DOCUMENTATION

emtrion
embedded systems

emCON-MX8MM Developer Kit for Android 11.0.0

User Manual

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Rev.	Date/Initial	Changes
1	04.11.2019/Ft	Inital Revision
2	29.06.2021/Rr	Changes for Android 11

Contents

1 Definitions

The table below lists some definitions of terms in this manual.

EMCON-MX8MM	Target platform
AOSP	Android Open Source Project
IDE	integrated development environment
OS	operating system
SoC	System on chip, here the i.MX8MM
UUU-Tool	universal update utility, Freescale/NXP i.MX chip image deploy tools

Table 1.1: *Definitions*

2 Introduction

emtrion has designed this Android developer kit to help you design your Android application quickly and efficiently, and evaluate the hardware.

The version of Android OS running on the developer kit is a custom Android version made by **emtrion**. It is compliant with Android 11.0.0 and bases on the version 11.0.0_1.2.0 from Google® with the extensions imx-android-11.0.0_1.2.0 comming from NXP®. Additionally some modifications have been added so that it is compliant with the emtrion module emcon-mx8mm.

The process of making or rebuilding the Android OS is substantial and requires a lot of knowledge regarding Linux and Android. If you have any requests or particular needs, **emtrion** can build a custom Android OS for you. Please contact sales@emtrion.de for any questions regardings this point.

3 Bootloader

This section gives a brief description of the bootloader used in this Developer Kit. When you are more interested in the function scope of the bootloader, please refer to the detailed description of the bootloader on the homepage of the U-Boot project: `http://www.denx.de/wiki/U-Boot/`

3.1 Communication settings

The bootloader communicates through the connector J26 on the Avari base board or through the connector J8 (UART A) on the Bvari base board. The communication settings are:

baud rate	115200 bps
data bits	8
stop bits	1
parity	none
handshake	none

Table 3.2: *communication settings*

3.2 DIP switch setup for emCON-MX8MM

The emCON-MX8MM module and the Avari base board contains DIP switches, which have to be setup as follows for a successful start up of the bootloader.

	1	2	3	4
Boot device eMMC	off	off	on	off

Table 3.4: *DIP switches on emCON-MX8 module*

	1	2	3	4	5	6	7	8
normal boot from on board device	on	off	on	don't care	don't care	don't care	don't care	don't care
force serial downloader mode	off	on	on	don't care	don't care	don't care	don't care	don't care

Table 3.6: *DIP switches SW1 on Avari base board*

3.3 Bootloader prompt

The bootloader prompt is reached if you press a key in the console window when the boot delay is counted down. The bootloader prompt allows you to change settings of the bootloader or to update the Android image in the eMMC flash.

We are using the U-Boot provided from NXP with some modifications and extensions related to our hardware. The U-Boot provided by NXP is a mainline U-Boot extended with code to support the i.MX8MM SoC. A detailed description of the bootloader can be found on the homepage of the U-Boot project: `http://www.denx.de/wiki/U-Boot/`.

3.3.1 Print/change environment variables

The environment variables are handled by using three commands: *printenv*, *setenv*, *saveenv*. *printenv* shows you the current setting of all environment variables. *printenv* <*variable*> shows only the current value of an environment variable. *setenv* <*variable*> <*value*> changes the value of an environment variable. This change is only in RAM and will be lost after reset. The changes can be made permanent by using *saveenv*. The following example shows how the boot command is set up.

```
1 emCON-MX8MM U-Boot > setenv bootcmd 'run bootcmd_android'
2 emCON-MX8MM U-Boot > saveenv
```

Listing 3.1:

3.3.2 Network setup

The network setup of the bootloader is also handled by environment variables:

variable	description
autoload	Set this to "no". This prevents that the use of the "dhcp" command automatically starts a tftp download
ipaddr	IP address of the device. Only effective if dhcp is disabled
serverip	IP address of the host PC which acts as TFTP server
netmask	Subnet mask of the device
ip-method	Set this to "static" or "dhcp" according to your setup. This is used by the update_uboot script

Table 3.8: *environment variables related to network setup*

If you have a DHCP server in your network and want to configure the device via dhcp simple use the command *"dhcp"*:

```
1 emCON-MX8MM U-Boot > dhcp
2 BOOTP broadcast 1
3 DHCP client bound to address 172.26.1.10 (6ms)
```

Listing 3.2:

If there is no DHCP server you have to set the variables *"ipaddr"* and *"netmask"* by hand.

To test your network settings you can ping the host PC from the device running the bootloader. To do so use the command *ping* <*ip address*>. **Please note, that the device running the bootloader cannot be pinged.**

3.4 Updating Android Images

3.4.1 Prerequisite

To update the Android on the target system you need the Universal Update Utility (UUU-Tool) on your host PC. This utility is the Freescale/NXP i.MX chip image deploy tool. You can download this utility from this URL `https://github.com/NXPmicro/mfgtools/releases` (click on the revision number to see the download links).

3.4.2 Updating

For the update process you need to connect the emCON-MX8MM device as a USB device to your host PC. You can use the connector J6 on the Avari baseboard. You also need the serial communication between bootloader and host PC, so you also need to connect the serial cable (see chapter 3.1 for settings.)

On the host PC start the UUU-Tool using

```
.\uuu.exe <script file without path>
```

Listing 3.3:

After powering up the device, stop the autoboot sequence by sending a key stroke from the host PC through the serial port to the emCON-MX8MM device. Then you execute the command

```
emCON-MX8MM U-Boot > run bootcmd_mfg
```

Listing 3.4:

This will start the fastboot mechanismn which connects to the UUU-Tool on the host PC through the USB device connection. You see the process in the UUU-Tool output and in the output of the bootloader on the serial line. When you see *Done* in the UUU-Tool or the message *Update finished successfully* when you have used the script listed in section 3.4.2.1 below.

3.4.2.1 Script for UUU-Tool

The following script can be used to update the Android stored on the emCON-MX8MM device. You have to replace the part *<path to image directory>* with the path to the directory where you have stored the new image files on your host PC.

```
uuu_version 1.2.39

# This command will be run when i.MX6/7 i.MX8MM, i.MX8MQ
SDP: boot -f <path to image directory>\flash.bin

# This command will be run when ROM support stream mode
# i.MX8QXP, i.MX8QM
SDPS: boot -f <path to image directory>\flash.bin

# These commands will be run when use SPL and will be skipped if no spl
# SDPU will be deprecated. please use SDPV instead of SDPU
```

```
# {
SDPU: delay 1000
SDPU: write -f <path to image directory>\flash.bin -offset 0x57c00
SDPU: jump
# }

# These commands will be run when use SPL and will be skipped if no spl
# if (SPL support SDPV)
# {
SDPV: delay 1000
SDPV: write -f <path to image directory>\flash.bin -skipspl
SDPV: jump
# }

FB: delay 1000
FB: ucmd echo
    "*****************************************************************"
FB: ucmd echo "* Writing Android"
FB: ucmd setenv fastboot_dev mmc
FB: ucmd setenv mmcdev 0
FB: ucmd mmc dev ${mmcdev}
FB: ucmd mmc dev ${mmcdev} 0
FB: ucmd mmc info
FB: ucmd echo
    "*****************************************************************"
FB: ucmd echo "* Unlocking device"
FB: flashing get_unlock_ability
FB: flashing unlock
FB[-t 600000]: flash gpt <path to image directory>\partition-table.img
FB: ucmd setenv fastboot_dev mmc
FB: flash dtbo_a <path to image directory>\dtbo.img
FB: flash boot_a <path to image directory>\boot.img
FB: flash vendor_boot_a <path to image directory>\vendor_boot.img
FB: flash vbmeta_a <path to image directory>\vbmeta.img
FB: flash super <path to image directory>\super.img
FB: flash dtbo_b <path to image directory>\dtbo.img
FB: flash boot_b <path to image directory>\boot.img
FB: flash vendor_boot_b <path to image directory>\vendor_boot.img
FB: flash vbmeta_b <path to image directory>\vbmeta.img
FB[-t 600000]: erase misc
FB[-t 600000]: erase presistdata
FB[-t 600000]: erase fbmisc
FB[-t 600000]: erase userdata
FB: ucmd echo
    "*****************************************************************"
FB: ucmd echo "* Update finished successfully"
FB: Done
```

Listing 3.5: *UUU script for Android update*

4 Android Application quick start Guide

4.1 Preparation

First of all, you need the Android Studio installed on your development PC. This can be done as it described on this page `https://developer.android.com/studio/install`. Alternatively, if available, you can install the Android Studio package from your (linux) distribution.

After you have installed the studio you can start the Android Studio application using this icon:

Figure 4.1: *Android Studio Icon*

When you first start it, the Setup Wizard of the Android Studio automatically start:

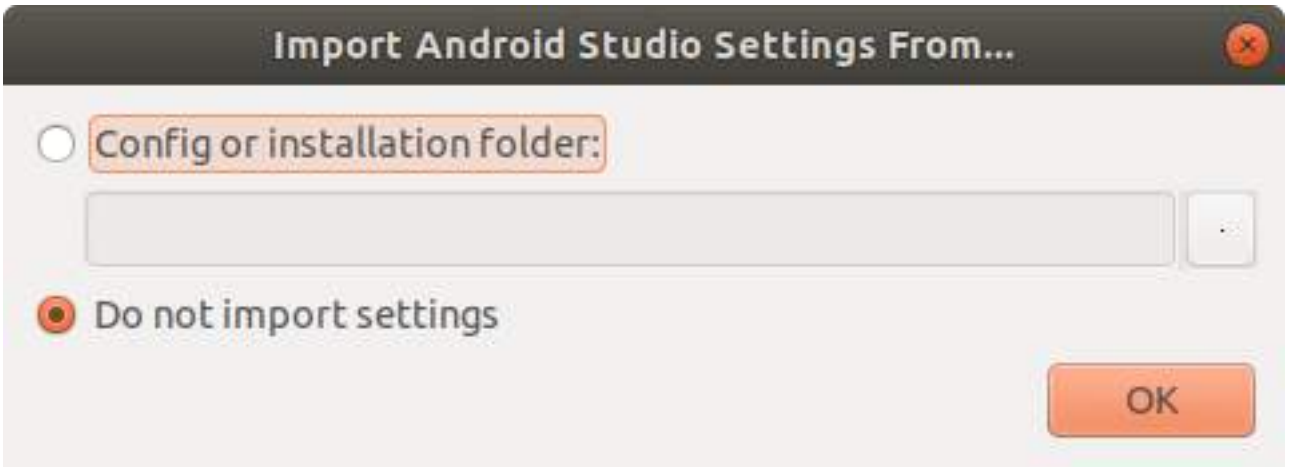

Figure 4.2: *Android Studio import settings dialog on the first start*


Android Studio Setup Wizard
Welcome
Android Studio
Welcome! This wizard will set up your development environment for Android Studio.
Additionally, the wizard will help port existing Android apps into Android Studio
or create a new Android application project.
Previo...
Next
Cancel
Finish

Figure 4.3:

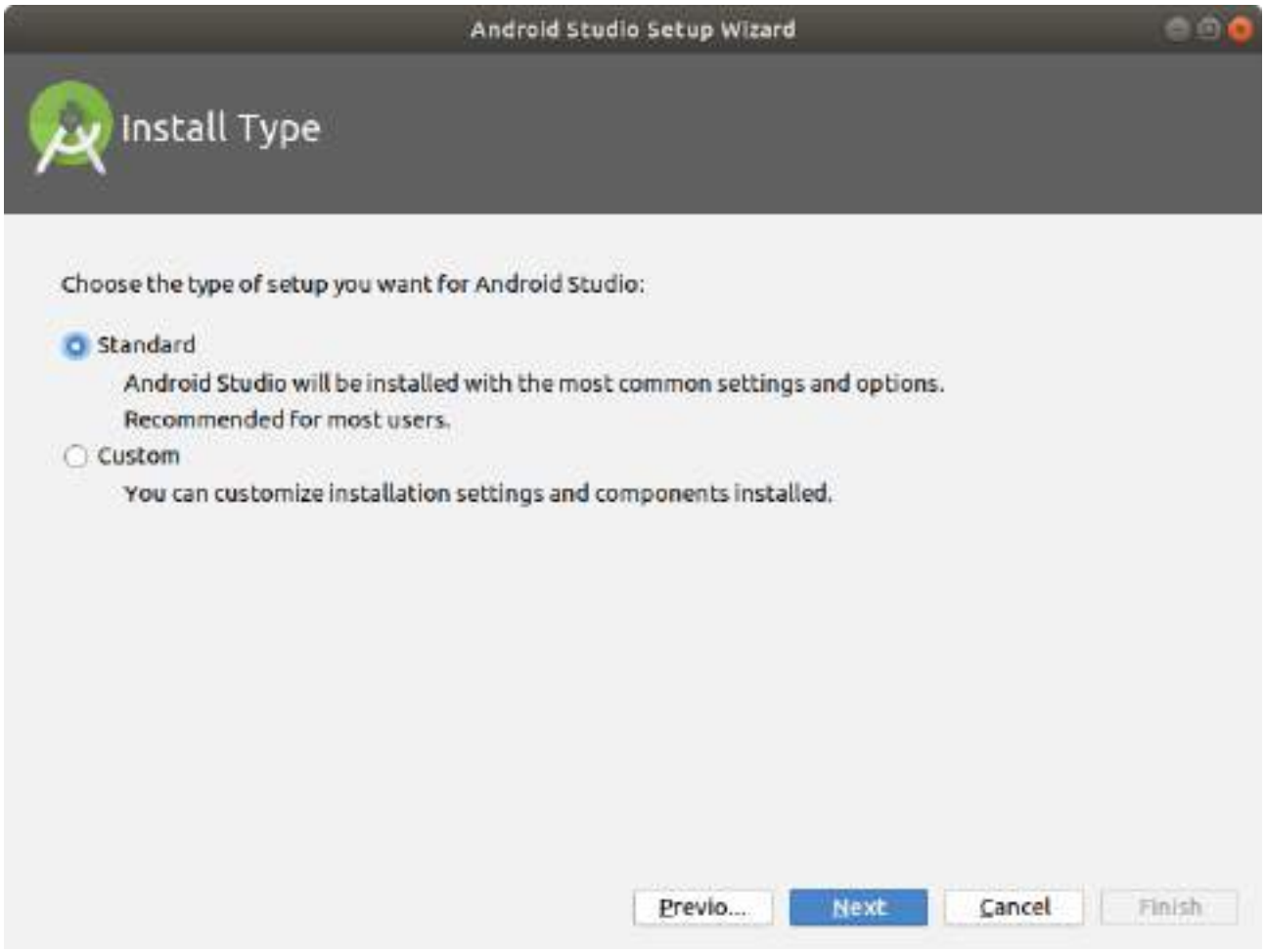
Android Studio Setup Wizard
Install Type
Choose the type of setup you want for Android Studio:
Standard
Android Studio will be installed with the most common settings and options.
Recommended for most users.
Custom
You can customize installation settings and components installed.
Previo...
Next
Cancel
Finish

Figure 4.4:

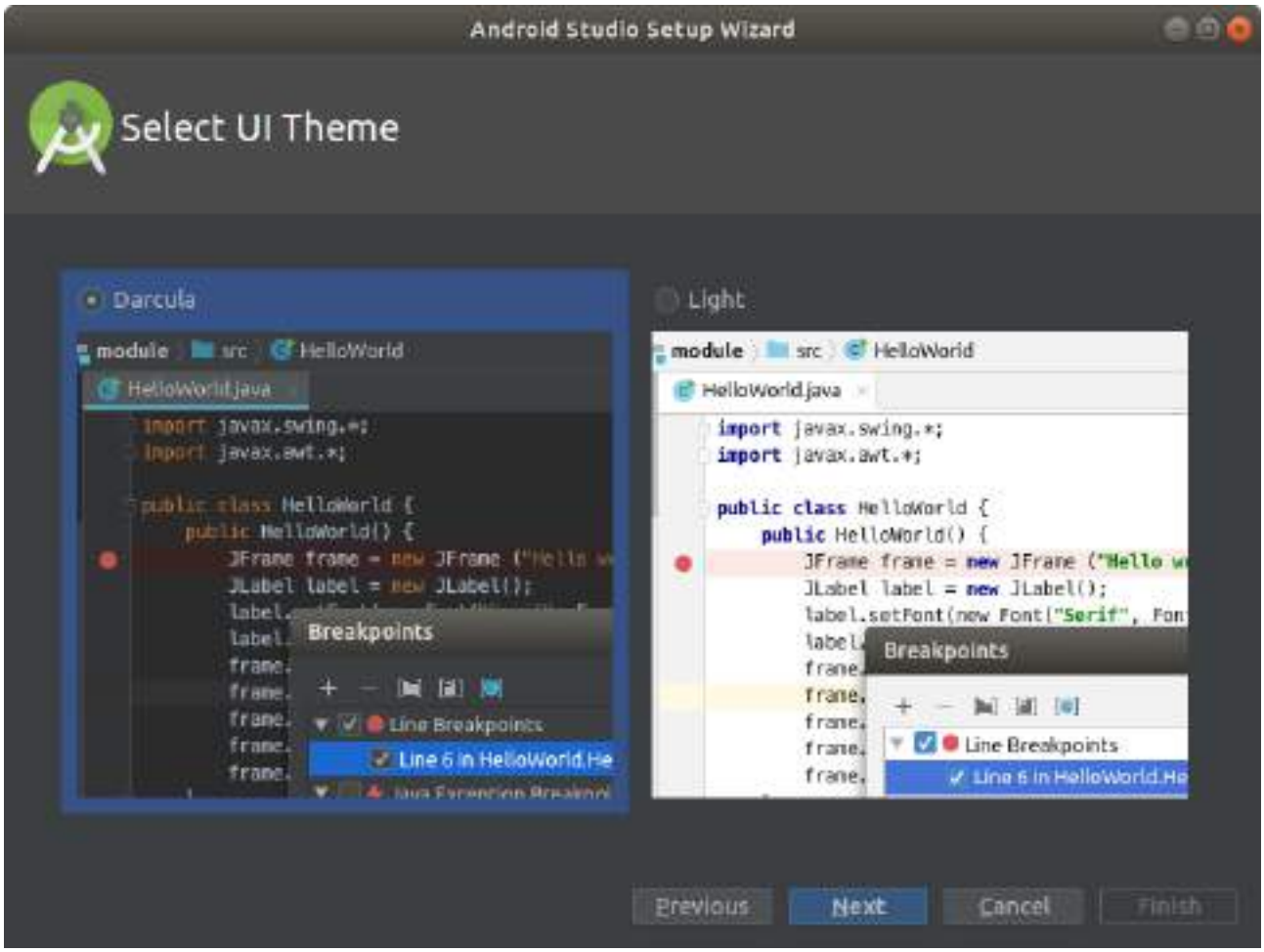
Android Studio Setup Wizard
Select UI Theme
Darcula
Light
module
src
HelloWorld
HelloWorld.java
Breakpoints
Line Breakpoints
Line 6 in HelloWorld.He
Previous
Next
Cancel
Finish

Figure 4.5:

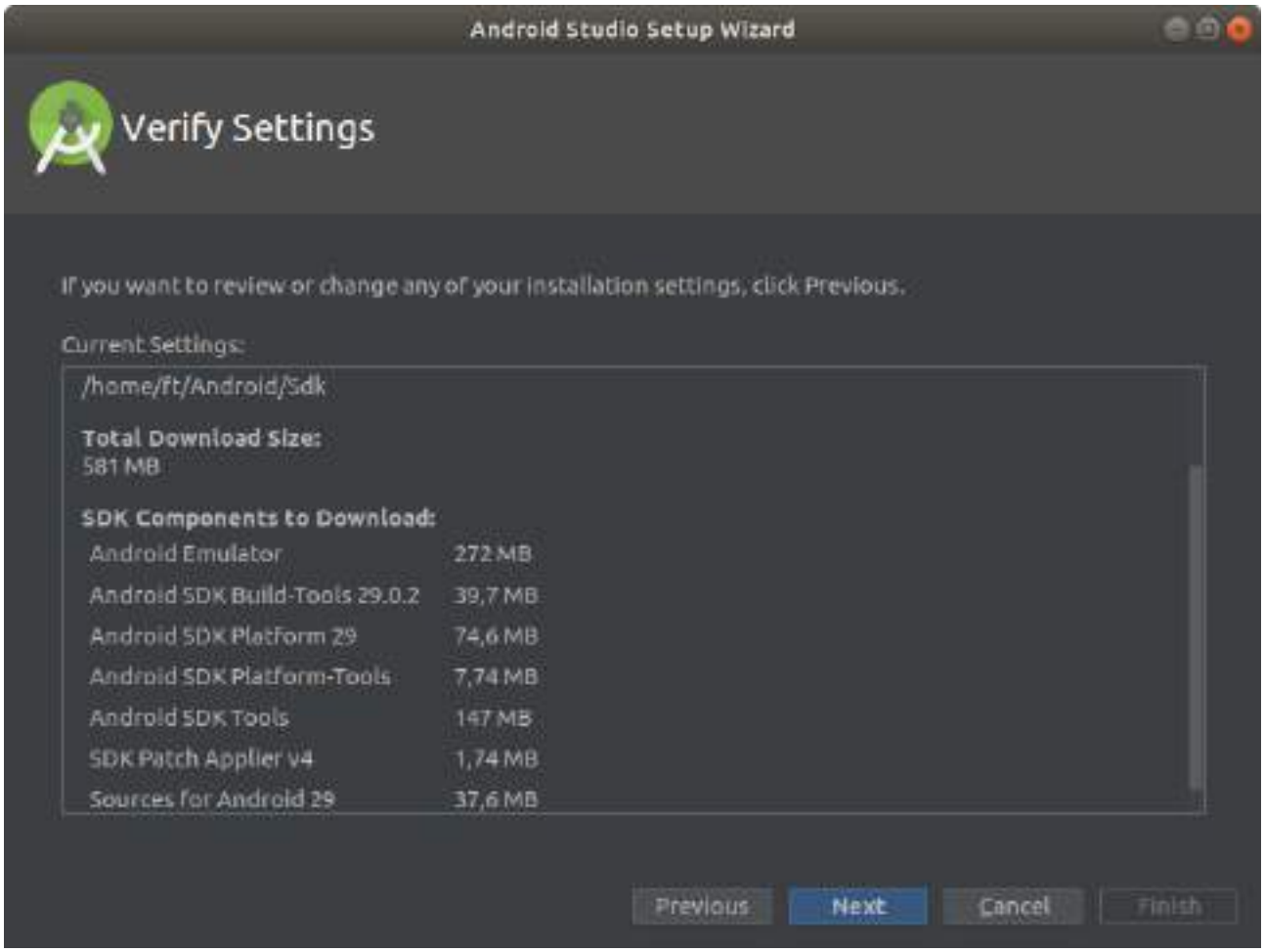
Android Studio Setup Wizard
Verify Settings
If you want to review or change any of your installation settings, click Previous.
Current Settings:
/home/ft/Android/Sdk
Total Download Size:
581 MB
SDK Components to Download:
Android Emulator 272 MB
Android SDK Build-Tools 29.0.2 39,7 MB
Android SDK Platform 29 74,6 MB
Android SDK Platform-Tools 7,74 MB
Android SDK Tools 147 MB
SDK Patch Applier v4 1,74 MB
Sources for Android 29 37,6 MB
Previous
Next
Cancel
Finish

Figure 4.6:

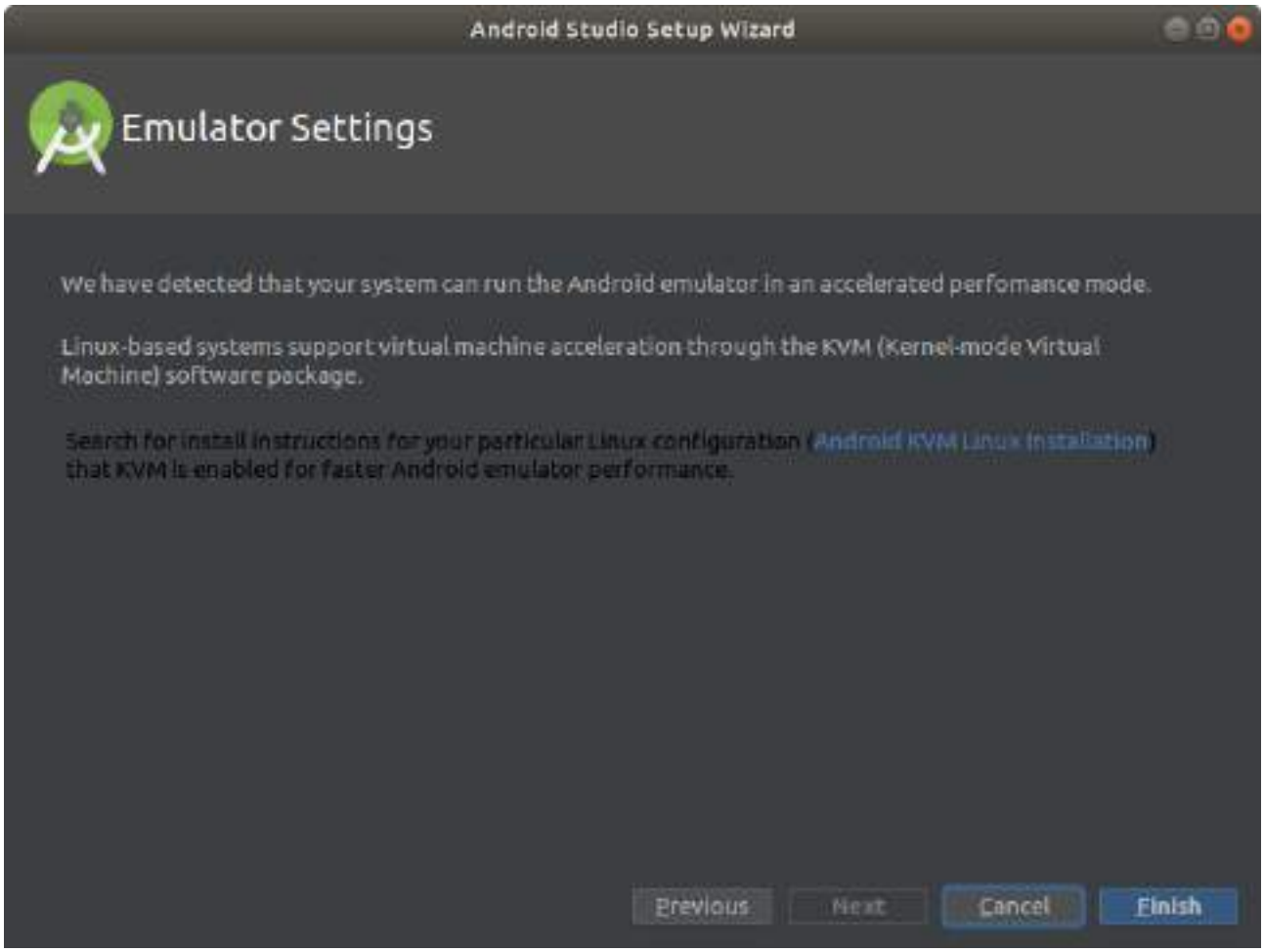

Figure 4.7:

The Setup Wizard downloads the required Software Development Kit (SDK) and setup the Android Studio environment. Then you are ready to develop you own application.

4.2 My Application: an Hello World example

You can start by clicking on a new project or use the recent project if available.

Figure 4.8: *Android Studio Welcome Screen*

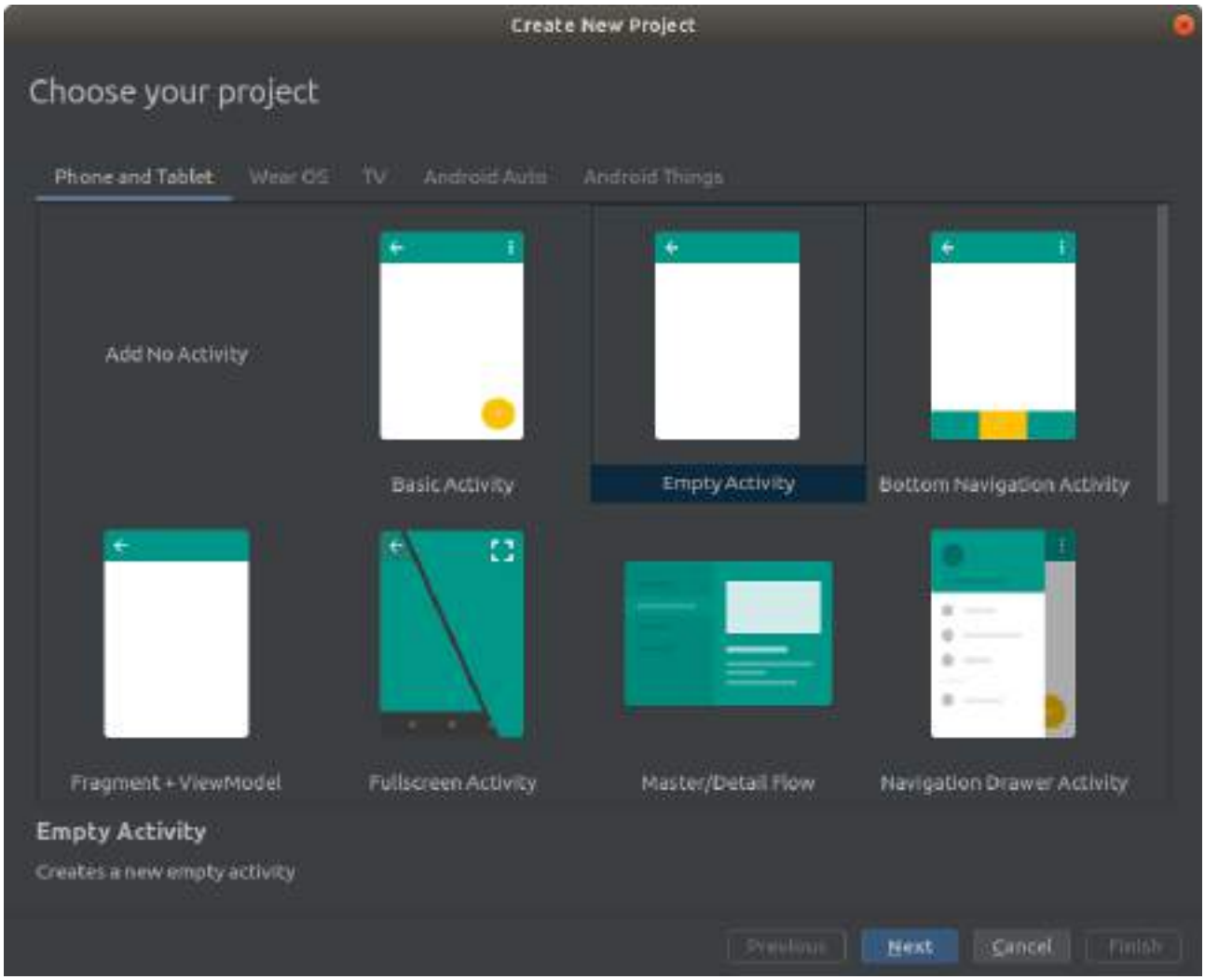

Figure 4.9: *Create New Project: Choose your Project*

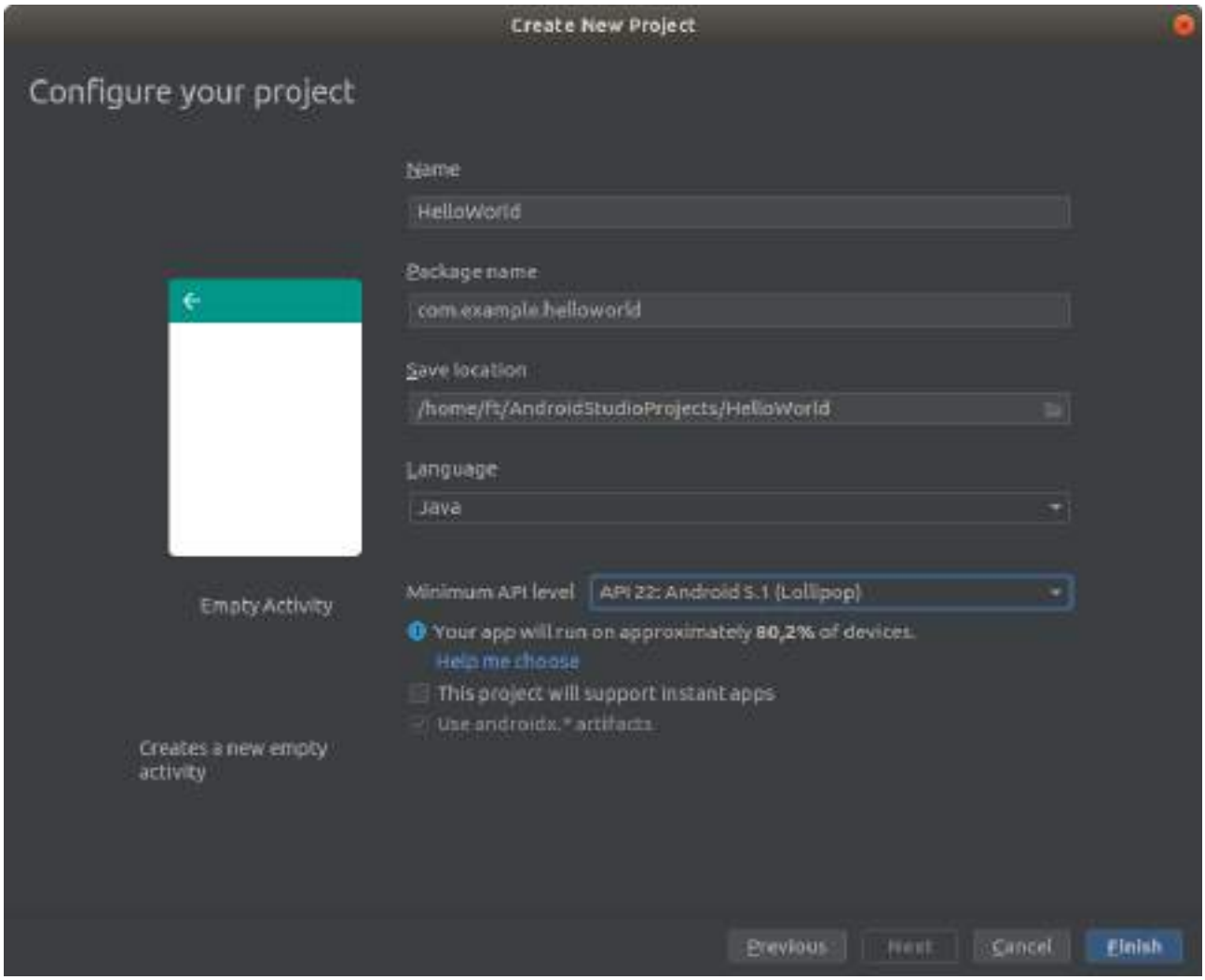

Figure 4.10: *Create New Project: Configure your Project*

Follow the next instructions: 1) Name your project (ex: HelloWorld) 2) In *Package Name*: change com.example.helloworld (ex: com.emtrion.helloworld) 3) Choose your API level. You can choose either the API level for Android Pie or an earlier one.

Now, you click on "Finish".

Now the IDE is launching. Your are ready to start coding.

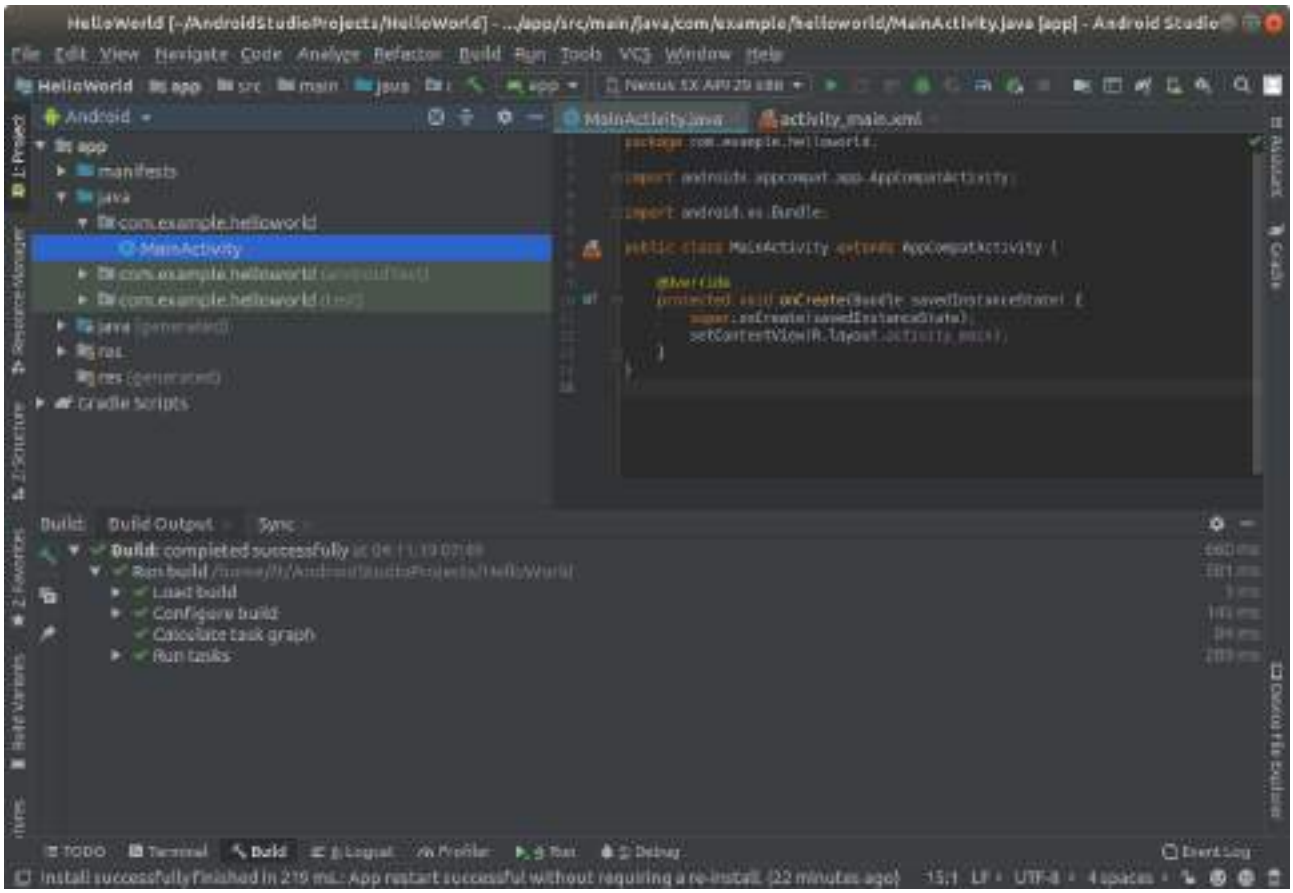

Figure 4.11: *Main screen after project creation*

Once you are ready, you have to connect the emCON-MX8MM device as a USB device to your development PC. You can use the connector J6 on the Avari base board resp. J7 on the Bvari base board. If the emtrion device is connected you should it choose in the drop box of the device connection (the right drop-down box in the toolbar below the menu bar).

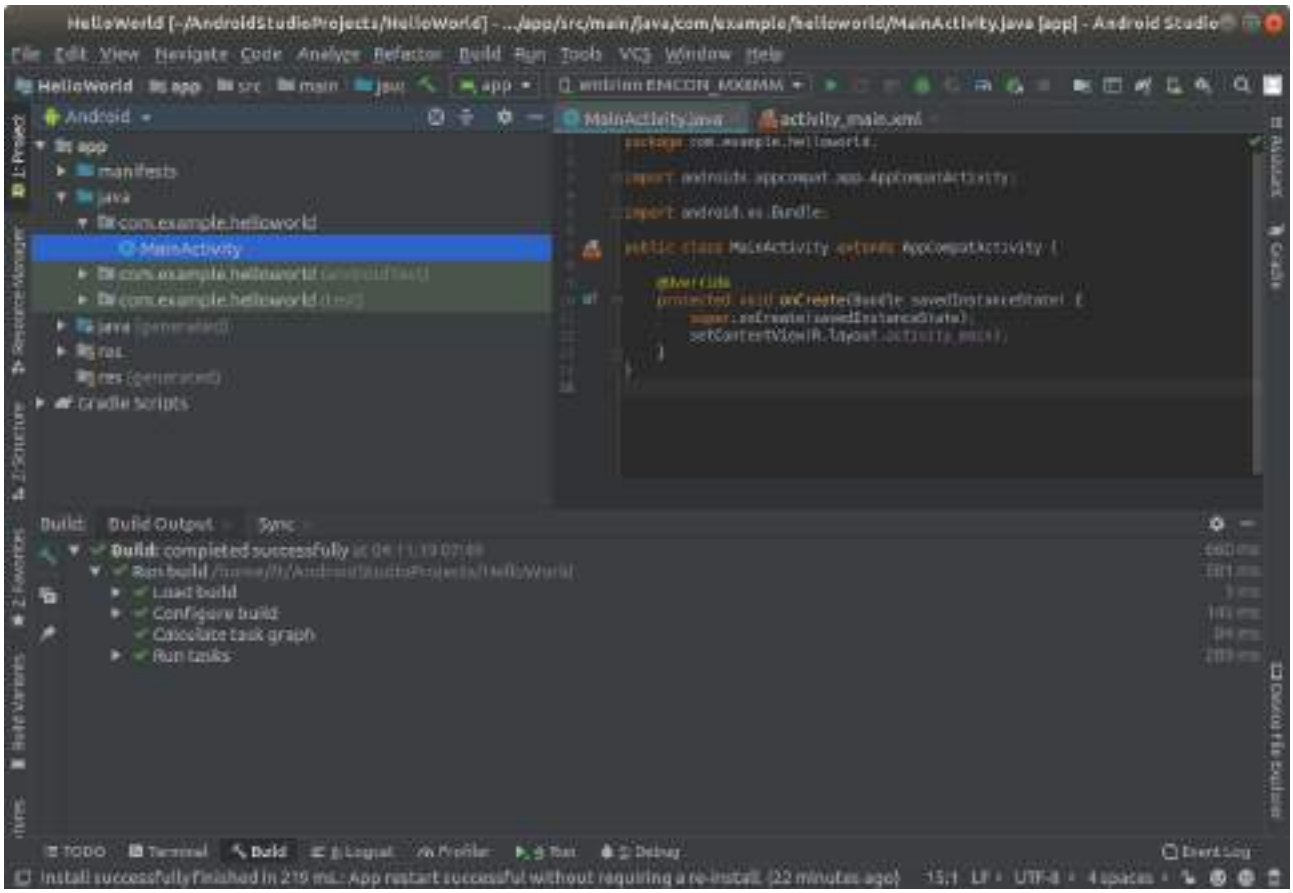

Figure 4.12: *Main screen*

Now you can either click on the green triangle run "app" to run the application in "release" mode or you can lunch the debugger (the tiny green bug on the right of the toolbar).

The IDE starts compiling and deploying the application to the device.

Once running, you can see your application on the emtrion board:

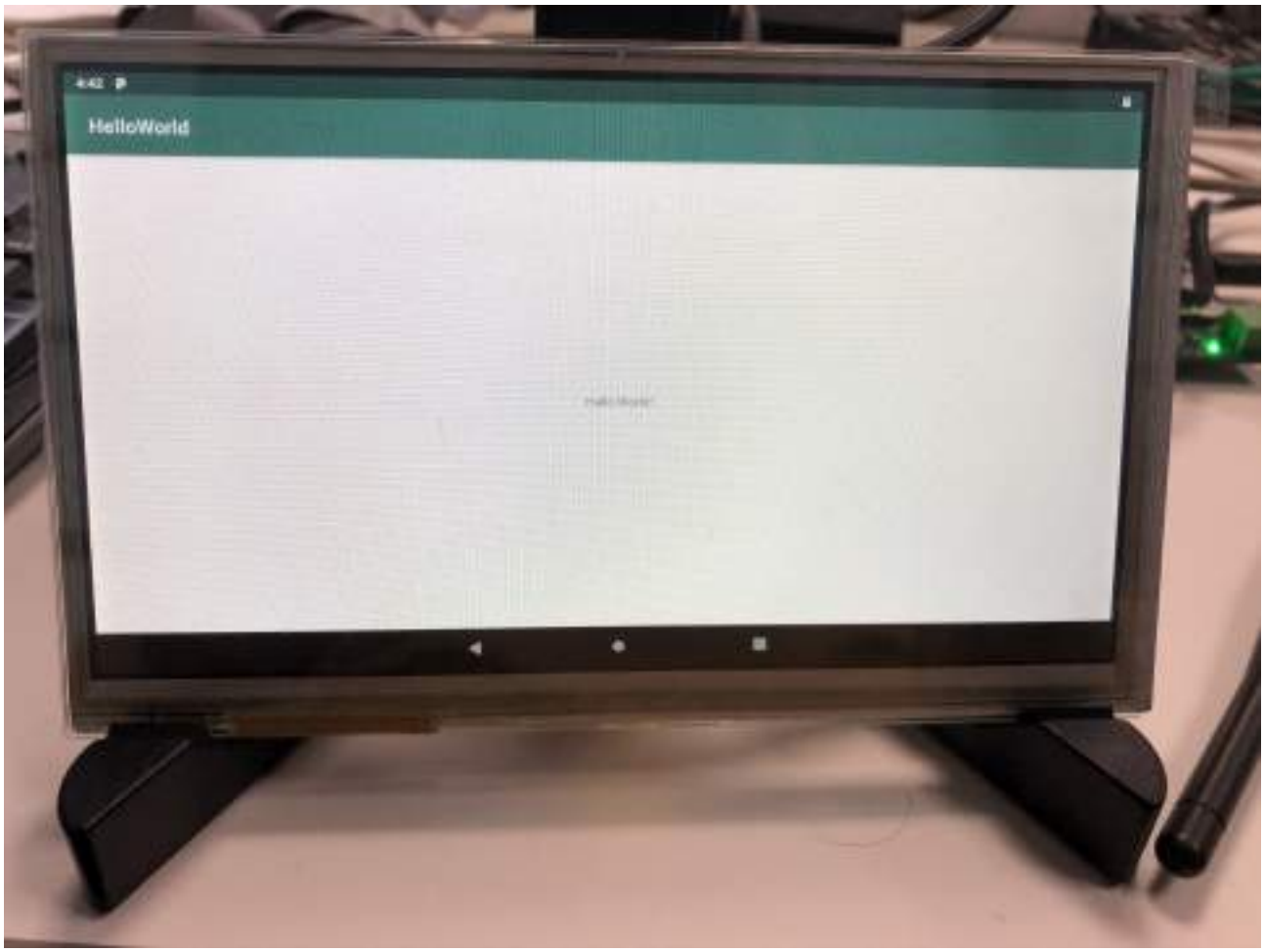

Figure 4.13: *Hello World on the emtrion emCON-MX8MM board*

5 Further information

Online resources

Further information can be found on the Emtrion support pages.

`https://support.emtrion.de`

We support you

Emtrion offers different kinds of services, among them Support, Training and Engineering. Contact us at sales@emtrion.de if you need information or technical support.