Application Note

Application Note

Customer Support

Android OTA SDCARD update

Doc No: CS6000-BD12A-AND-V3.3EN
Version: V3.3
Release date: 2018-09-11
Classification: Internal

Android OTA SDCARD update

Application Note

MediaTek Inc.

Postal address

No. 1, Dusing 1st Rd. , Hsinchu Science Park, Hsinchu City, Taiwan 30078

MTK support office address

No. 1, Dusing 1st Rd. , Hsinchu Science Park, Hsinchu City, Taiwan 30078

Internet

http://www.mediatek.com/

Document Revision History

Revision	Date	Author	Description
V1.0	2016-12-28	Haohsiang	Initial Release
V2.0	2017-12-25	Haohsiang	Modify 7.2.1 and add 10.3 for Android O
V3.0	2018-08-31	Haohsiang	Add 10.4 for Android P
V3.1	2018-09-05	Haohsiang	Add script for property rename on Android P
V3.2	2018-09-11	Haohsiang	Add VBMETA_IN_BOOT to kernel config on Android P

Table of Contents

Lists of Tables

Lists of Figures

1 Introduction

OTA (Over-The-Air) downloads ota package to data partition or sdcard. Android recovery mode uses this ota package to upgrade handset.

1.1 Purpose

This document provides the user guidelines for the OTA and recovery mode. It describes how to generate the ota package on the Android platform. This manual also elaborates the mechanism required to use the SIU (Sdcard Image Update).

1.2 Who Should Read This Document

This document is primarily intended for:

- Engineers with technical knowledge of the OTA

1.3 How to Use This Manual

This segment explains how information is distributed in this document, and presents some cues and examples to simplify finding and understanding information in this document. Table 1-1 presents an overview of the chapters and appendices in this document.

Table 1-1. Chapter Overview

#	Chapter	Contents
1	Introduction	Describes the scope and layout of this document.
2	References	Reference website or documents
3	OTA update definitions	OTA update definitions
4	Abbreviations	OTA/Recovery Abbreviations
5	Architecher Overview	OTA/Recovery Architecher Overview
6	MTK features	MTK turnkey features in recovery mode
7	Generate OTA package	Describe how to generate incremental and full ota package
8	OTA/Recovery limitations	Describes MTK OTA/Recovery limitations.
9	FAQ	MTK turnkey features in recovery mode
10	Android version update	Application Note of Android version update

1.3.1 Terms and Conventions

This document uses special terms and typographical conventions to help you easily identify various information types in this document. These cues are designed to simply finding and understanding the information this document contains.

Table 1-2. Conventions

Convention	Usage	Example
[1]	Serial number of a document in the order of appearance in the References topic	Look up Chapter 2: System Architecture in [1]
☛	Important	

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

[1] MTK Company Profile, http://brandclips.mediatek.inc/uploads/Company-profile-1H-2016_0418-Lite-final.pptx

[2] MTK Word Template, http://brandclips.mediatek.inc/uploads/Microsoft-Office-Word-Oct-2014.rar

[3] The Android OTA Package Tools, https://source.android.com/devices/tech/ota/tools.html

[4] Inside OTA Packages, https://source.android.com/devices/tech/ota/inside_packages.html

[5] MTK Root integrity check

3 OTA update Definitions

For the purposes of the present document, the following terms and definitions apply:

This chapter is include from [3] and [4]

Full updates: A full update is one where the entire final state of the device (system, boot, and recovery partitions) is contained in the package. As long as the device is capable of receiving the package and booting the recovery system, **the package can install the desired build regardless of the current state of the device.**

Incremental updates: An incremental update contains a set of binary patches to be applied to the data already on the device. This can result in considerably smaller update packages:

Files that have not changed don't need to be included.

Files that have changed are often very similar to their previous versions, so the package need only contain an encoding of the differences between the two files.

You can install the incremental update package only on a device that has the old or source build used when constructing the package.

Update Package: An update package (ota_update.zip, incremental_ota_update.zip) is a .zip file that contains the executable binary META-INF/com/google/android/update-binary. After verifying the signature on the package, recovery extracts this binary to /tmp and runs it, passing the following arguments:

Inside OTA Packages: Updater contains several builtin functions and an interpreter for an extensible scripting language (**edify**) that supports commands for typical update-related tasks. Updater looks in the package .zip file for a script in the file META-INF/com/google/android/updater-script.

Edify syntax: An edify script is a single expression in which all values are strings. Empty strings are false in a Boolean context and all other strings are true.

4 Abbreviations

Please note the abbreviations and their explanations provided in **Error! Reference source not found.**. They are sed in many fundamental definitions and explanations in this document and are specific to the information that this document contains.

Table 4-1. Abbreviations

Abbreviations	Explanation
MTK	MediaTek, Asia's largest fabless IC design company.
OTA	Over-The-Air
SIU	Sdcard Image Update

5 Architecher Overview

This chapter first gives a brief description of the modules of the system and the relationship of the modules.

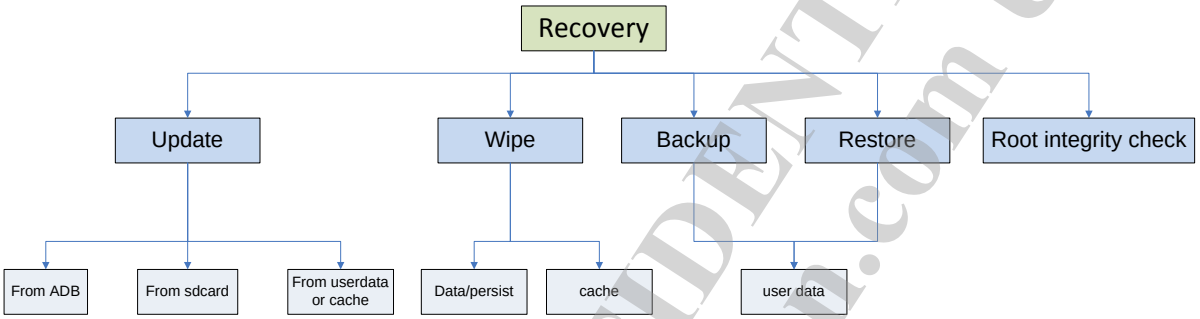

Figure 5-1.Recovery function block diagram.

5.1 [Recovery update workflows]

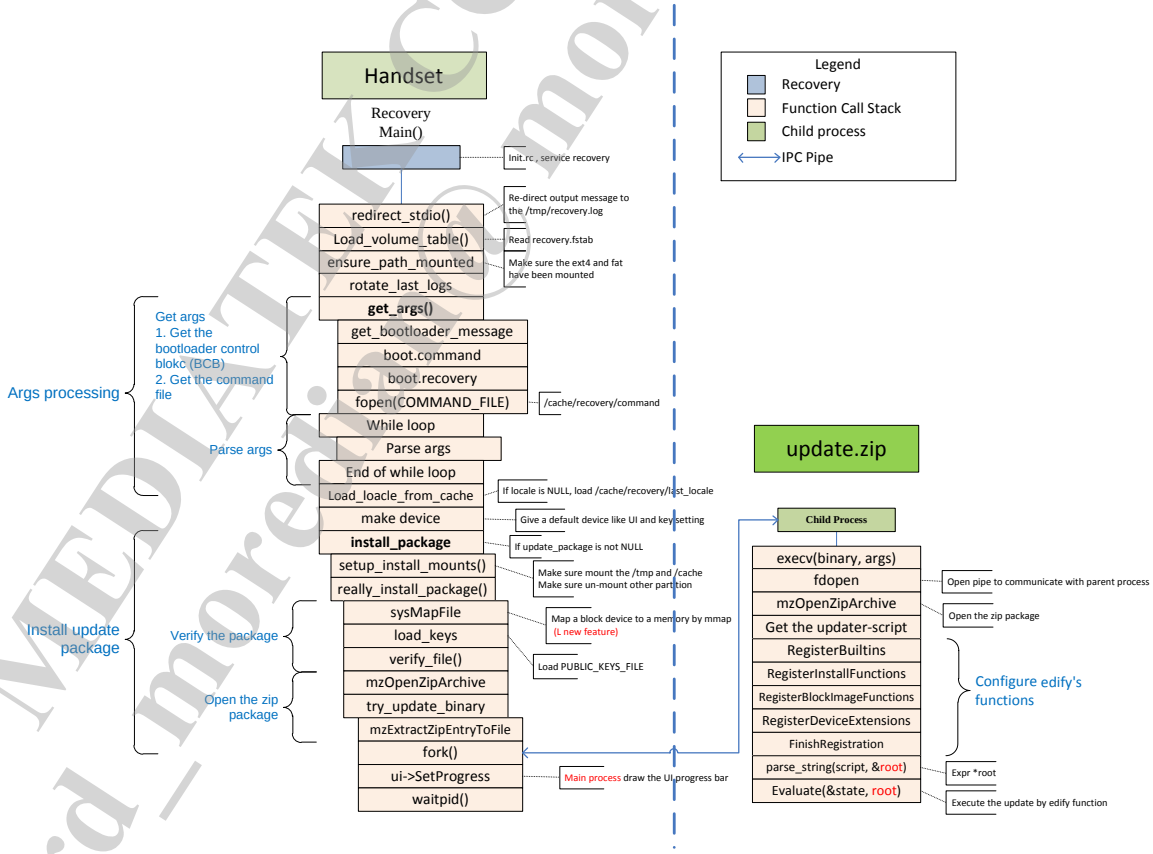

Figure 5.1-2 Recovery update workflows.

6 MTK Features in recovery mode

The followings are MTK turnkey features in recovery mode

6.1 Wipe data/factory reset

When execute this item, device's data and cache partitions will be erased. And device will be in factory reset state.

6.2 Wipe cache partition

When execute this item, it will erase device's cache partition.

6.3 Backup user data

When execute this item, SD card must be plugged into devcie. It will backup device's data partition to SD card.

6.4 Restore user data

When execute this item, SD card must be plugged into device. It can restore the previous backup data from SD card to device.

6.5 Root integrity check

Root integrity check function checks handset whether has been modify (root) or not. If handset doesn't root , it will display System check SUCCESS !!

7 Generate OTA package Guideline

This chapter gives a description of a group of generating ota package guideline.

7.1 Generate OTA full update package step by step

7.1.1 Full build project

Command : make -j8 -k 2>&1 |tee normal_build.log

7.1.2 Build OTA full update package for zip format

Command : make -j8 otapackage -k 2>&1 |tee build_ota.log

7.1.3 Full update package is in the out folder

Example full update package : full_project_name-ota-1482807938.zip

7.2 Generate OTA incremental update package step by step

7.2.1 Build OTA incremental update package for zip format

UFS/EMMC example command: ./build/tools/releasetools/ota_from_target_files --block -k ./device/mediatek/common/security/releasekey -s ./device/mediatek/build/releasetools/mt_ota_from_target_files -i V1.zip V2.zip update.zip

Nand example command: ./build/tools/releasetools/ota_from_target_files -v -g -p out/host/linux-x86 -k ./device/mediatek/common/security/releasekey -s ./device/mediatek/build/releasetools/mt_ota_from_target_files -i V1.zip V2.zip update.zip

Note:

1. V1.zip and V2.zip is from obj/PACKAGING/target_files_intermediates/ in out folder.
2. Google native Android default update only **boot.img**, **system.img**, and **recovery.img**

If handset must upgrade besides Google default image (ex: LK, Preloader, TEE, and modem) ,

Please add parameter **-s** as -s ./device/mediatek/build/releasetools/mt_ota_from_target_files

3. Scrips pathes are changed as followings in Android O :
    a. -s vendor/mediatek/proprietary/scripts/releasetools/mt_ota_from_target_files
    b. -k device/mediatek/security/releasekey
4. Nand and EMMC gen ota package command are all the same in Android O

8 OTA/Recovery limitations

This chapter describes MTK OTA/Recovery limitations.

8.1 MTK OTA/Recovery does NOT support

☞ The battery power is loss during upgrade phone.

☞ The sdcard hot-plug during upgrade phone.

8.2 MTK OTA/Recovery support

Backup and restore user data.

Upgrade with changing partition size.

8.2.1 Backup and restore user data

☞ **To support these features, there are some common rules MUST BE observed.**

SD card MUST NOT BE write-protected.

SD card MUST have enough free space to store the user data.

The size of new userdata partition MUST BE larger than the user data used.

Backup of user data image is encrypted. The encrypted data can ONLY be restored to the original mobile device.

8.2.2 Upgrade with Changing partition size

☞ **To support Upgrade with Changing Partition Size, following rules MUST BE observed.**

For userdata Encrypted Phone

☞ Change partition is NOT allowed on Encrypted Phone, otherwise userdata partition will be lost.

For userdata Non-Encrypted Phone

ONLY userdata, cache, and system partitions are allowed to resize.

☞ MTK will try to resize userdata but can NOT make sure rezie always success.

When user data partition size is changed, Backup and Restore User Data will be performed automatically.

Only recovery uses external SD card, the phone can upgrade with changing partition size.

The number of partitions MUST BE consistent between the two versions.

The order of the last three partitions MUST BE the order of system/cache/userdata.

ONLY three partitions (system/cache/userdata) can have different size between the two versions.

☞ ONLY full update OTA package can do changed partition size upgrade.

☞ Differential OTA package CANNOT do changed partition size upgrade.

The default partition name of scatter file and format CANNOT be altered.

The custom partition ONLY can be added before expdb partition.

The default partition name of scatter file and format CANNOT be altered.

9 Frequently Asked Questions

9.1 FAQ - How to get recovey log or debug message ?

In recovery mode: adb pull /tmp/recovery.log – submit eService please attach this file
In normal mode: adb pull /cache/recovery/last_log – submit eService please attach this file
Core dump db is also in cache partition from Android N

9.2 FAQ – Does OTA change partition layout ?

Please check chapter 8 OTA/Recovery limitations

9.3 FAQ – How to OTA bootloader (preloader and lk) without backup partition ?

If handset does't have double partition for LK (lk and lk2), please modify build/core/Makefile as followings:

Before:

$(hide) ./device/mediatek/build/releasetools/mt_ota_preprocess.py $(zip_root) $(PRODUCT_OUT)
$(PRODUCT_OUT)/ota_update_list.txt

After:

$(hide) **MTK_LOADER_UPDATE=yes MTK_PRELOADER_OTA_BACKUP=no**
./device/mediatek/build/releasetools/mt_ota_preprocess.py $(zip_root) $(PRODUCT_OUT)
$(PRODUCT_OUT)/ota_update_list.txt

10 Application Note of Android new version

This chapter describes Android version update notes , ex: Android L (5.0) to Android M (6.0)

10.1 Android L (5.0) to Android M (6.0)

Trustzone.bin must be updated

Strongly recommended to use **full package** for upgrade, the reasons are as follows

- ☞ Because crossing different Android version, update package is larger and phone spends more time for updating.
- ☞ If customer uses incremental package and phone power loss accidently, it must only use full package to update phone.

If **MTK security boot** is enabled,

- ☞ **lk.bin** and **preloader_xxx.bin** must be updated.
- ☞ **Note:** If handset does NOT have lk2 partition, handset has a low risk to be dead when power loss happened during upgrade lk or preloader.

☞ /system/cache/data partition layout changed is **NOT** allowed, otherwise userdata partition will be lost.

It will show alert message (Notice user to backup data) on MOTA or SIU

If data partition is not encrypted, recovery will try to resize data partition

Other partition layout changed is **NOT** allowed, otherwise OTA will fail.

MTK_2SDCARD_SWAP on M (6.0) is phased out

If apps installed on SDCARD **will be lost**, if the handset had enabled MTK_2SDCARD_SWAP on previous version.

10.2 Android N (7.0)

1. Phase out RedBend FOTA third party in MTK recovery mode. (RedBend DM is NOT phase out)
2. Phase out applysig function , we combine signature to the image.
3. Add core dump in recovery mode, When recovery or updater process has NE,
   core dump file will be generated in cache partition. ex: core.pid_240.signal_11.time_1262304693

10.3 Android O (8.0)

1. Phase out core dump
2. OTA N to O setting on Android O
   a. **Disable FULL_TREBLE**
      i. device/mediatek/[PROJ]/device.mk
      ii. PRODUCT_FULL_TREBLE_OVERRIDE := false
   b. **Disable vendor partition**
      i. device/mediatek/[PROJ]/BoardConfig.mk
      TARGET_COPY_OUT_VENDOR := system/vendor
      BOARD_VENDORIMAGE_FILE_SYSTEM_TYPE :=
      TARGET_RECOVERY_FSTAB :=
      $(MTK_PTGEN_PRODUCT_OUT)/$(TARGET_COPY_OUT_VENDOR)/etc/fstab.$(MTK_PLATFORM_DIR)
      ii. kernel-3.18/arch/arm/configs/[PROJ]_debug_defconfig (*1)
      CONFIG_MTK_LATE_MOUNT=y
   c. **Disable DTBO**
      i. device/mediatek/[PROJ]/ProjectConfig.mk
      MTK_DTBO_FEATURE = no
      ii. kernel-3.18/arch/arm/configs/[PROJ]_debug_defconfig (*1)
      CONFIG_BUILD_ARM_DTB_OVERLAY_IMAGE_NAMES="xxx"
      CONFIG_BUILD_ARM_APPENDED_DTB_IMAGE_NAMES="[PROJ]"
      # CONFIG_MTK_DTBO_FEATURE is not set
      iii. kernel-3.18/arch/arm64/configs/[PROJ]_debug_defconfig (*1)
      CONFIG_BUILD_ARM64_DTB_OVERLAY_IMAGE_NAMES="xxx"
      CONFIG_BUILD_ARM64_APPENDED_DTB_IMAGE_NAMES="[PROJ]"
      # CONFIG_MTK_DTBO_FEATURE is not set
   d. **Disable MTK_LOADER_BACKUP (Only MT6737 family and MT6753)**
      i. **MTK_LOADER_BACKUP=no**
      ii. **Preloader:**
      vendor/mediatek/proprietary/bootable/bootloader/preloader/custom/k53v1_64_ota/k53v1_64_ota.mk
      iii. **LK:**
      /vendor/mediatek/proprietary/bootable/bootloader/lk/project/k53v1_64_ota.mk
      iv. **ProjectConfig:**
      device/mediatekprojects/k53v1_64_ota/ProjectConfig.mk

10.4 Android P (9.0)

Topic	New launch in Android P (by default)	OTA (O to P)
Overall config	device/mediatek/common/device.mk PRODUCT_SHIPPING_API_LEVEL := 28	device/mediatekprojects/[PROJ]/device.mk PRODUCT_SHIPPING_API_LEVEL_OVERRIDE := 26
VNDK enforcement	Enabled by default when we set PRODUCT_SHIPPING_API_LEVEL as 28	Can support and can enable by setting following config device/mediatekprojects/[PROJ]/device.mk BOARD_VNDK_VERSION := current
System property compatibility	Enabled by default when we set PRODUCT_SHIPPING_API_LEVEL as 28	Cannot support and need to disable device/mediatekprojects/[PROJ]/device.mk PRODUCT_COMPATIBLE_PROPERTY_OVERRIDE := false
System SDK	Enabled by default when we set PRODUCT_SHIPPING_API_LEVEL as 28	Can support and can enable by setting following config device/mediatekprojects/[PROJ]/device.mk BOARD_SYSTEMSDK_VERSIONS := 28
HIDL	Set initial Android version as P and use device/mediatek/common/manifest_target_level_p.xml when we set PRODUCT_SHIPPING_API_LEVEL as 28	Set initial Android version as O and use device/mediatek/common/manifest_target_level_o.xml when we set PRODUCT_SHIPPING_API_LEVEL_OVERRIDE as 26
System as root kernel-4.4 should enable DM_ANDROID_VERITY	Should support device/mediateksample/[PROJ]/ProjectConfig.mk device/mediatekprojects/[PROJ]/ProjectConfig.mk SYSTEM_AS_ROOT = yes vendor/mediatek/proprietary/bootable/bootloader/lk/project/${PROJ}.mk SYSTEM_AS_ROOT = yes kernel-4.4 platform kernel-4.4/drivers/misc/mediatek/Kconfig SYSTEM_AS_ROOT default y MTK_GROUP_ENABLE_VERITY default y	Can support and can enable by setting following config device/mediatekprojects/[PROJ]/ProjectConfig.mk SYSTEM_AS_ROOT = yes vendor/mediatek/proprietary/bootable/bootloader/lk/project/${PROJ}.mk SYSTEM_AS_ROOT = yes kernel-4.4 platform kernel-4.4/drivers/misc/mediatek/Kconfig SYSTEM_AS_ROOT default y MTK_GROUP_ENABLE_VERITY default y
System as root kernel-4.9 should enable AVB2.0	kernel-4.9 platform kernel-4.9/drivers/misc/mediatek/Kconfig SYSTEM_AS_ROOT default y kernel-4.9/drivers/misc/mediatek/masp/Kconfig MTK_AVB20_SUPPORT default y device/mediatek/common/device.mk MAIN_VBMETA_IN_BOOT := no BOARD_AVB_ENABLE := true vendor/mediatek/proprietary/bootable/bootloader/lk/platform/[PLAT]/rules.mk MTK_AVB20_SUPPORT:=yes	kernel-4.9 platform kernel-4.9/drivers/misc/mediatek/Kconfig SYSTEM_AS_ROOT default y kernel-4.9/drivers/misc/mediatek/masp/Kconfig MTK_AVB20_SUPPORT default y device/mediatek/common/device.mk MAIN_VBMETA_IN_BOOT := yes BOARD_AVB_ENABLE := true vendor/mediatek/proprietary/bootable/bootloader/lk/platform/[PLAT]/rules.mk MTK_AVB20_SUPPORT:=yes Additional setting if project already enabled AVB2.0 in O: device/mediatekprojects/[PROJ]/ProjectConfig.mk MAIN_VBMETA_IN_BOOT_OVERRIDE := no
AVB2.0 (kernel-4.9)	N/A	device/mediatekprojects/[PROJ]/device.mk BOARD_OTA_FRAMEWORK_VBMETA_VERSION_OVERRIDE := 0.0 NOTE: Above config in device.mk is only for O to P on non-A/B platform. After O to P finished, this config must be removed when ota from P to P kernel-4.9/arm[64]/config/mediatek/[PROJ]_defconfig CONFIG_MTK_MAIN_VBMETA_IN_BOOT=y
64-bit binder	Should support in both 32-bit and 64-bit project devide/mediatek/[PLAT]/BoardConfig.mk TARGET_USES_64_BIT_BINDER := true kernel-4.4/drivers/misc/mediatek/Kconfig kernel-4.9/drivers/misc/mediatek/Kconfig ANDROID_BINDER_IPC_32BIT default n	Can support and can enable by setting following config devide/mediatek/[PLAT]/BoardConfig.mk TARGET_USES_64_BIT_BINDER := true kernel-4.4/drivers/misc/mediatek/Kconfig kernel-4.9/drivers/misc/mediatek/Kconfig ANDROID_BINDER_IPC_32BIT default n
Rename DTBO	Both of partition and image is dtbo Reduce partition size of dtbo (16MB -> 8MB) device/mediatekprojects/[PROJ]/ProjectConfig.mk MTK_DTBO_UPGRADE_FROM_ANDROID_O = no	Set partition name and size as setting as Android O device/mediatekprojects/[PROJ]/ProjectConfig.mk MTK_DTBO_UPGRADE_FROM_ANDROID_O = yes

Property rename	**N/A**	**device/mediatekprojects/[PROJ]/device.mk** **PRODUCT_COPY_FILES += device/mediatek/common/init.migrate_legacy_props_needed.rc :$(TARGET_COPY_OUT_VENDOR)/etc/init/init.migrate_legacy_props_needed.rc** **PRODUCT_PROPERTY_OVERRIDES += persist.vendor.migrate_legacy_props=needed**

☞**Build incremental command changed:**

No need -s parameter

example: ./build/tools/releasetools/ota_from_target_files -v --block -- -p out/host/linux-x86 -k device/mediatek/security/releasekey -i source.zip target.zip update.zip

Change mount point from /vendor/nvdata to /mnt/vendor/nvdata

Erasing /mnt/vendor/nvdata for factory reset.

Rename ODMDTBO partition and image name to DTBO

	Android O	Android P
Partition name	ODMDTBO	DTBO
Partition size	16MB	8MB

☞ **A/B system updates from Android O to Android P:**

Besides MT6761, MT6762, and MT6765 , set MTK_BOOTCTRL_VERSION = 1.0 on Preloader, LK , and ProjectConfig.mk

Example project k37mv1_64_ab :

- **ProjectConfig.mk :** device/mediatek/k37mv1_64_ab/ProjectConfig.mk
- **Preloader:**

vendor/mediatek/proprietary/bootable/bootloader/preloader/custom/k37mv1_64_ab/k37mv1_64_ab.mk

- **LK:**

vendor/mediatek/proprietary/bootable/bootloader/ lk/project/k37mv1_64_ab.mk