./kernel concepts

Android 10 BSP for MSC SM2S-IMX8PLUS

Getting Started - May 3, 2022

Description

Android BSP for SM2S-IMX8PLUS SOMs version 1.0.2 - based on imx-android 10.0.0_2.6.0 (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-IMX8PLUS-QC-14N0740I
- 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:
   09:27:53 Build sandboxing disabled due to nsjail error. This may become fatal in the future.
   09:27:53 Please let us know why nsjail doesn't work in your environment at:
   09:27:53   https://groups.google.com/forum/#!forum/android-building
   09:27:53   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_coral_car-userdebug
        16. aosp_crosshatch-userdebug
        17. aosp_crosshatch_car-userdebug
        18. aosp_flame-userdebug
        19. aosp_marlin-userdebug
        20. aosp_sailfish-userdebug
        21. aosp_sargo-userdebug
        22. aosp_taimen-userdebug
        23. aosp_walleye-userdebug
        24. aosp_walleye_test-userdebug
        25. aosp_x86-eng
        26. aosp_x86_64-eng
        27. beagle_x15-userdebug
   ```

```
     28. car_x86_64-userdebug
     29. evk_6sl-user
     30. evk_6sl-userdebug
     31. evk_7ulp-user
     32. evk_7ulp-userdebug
     33. evk_8mm-user
     34. evk_8mm-userdebug
     35. evk_8mm_drm-user
     36. evk_8mm_drm-userdebug
     37. evk_8mn-user
     38. evk_8mn-userdebug
     39. evk_8mp-user
     40. evk_8mp-userdebug
     41. evk_8mq-user
     42. evk_8mq-userdebug
     43. evk_8mq_drm-user
     44. evk_8mq_drm-userdebug
     45. fuchsia_arm64-eng
     46. fuchsia_x86_64-eng
     47. hikey-userdebug
     48. hikey64_only-userdebug
     49. hikey960-userdebug
     50. hikey960_tv-userdebug
     51. hikey_tv-userdebug
     52. m_e_arm-userdebug
     53. mek_8q-user
     54. mek_8q-userdebug
     55. mek_8q_car-user
     56. mek_8q_car-userdebug
     57. mek_8q_car2-user
     58. mek_8q_car2-userdebug
     59. mini_emulator_arm64-userdebug
     60. mini_emulator_x86-userdebug
     61. mini_emulator_x86_64-userdebug
     62. poplar-eng
     63. poplar-user
     64. poplar-userdebug
     65. qemu_trusty_arm64-userdebug
     66. sabreauto_6q-user
     67. sabreauto_6q-userdebug
     68. sabresd_6dq-user
     69. sabresd_6dq-userdebug
     70. sabresd_6dq_car-user
     71. sabresd_6dq_car-userdebug
     72. sabresd_6sx-user
     73. sabresd_6sx-userdebug
     74. sabresd_7d-user
     75. sabresd_7d-userdebug
     76. sm2s_imx8plus_005_lvds0_native_single_mode_ama121a01-eng
     77. sm2s_imx8plus_005_lvds0_native_single_mode_ama121a01-user
     78. sm2s_imx8plus_005_lvds0_native_single_mode_ama121a01-userdebug
     79. sm2s_imx8plus_14N0740I_lvds0_native_single_mode_ama121a01-eng
     80. sm2s_imx8plus_14N0740I_lvds0_native_single_mode_ama121a01-user
     81. sm2s_imx8plus_14N0740I_lvds0_native_single_mode_ama121a01-userdebug
     82. uml-userdebug

Which would you like? [aosp_arm-eng] 80
09:28:30 Build sandboxing disabled due to nsjail error. This may become fatal in the future.
09:28:30 Please let us know why nsjail doesn't work in your environment at:
```

```
09:28:30   https://groups.google.com/forum/#!forum/android-building
09:28:30   https://issuetracker.google.com/issues/new?component=381517
09:28:31 Build sandboxing disabled due to nsjail error. This may become fatal in the future.
09:28:31 Please let us know why nsjail doesn't work in your environment at:
09:28:31   https://groups.google.com/forum/#!forum/android-building
09:28:31   https://issuetracker.google.com/issues/new?component=381517

============================================
PLATFORM_VERSION_CODENAME=REL
PLATFORM_VERSION=10
TARGET_PRODUCT=sm2s_imx8plus_14N0740I_lvds0_native_single_mode_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-5.14.14-gentoo-x86_64-Ubuntu-20.04.3-LTS
HOST_CROSS_OS=windows
HOST_CROSS_ARCH=x86
HOST_CROSS_2ND_ARCH=x86_64
HOST_BUILD_TYPE=release
BUILD_ID=QQ3A.200805.001
OUT_DIR=out
============================================
```

(replace 80 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_imx8plus/
```

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_imx8plus/
   ```

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 lines:

   ```
   MSC_DISPLAY_CON := lvds0-native-single-mode
   MSC_DISPLAY_STR := lvds0_native_single_mode
   ```

4. Select your display by adding the following lines:

   ```
   MSC_DISPLAY := ama121a01
   TARGET_BOARD_DTO_CONFIG += overlay-lvds0-ama-121a01.dtb
   ```

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

   ```
   include device/fsl/imx8m/sm2s_imx8plus/sm2s_imx8plus_14N0740I.mk
   include device/fsl/imx8m/sm2s_imx8plus/sm2s_imx8plus_common.mk
   ```

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

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

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

   ```
   PRODUCT_NAME := ${MSC_SOM_FAM}_${MSC_SOM_TYPE}_${MSC_SOM_VARIANT}_${MSC_DISPLAY_STR}_${MSC_DISPLAY
   PRODUCT_MODEL := ${MSC_SOM_FAM}_${MSC_SOM_TYPE}_${MSC_SOM_VARIANT}_${MSC_DISPLAY_STR}_${MSC_DISPLA
   PRODUCT_DEVICE := ${MSC_SOM_FAM}_${MSC_SOM_TYPE}
   ```

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_imx8plus/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_drm.mk \
      $(LOCAL_DIR)/evk_8mn/evk_8mn.mk \
      $(LOCAL_DIR)/evk_8mp/evk_8mp.mk \
      $(LOCAL_DIR)/sm2s_imx8plus/sm2s_imx8plus_005_lvds0_native_single_mode_ama121a01.mk \
      $(LOCAL_DIR)/sm2s_imx8plus/sm2s_imx8plus_14N0740I_lvds0_native_single_mode_ama121a01.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_drm-user \
  evk_8mm_drm-userdebug \
  evk_8mn-user \
  evk_8mn-userdebug \
  evk_8mp-user \
  evk_8mp-userdebug \
  sm2s_imx8plus_005_lvds0_native_single_mode_ama121a01-eng \
  sm2s_imx8plus_005_lvds0_native_single_mode_ama121a01-user \
  sm2s_imx8plus_005_lvds0_native_single_mode_ama121a01-userdebug \
  sm2s_imx8plus_14N0740I_lvds0_native_single_mode_ama121a01-eng \
  sm2s_imx8plus_14N0740I_lvds0_native_single_mode_ama121a01-user \
  sm2s_imx8plus_14N0740I_lvds0_native_single_mode_ama121a01-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