./kernel concepts

# Android 10 BSP for MSC SM2S-IMX8MINI

Getting Started - May 3, 2022

# Description

Android BSP for SM2S-IMX8MINI SOMs version 1.0.2 - based on imx-android 10.0.0_2.0.0 (Android 10).

## Package Contents

- README
  contains quick instructions
- bsp_init.sh
  script to download and install the BSP tree on the build host
- bsp_build.sh
  script to build the BSP
- patches.tar.bz2
  Patchset against imx-android
- required_packages_ubuntu_focal
  list of required packages for Ubuntu Focal Fossa

## Supported Hardware

- SOMs
  - SM2S-IMX8MINI-QC-13N4200I
  - SM2S-IMX8MINI-QC-14N0261I
- Baseboards
  - SM2-MB-EP1-001
- Displays
  - MSC DIS-AM1280800-101-KIT (lvds)

## Supported Features

- WiFi (802.11ac/b/g/n)
- Bluetooth/BLE
- Ethernet
- USB Host
- USB Client
- MSC SMARC MIPI Camera Kit001
- Audio Output and Input via SGTL5000 sound codec
- SDHC-Slot

# Prequerisites

## imx-android

This BSP requires the imx-android tarball, you may get it from here. (NXP Login required)

## Toolchain

Certain parts of the original imx-android require the GNU ARM toolchain to compile. You may get it from here

### OS

This BSP was tested on Ubuntu 20.04 Focal Fossa with the following additional packages:

```
uuid uuid-dev zlib1g-dev liblz-dev liblzo2-2 liblzo2-dev lzop git-core curl u-boot-tools \
mtd-utils openjdk-8-jdk device-tree-compiler gdisk m4 libz-dev bison \
flex libssl-dev rsync android-sdk-libsparse-utils android-sdk-ext4-utils \
libncurses5:i386 libncurses5-dev python-is-python2 python
```

> libncurses5:i386 is only available in universe repositories, which may not be active:
> `sudo add-apt-repository universe`

Additionally, the Universal Update Utility (uuu) is needed.

### Build Hardware

AOSP and therefore imx-android and this BSP contain a lot of code that needs to be compiled. A rather potent machine is adviseable. For comparison: A full build of this BSP from scratch takes about 140 Minutes on a dual Xeon E5-2650 v2 (16C/32T). 1GiB of RAM per logical CPU is recommended. This BSP requires 200GiB of drive space for source tree, intermediates and results.

## Initialization

> In case you have not configured git yet (i.e. fresh installation) you need to supply some information:
> `git config --global user.email your mail address`
> `git config --global user.name your name`

For installation and setup purposes, unzip the BSP tarball to a folder of your choice and place the imx-android package and the GNU ARM toolchain in this folder. Then use the bsp_init.sh script to download and prepare the sources:

```
./bsp_init.sh -r
```

This will install imx-android and the GNU ARM toolchain to PWD and then patch imx-android to support IMX8MINI. Depending on your internet connection this may take a while as imx-android installation involves cloning a a lot of git repositories over the internet.

The script accepts several options:

- -r | –localrepo
  Do not expect repo tool to be in PATH, download it to PWD and use it from there.

## Building

### Scripted Build

To build the binaries for a device run

```
./bsp_build.sh
```

This script takes several options:

- -t | –type
  SOM-Type. Default: sm2s
- -m | –model
  SOM-Model. Default: imx8mini

- -d | –display
  Display to run on. Default: ama121a01 (MSC DIS-AM1280800-101-KIT)
- -v | –variant
  SOM-variant. Default: 14N0261I
- -j | –jobs
  Number of concurrent build threads to run. Default: 1
- -b | –buildvariant
  Build variant of Android (eng/user/userdebug). Default: user
- -c | –tc_path
  Path to GNU ARM Toolchain. Default: $PWDgcc-arm-8.3-2019.03-x86_64-aarch64-linux-gnu
  The default is correct for installation via bsp_init.sh.

## Manual Build

1. change into build directory

   ```
   $ cd android_build/
   ```

2. source build environment

   ```
   $ . build/envsetup.sh
   ```

3. select device using launch command

   ```
   $ lunch

   You're building on Linux

   Lunch menu... pick a combo:
   12:54:44 Build sandboxing disabled due to nsjail error. This may become fatal in the future.
   12:54:44 Please let us know why nsjail doesn't work in your environment at:
   12:54:44   https://groups.google.com/forum/#!forum/android-building
   12:54:44   https://issuetracker.google.com/issues/new?component=381517
        1. aosp_arm-eng
        2. aosp_arm64-eng
        3. aosp_blueline-userdebug
        4. aosp_bonito-userdebug
        5. aosp_car_arm-userdebug
        6. aosp_car_arm64-userdebug
        7. aosp_car_x86-userdebug
        8. aosp_car_x86_64-userdebug
        9. aosp_cf_arm64_phone-userdebug
        10. aosp_cf_x86_64_phone-userdebug
        11. aosp_cf_x86_auto-userdebug
        12. aosp_cf_x86_phone-userdebug
        13. aosp_cf_x86_tv-userdebug
        14. aosp_coral-userdebug
        15. aosp_crosshatch-userdebug
        16. aosp_flame-userdebug
        17. aosp_marlin-userdebug
        18. aosp_sailfish-userdebug
        19. aosp_sargo-userdebug
        20. aosp_taimen-userdebug
        21. aosp_walleye-userdebug
        22. aosp_walleye_test-userdebug
        23. aosp_x86-eng
        24. aosp_x86_64-eng
        25. beagle_x15-userdebug
        26. car_x86_64-userdebug
        27. evk_6sl-user
   ```

```
28. evk_6sl-userdebug
29. evk_7ulp-user
30. evk_7ulp-userdebug
31. evk_7ulp_revb-user
32. evk_7ulp_revb-userdebug
33. evk_8mm-user
34. evk_8mm-userdebug
35. evk_8mm_ddr4-user
36. evk_8mm_ddr4-userdebug
37. evk_8mm_drm-user
38. evk_8mm_drm-userdebug
39. evk_8mn-user
40. evk_8mn-userdebug
41. evk_8mp-user
42. evk_8mp-userdebug
43. evk_8mq-user
44. evk_8mq-userdebug
45. evk_8mq_drm-user
46. evk_8mq_drm-userdebug
47. fuchsia_arm64-eng
48. fuchsia_x86_64-eng
49. hikey-userdebug
50. hikey64_only-userdebug
51. hikey960-userdebug
52. hikey960_tv-userdebug
53. hikey_tv-userdebug
54. m_e_arm-userdebug
55. mek_8q-user
56. mek_8q-userdebug
57. mek_8q_car-user
58. mek_8q_car-userdebug
59. mek_8q_car2-user
60. mek_8q_car2-userdebug
61. mini_emulator_arm64-userdebug
62. mini_emulator_x86-userdebug
63. mini_emulator_x86_64-userdebug
64. poplar-eng
65. poplar-user
66. poplar-userdebug
67. qemu_trusty_arm64-userdebug
68. sabreauto_6q-user
69. sabreauto_6q-userdebug
70. sabresd_6dq-user
71. sabresd_6dq-userdebug
72. sabresd_6dq_car-user
73. sabresd_6dq_car-userdebug
74. sabresd_6sx-user
75. sabresd_6sx-userdebug
76. sabresd_7d-user
77. sabresd_7d-userdebug
78. sm2s_imx8mini_03N0280I_lvds_ama121a01-user
79. sm2s_imx8mini_03N0280I_lvds_ama121a01-userdebug
80. sm2s_imx8mini_03N0280I_lvds_p251hvn01-user
81. sm2s_imx8mini_03N0280I_lvds_p251hvn01-userdebug
82. sm2s_imx8mini_03N4200I_lvds_am800480n7-user
83. sm2s_imx8mini_03N4200I_lvds_am800480n7-userdebug
84. sm2s_imx8mini_03N4200I_lvds_ama121a01-user
85. sm2s_imx8mini_03N4200I_lvds_ama121a01-userdebug
86. sm2s_imx8mini_03N4200I_lvds_p251hvn01-user
```

```
     87. sm2s_imx8mini_03N4200I_lvds_p251hvn01-userdebug
     88. sm2s_imx8mini_03N4210I_lvds_am800480n7-user
     89. sm2s_imx8mini_03N4210I_lvds_am800480n7-userdebug
     90. sm2s_imx8mini_03N4210I_lvds_ama121a01-user
     91. sm2s_imx8mini_03N4210I_lvds_ama121a01-userdebug
     92. sm2s_imx8mini_03N4210I_lvds_p251hvn01-user
     93. sm2s_imx8mini_03N4210I_lvds_p251hvn01-userdebug
     94. sm2s_imx8mini_13N4200I_lvds_am800480n7-user
     95. sm2s_imx8mini_13N4200I_lvds_am800480n7-userdebug
     96. sm2s_imx8mini_13N4200I_lvds_ama121a01-user
     97. sm2s_imx8mini_13N4200I_lvds_ama121a01-userdebug
     98. sm2s_imx8mini_13N4200I_lvds_p251hvn01-user
     99. sm2s_imx8mini_13N4200I_lvds_p251hvn01-userdebug
     100. sm2s_imx8mini_14N0261I_lvds_ama070a04-user
     101. sm2s_imx8mini_14N0261I_lvds_ama070a04-userdebug
     102. sm2s_imx8mini_14N0261I_lvds_ama121a01-user
     103. sm2s_imx8mini_14N0261I_lvds_ama121a01-userdebug
     104. sm2s_imx8mini_14N0261I_lvds_p251hvn01-user
     105. sm2s_imx8mini_14N0261I_lvds_p251hvn01-userdebug
     106. sm2s_imx8mini_24N4200E_lvds_am800480n7-user
     107. sm2s_imx8mini_24N4200E_lvds_am800480n7-userdebug
     108. sm2s_imx8mini_24N4200E_lvds_ama121a01-user
     109. sm2s_imx8mini_24N4200E_lvds_ama121a01-userdebug
     110. sm2s_imx8mini_24N4200E_lvds_p251hvn01-user
     111. sm2s_imx8mini_24N4200E_lvds_p251hvn01-userdebug
     112. uml-userdebug

Which would you like? [aosp_arm-eng] 96
12:56:47 Build sandboxing disabled due to nsjail error. This may become fatal in the future.
12:56:47 Please let us know why nsjail doesn't work in your environment at:
12:56:47   https://groups.google.com/forum/#!forum/android-building
12:56:47   https://issuetracker.google.com/issues/new?component=381517
12:56:47 Build sandboxing disabled due to nsjail error. This may become fatal in the future.
12:56:47 Please let us know why nsjail doesn't work in your environment at:
12:56:47   https://groups.google.com/forum/#!forum/android-building
12:56:47   https://issuetracker.google.com/issues/new?component=381517

============================================
PLATFORM_VERSION_CODENAME=REL
PLATFORM_VERSION=10
TARGET_PRODUCT=sm2s_imx8mini_13N4200I_lvds_ama121a01
TARGET_BUILD_VARIANT=user
TARGET_BUILD_TYPE=release
TARGET_ARCH=arm64
TARGET_ARCH_VARIANT=armv8-a
TARGET_CPU_VARIANT=cortex-a53
TARGET_2ND_ARCH=arm
TARGET_2ND_ARCH_VARIANT=armv7-a-neon
TARGET_2ND_CPU_VARIANT=cortex-a9
HOST_ARCH=x86_64
HOST_2ND_ARCH=x86
HOST_OS=linux
HOST_OS_EXTRA=Linux-5.8.12-gentoo-x86_64-Ubuntu-16.04.7-LTS
HOST_CROSS_OS=windows
HOST_CROSS_ARCH=x86
HOST_CROSS_2ND_ARCH=x86_64
HOST_BUILD_TYPE=release
BUILD_ID=QQ2A.200305.004.A1
OUT_DIR=out
```

```
==========================================
```

(replace 96 with correct number for your board)

4. build i.MX specific parts (“vendor” parts)

```
AARCH64_GCC_CROSS_COMPILE="$(realpath ../gcc-arm-8.3-2019.03-x86_64-aarch64-linux-gnu)/\
bin/aarch64-linux-gnu- \
./imx-make.sh kernel bootloader bootimage vendorimage dtboimage -j1
```

5. build AOSP

```
make -j1 droid fastboot
```

## Installation on target

Connect the target via USB to the build host, set the FORCE_RECOVERY switch on the target and apply power to it.

Change into the output directory, e.g. from the directory where bsp_build.sh resides:

```
cd android_build/out/target/product/sm2s/
```

And run uuu on uuu.lst:

```
sudo uuu uuu.lst
```

Reset the FORCE_RECOVERY switch and power cycle the target to boot.

## Usage

## Customization

### Adding your own device

To add a device named “my_own_device” do the following:

1. cd into android_build/device/fsl/imx8m/sm2s/

```
cd android_build/device/fsl/imx8m/sm2s/
```

2. Fire up an editor of your choice to create the file “my_own_device.mk”

```
nano my_own_device.mk
```

3. Select your display connection by adding the following line:

```
DISPLAY_CON := lvds
```

4. Select your display by adding the following line:

```
DISPLAY := ama121a01
```

5. Select your SMARC-module by adding the following line:

```
include device/fsl/imx8m/sm2s/sm2s_imx8mini_03N0280I.mk
```

6. include SMARC general definitions by adding the following line:

```
include device/fsl/imx8m/sm2s/sm2s_common.mk
```

7. set your product’s name by adding the following lines:

```
PRODUCT_NAME := sm2s_imx8mini_03N0280I_lvds_ama121a01
PRODUCT_MODEL := sm2s_imx8mini_03N0280I_lvds_ama121a01
```

8. save the file and exit the editor.
9. cd into parent directory

10. edit AndroidProducts.mk:

```
nano AndroidProducts.mk
```

11. under “PRODUCT_MAKEFILES :=
” add the following line:

```
$(LOCAL_DIR)/sm2s/my_own_device.mk \
```

12. under “COMMON_LUNCH_CHOICES :=
” add the following lines:

```
my_own_device-user \
my_own_device-userdebug
```

It should now look like this:

```
PRODUCT_MAKEFILES := \
  $(LOCAL_DIR)/evk_8mq/evk_8mq.mk \
  $(LOCAL_DIR)/evk_8mq/evk_8mq_drm.mk \
  $(LOCAL_DIR)/evk_8mm/evk_8mm.mk \
  $(LOCAL_DIR)/evk_8mm/evk_8mm_ddr4.mk \
  $(LOCAL_DIR)/evk_8mm/evk_8mm_drm.mk \
  $(LOCAL_DIR)/evk_8mn/evk_8mn.mk \
  $(LOCAL_DIR)/evk_8mp/evk_8mp.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_03N0280I_lvds_ama121a01.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_03N0280I_lvds_p251hvn01.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_03N4200I_lvds_am800480n7.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_03N4200I_lvds_ama121a01.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_03N4200I_lvds_p251hvn01.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_03N4210I_lvds_am800480n7.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_03N4210I_lvds_ama121a01.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_03N4210I_lvds_p251hvn01.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_13N4200I_lvds_am800480n7.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_13N4200I_lvds_ama121a01.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_13N4200I_lvds_p251hvn01.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_14N0261I_lvds_ama070a04.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_14N0261I_lvds_ama121a01.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_14N0261I_lvds_p251hvn01.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_24N4200E_lvds_am800480n7.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_24N4200E_lvds_ama121a01.mk \
  $(LOCAL_DIR)/sm2s/sm2s_imx8mini_24N4200E_lvds_p251hvn01.mk \
  $(LOCAL_DIR)/sm2s/my_own_device.mk

COMMON_LUNCH_CHOICES := \
  evk_8mq-user \
  evk_8mq-userdebug \
  evk_8mq_drm-user \
  evk_8mq_drm-userdebug \
  evk_8mm-user \
  evk_8mm-userdebug \
  evk_8mm_ddr4-user \
  evk_8mm_ddr4-userdebug \
  evk_8mm_drm-user \
  evk_8mm_drm-userdebug \
  evk_8mn-user \
  evk_8mn-userdebug \
  evk_8mp-user \
  evk_8mp-userdebug \
  sm2s_imx8mini_03N0280I_lvds_ama121a01-user \
  sm2s_imx8mini_03N0280I_lvds_ama121a01-userdebug \
  sm2s_imx8mini_03N0280I_lvds_p251hvn01-user \
  sm2s_imx8mini_03N0280I_lvds_p251hvn01-userdebug \
```

```
sm2s_imx8mini_03N4200I_lvds_am800480n7-user \
sm2s_imx8mini_03N4200I_lvds_am800480n7-userdebug \
sm2s_imx8mini_03N4200I_lvds_ama121a01-user \
sm2s_imx8mini_03N4200I_lvds_ama121a01-userdebug \
sm2s_imx8mini_03N4200I_lvds_p251hvn01-user \
sm2s_imx8mini_03N4200I_lvds_p251hvn01-userdebug \
sm2s_imx8mini_03N4210I_lvds_am800480n7-user \
sm2s_imx8mini_03N4210I_lvds_am800480n7-userdebug \
sm2s_imx8mini_03N4210I_lvds_ama121a01-user \
sm2s_imx8mini_03N4210I_lvds_ama121a01-userdebug \
sm2s_imx8mini_03N4210I_lvds_p251hvn01-user \
sm2s_imx8mini_03N4210I_lvds_p251hvn01-userdebug \
sm2s_imx8mini_13N4200I_lvds_am800480n7-user \
sm2s_imx8mini_13N4200I_lvds_am800480n7-userdebug \
sm2s_imx8mini_13N4200I_lvds_ama121a01-user \
sm2s_imx8mini_13N4200I_lvds_ama121a01-userdebug \
sm2s_imx8mini_13N4200I_lvds_p251hvn01-user \
sm2s_imx8mini_13N4200I_lvds_p251hvn01-userdebug \
sm2s_imx8mini_24N4200E_lvds_am800480n7-user \
sm2s_imx8mini_24N4200E_lvds_am800480n7-userdebug \
sm2s_imx8mini_24N4200E_lvds_ama121a01-user \
sm2s_imx8mini_24N4200E_lvds_ama121a01-userdebug \
sm2s_imx8mini_24N4200E_lvds_p251hvn01-user \
sm2s_imx8mini_24N4200E_lvds_p251hvn01-userdebug \
sm2s_imx8mini_14N0261I_lvds_ama070a04-user \
sm2s_imx8mini_14N0261I_lvds_ama070a04-userdebug \
sm2s_imx8mini_14N0261I_lvds_ama121a01-user \
sm2s_imx8mini_14N0261I_lvds_ama121a01-userdebug \
sm2s_imx8mini_14N0261I_lvds_p251hvn01-user \
sm2s_imx8mini_14N0261I_lvds_p251hvn01-userdebug \
my_own_device-user \
my_own_device-userdebug
```

**Note: Mind the backslashes ("\")!**

13. Build the system as described in Manual Build

## Further Reading

- WiFi and Bluetooth driver and firmware license agreement

  `android_build/vendor/msc/linux-sdio-driver-209a/HDW Software Use License Agreement Template.pdf`

- Freescale imx-android Documentation
  https://www.nxp.com/docs/en/supporting-information/android_Q10.0.0_2.0.0_docs.zip
- Android App Developer Documentation
  https://developer.android.com/docs