



MT7981 Build SOP

2022/5/3

Document Revision History

Revision	Date	Author (Optional)	Description
1.0	2022-4-22	Sean Ma	Official release
1.1	2022-4-22	PeiChen Tsai	Review and Correct
1.2	2022-4-26	Ekai Kuo	Correct
1.3	2022-4-29	PeiChen Tsai	Correct naming and final review
1.4	2022-5-03	PeiChen Tsai	Align ATF package with Panther

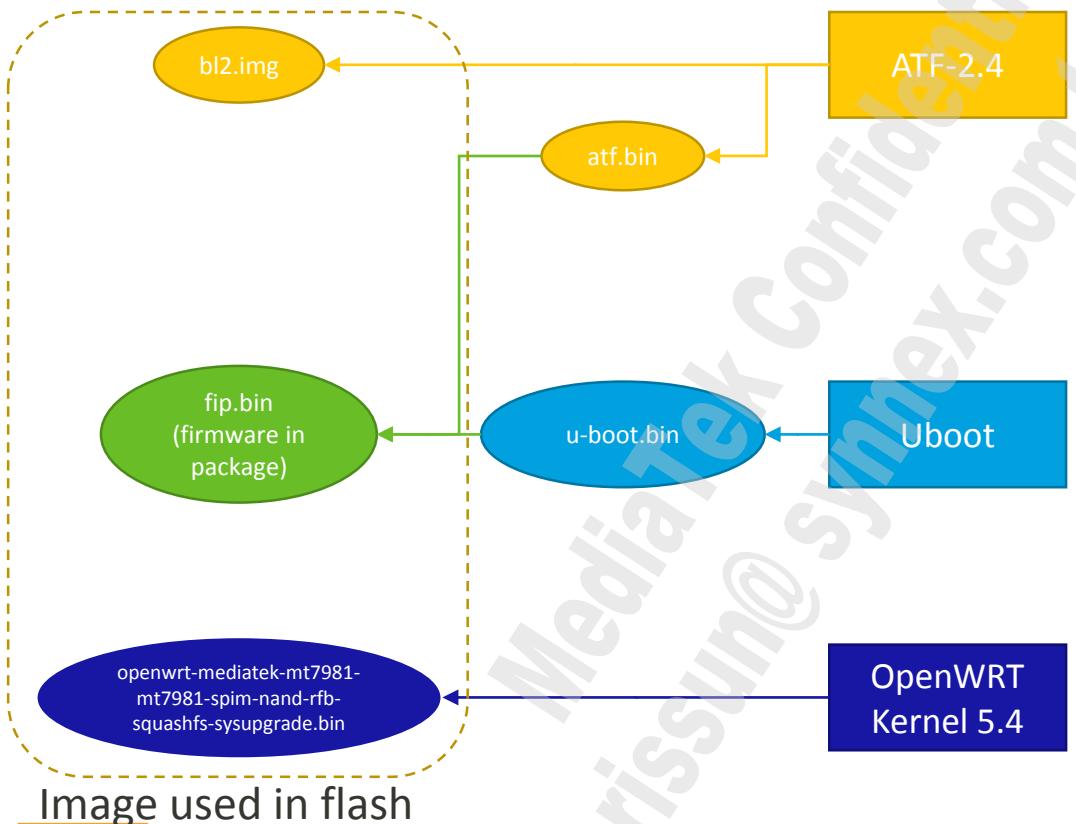
Outline

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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

Cheetah Bootloader and SDK Image Layout



- **ATF-2.4**

- Cheetah's preloader is integrated in ATF. ATF will build **atf-bl2**, which is Cheetah'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-2022.04_0421_formal.tar.xz
 - CMD:~/\$> cd uboot-mtk-20220412-sb/
 - CMD:~/uboot-mtk-20220412-sb\$> make mt7981_spim_nand_rfb_defconfig
 - Note :
 - if NOR flash, please use mt7981_spim_nor_rfb_defconfig
 - if Secure Boot, please use mt7981_spim_nand_sb_rfb_defconfig
 - if MT7981 eMMC flash, please use mt7981_emmc_rfb_defconfig
 - CMD:~/uboot-mtk-20220412-sb\$> make CROSS_COMPILE=/usr/bin/aarch64-linux-gnu-
 - **Uboot's output image, i.e. u-boot.bin location is in uboot-mtk-20220412-sb/**

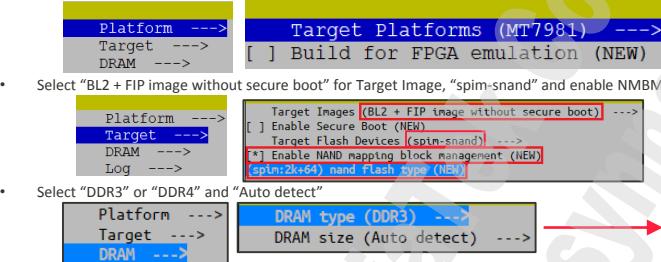
Build BL2/FIP image

- Build ATF

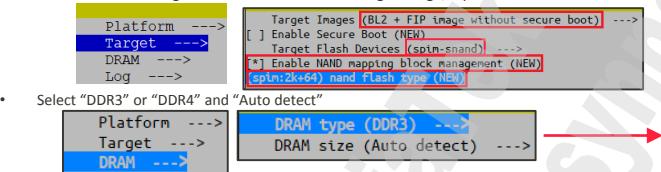
- Untar ATF `atf-${date code}-${commit ID}.tar.xz` and compile it

- For example :

- CMD:~/> tar -Jxvf atf-2.6-20220421-be1606233.tar.xz
- CMD:~/> cd atf-2.6-20220421-be1606233/
- CMD:~/atf-2.6-20220421-be1606233\$ make menuconfig
 - Select "MT7981"



- 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"

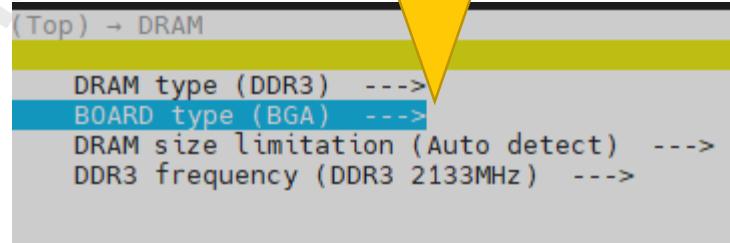


- Enter u-boot.bin image path

- CMD:~/atf-2.6-20220421-d0152f6db\$ make

- BL2 image is located in `atf-${date code}-${commit ID}/build/mt7981/release/bl2.img`
- FIP image is located in `atf-${date code}-${commit ID}/build/mt7981/release/fip.bin`

If it's 7981a or 7981b > BGA
If it's 7981c > FCN



Note: It's bl2.img

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-mt7981-{\$data code}.tar.xz”

- CMD:~/\$> tar -Jxvf mtk-wifi-mt7981-20220426.tar.xz

3. Import WiFi packages into OpenWRT SDK source

- CMD:~/\$> cp -rf mtk-wifi-mt7981/* 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 AX3000 auto build script (including config and make)

- CMD:~/openwrt#> ./autobuild/mt7981-AX3000/lede-branch-build-sanity.sh

7. If you only want to config and do not build it, please add config argument.

- CMD:~/openwrt#> ./autobuild/mt7981-AX3000/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/mt7981/ folder

- CMD:`~/openwrt/bin/targets MEDIATEK/mt7981#> tree -L 1`

```
@compiler:~/openwrt/bin/targets MEDIATEK/mt7981$ tree -L 1
.
├── config.buildinfo
├── feeds.buildinfo
├── openwrt MEDIATEK mt7981.manifest
├── openwrt MEDIATEK mt7981 mt7981-snfi-nand-2500wan-gmac2-initramfs-kernel.bin
├── openwrt MEDIATEK mt7981 mt7981-snfi-nand-2500wan-gmac2-squashfs-factory.bin
├── openwrt MEDIATEK mt7981 mt7981-snfi-nand-2500wan-gmac2-squashfs-sysupgrade.bin
├── openwrt MEDIATEK mt7981 mt7981-spim-nand-rfb-initramfs-kernel.bin
├── openwrt MEDIATEK mt7981 mt7981-spim-nand-rfb-squashfs-factory.bin
├── openwrt MEDIATEK mt7981 mt7981-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 menu, shows as below
2. Press 2 for upgrade kernel firmware while boot menu count down
Press 3 for upgrade BL2 image
Press 4 for upgrade FIP image

```
*** U-Boot Boot Menu ***

1. Startup system (Default)
2. Upgrade firmware
3. Upgrade ATF BL2
4. Upgrade ATF FIP
5. Upgrade single image
6. Load image
0. U-Boot console

Hit any key to stop autoboot: 4
Press UP/DOWN to move, ENTER to select, ESC/CTRL+C to quit
```

```
*** Upgrading Firmware ***

Run image after upgrading? (Y/n):
```

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-**mt7981-*<flash type>*-rfb-squashfs-sysupgrade.bin**

9. Press Enter, then start upgrade

```
*** Upgrading Firmware ***
Run image after upgrading? (Y/n): y
Available load methods:
 0 - TFTP client (Default)
 1 - Xmodem
 2 - Ymodem
 3 - Kermit
 4 - S-Record
Select (enter for default): 0
Input U-Boot's IP address: 192.168.1.1
Input TFTP server's IP address: 192.168.1.111
Input IP netmask: 255.255.255.0
Input file name: openwrt-mediatek-mt7981-<flash type>-rfb-squashfs-sysupgrade.bin

Using ethernet@15100000 device
TFTP from server 192.168.1.111; our IP address is 192.168.1.1
Filename 'openwrt-mediatek-mt7981-<flash type>-rfb-squashfs-sysupgrade.bin'.
Load address: 0x4007ff28
Loading: T T T T #####
done
Bytes transferred = 9411388 (8f9b3c hex)
Saving Environment to MID... Erasing on MID device 'spi-nand0'... OK
Writing to MTD device 'spi-nand0'... OK
OK
```

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 MT7981 release note.**
 3. **In the MT7981 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 MT7981 release note.
4. In the MT7981 release note, it includes the commit ID with different release version.

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