Flash type.



      - Select “DDR3” or “DDR4” and “Auto detect”



      - Enter u-boot.bin image path



    - CMD:~/atf-20220114-95c4e1886$> make
  - **BL2 image is locatd in atf-${date code}-${commit ID}/build/mt7986/release/bl2.img**
  - **FIP image is locatd in atf-${date code}-${commit ID}/build/mt7986/release/fip.bin**

Build SDK and WiFi Package - Step 1.) to Step 5.)

1. Get Openwrt 21.02 source code from Git server
   - CMD:~/$> git clone --branch openwrt-21.02 https://git.openwrt.org/openwrt/openwrt.git
2. Untar WiFi package “mtk-wifi-mt7986-${data code}_bin.tar.xz”
   - CMD:~/$> tar -Jxvf mtk-wifi-mt7986-20210127_bin.tar.xz
3. Import WiFi packages into OpenWRT SDK source
   - CMD:~/$> cp -rf mtk-wifi-mt7986/* openwrt/
4. Change to openwrt folder
   - CMD:~/$> cd openwrt/
5. Add MTK feed
   - CMD:~/openwrt$> echo "src-git mtk_openwrt_feed https://git01.mediatek.com/openwrt/feeds/mtk-openwrt-feeds" >> feeds.conf.default

NOTE: PLEASE TYPE THOSE COMMANDS MANUALLY, DO NOT USE COPY AND PASTE

Build SDK and WiFi Package - Step 6.) to Step 7.)

6. Run AX6000 auto build script (including config and make)
   - CMD:~/openwrt#> ./autobuild/mt7986-AX4200/lede-branch-build-sanity.sh

7. If you only want to config and do not build it, please add config argument.
   - CMD:~/openwrt#> ./autobuild/mt7986-AX4200/lede-branch-build-sanity.sh config

8. If you want to compile (or re-compile), please use make instead of running the script again.
   - CMD:~/openwrt#> make V=s

Note: you can only run “lede-branch-build-sanity.sh” once, if you want to re-compile, please use “make” instead of running the script again.

NOTE: PLEASE TYPE THOSE COMMANDS MANUALLY, DO NOT USE COPY AND PASTE

Build SDK and WiFi Package - Step 8.)

8. After compile PASS, you can get image at openwrt/bin/targets/mediatek/mt7986/ folder

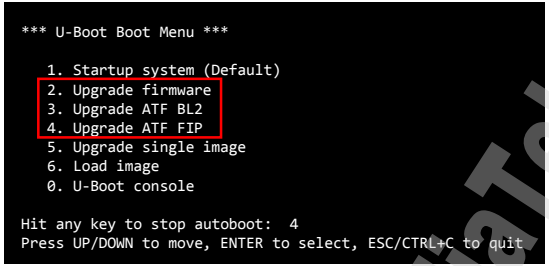
   – CMD:~/openwrt/bin/targets/mediatek/mt7986#> tree -L 1

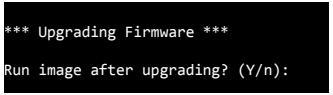
```
@compiler:~/openwrt/bin/targets/mediatek/mt7986$ tree -L 1
.
├── config.buildinfo
├── feeds.buildinfo
├── openwrt-mediatek-mt7986.manifest
├── openwrt-mediatek-mt7986-mt7986c-ax4200-2500wan-spim-nand-rfb-initramfs-kernel.bin
├── openwrt-mediatek-mt7986-mt7986c-ax4200-2500wan-spim-nand-rfb-squashfs-factory.bin
├── openwrt-mediatek-mt7986-mt7986c-ax4200-2500wan-spim-nand-rfb-squashfs-sysupgrade.bin
├── openwrt-mediatek-mt7986-mt7986c-ax4200-spim-nand-rfb-initramfs-kernel.bin
├── openwrt-mediatek-mt7986-mt7986c-ax4200-spim-nand-rfb-squashfs-factory.bin
├── openwrt-mediatek-mt7986-mt7986c-ax4200-spim-nand-rfb-squashfs-sysupgrade.bin
├── packages
├── sha256sums
└── version.buildinfo
```

Update Image From U-Boot - Step 1.) to Step 2.)

1. Power on device and wait for U-Boot boot manu, shows as below

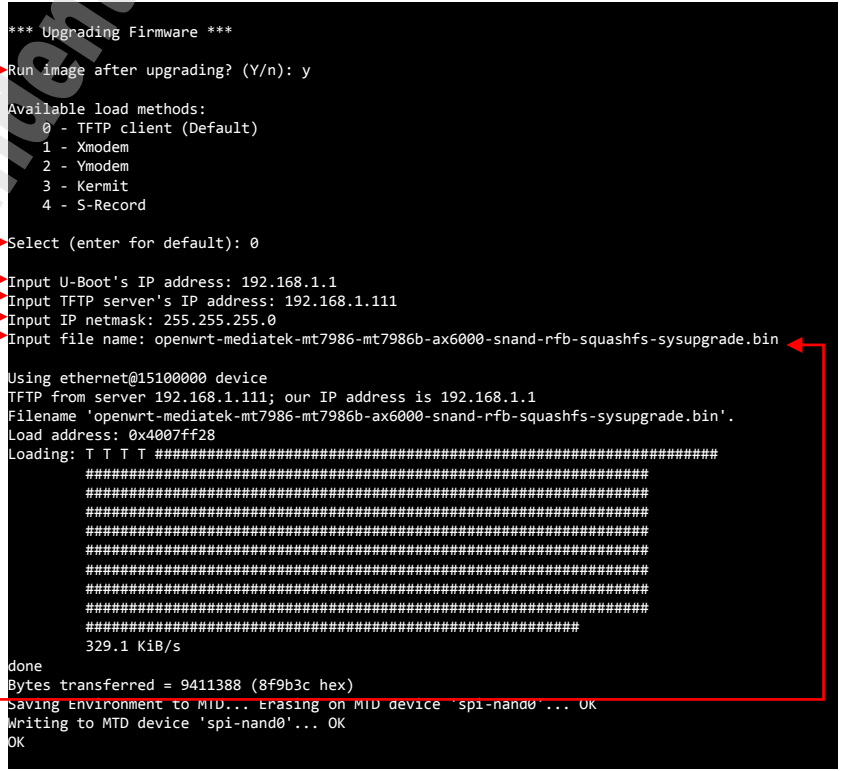
2. Press 2 for upgrade kernel firmware while boot manu count down
   Press 3 for upgrade BL2 image
   Press 4 for upgrade FIP image





Update Image From U-Boot - Step 3.) to Step 9.)

3. Press Y for start upgrade
4. Press 0 for upgrade from TFTP
5. Input device IP
6. Input TFTP server IP
7. Input netmask
8. Input image file name
   - ATF BL2 : bl2.img
   - ATF FIP : fip.bin
   - Kernel : openwrt-mediatek-mt7986b-ax6000-<flash type>-rfb-squashfs-sysupgrade.bin
9. Press Enter, then start upgrade



Appendix - A

- **How to sync. to specific commit ID of openwrt**
  1. **If you want to revert to specific openwrt commit ID. You can use git checkout with commit ID under openwrt/ folder.**
     - CMD:~/openwrt#> git checkout <commit ID>
  2. **You can find the openwrt commit ID in MT7986 release note.**
  3. **In the MT7986 release note, it includes the commit ID with different release version.**

Appendix - B

- **How to sync. to specific commit ID of feeds**
  1. **If you want to revert to specific feeds commit ID. You can add commit ID to openwrt/autobuild/feeds.conf.default-21.02 file**
  2. **For example:**

```
@compiler:~/openwrt_AX4200/openwrt/autobuild$ cat feeds.conf.default-21.02
src-git mtk_openwrt_feed https://git01.mediatek.com/openwrt/feeds/mtk-openwrt-feeds^b629793
src-git packages https://git.openwrt.org/feed/packages.git^ee69afe
src-git luci https://git.openwrt.org/project/luci.git^0a0ce2a
src-git routing https://git.openwrt.org/feed/routing.git^fc0b140
```

  Note: If there is no feeds.conf.default-21.02, create it.

  3. **You can find the feeds commit ID in MT7986 release note.**
  4. **In the MT7986 release note, it includes the commit ID with different release version.**

MEDIATEK

everyday genius