

EDM Yocto 2.0 Pre-Built Image User's Guide

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TechNexion

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1. Boot Yocto image

1.1 Supported hardware

These are the systems covered in this guide:

System-on-Modules:

- EDM1-CF-IMX6
- EDM1-CF-IMX6P
- EDM1-CF-IMX6QP
- EDM1-CF-IMX6SX
- EDM2-CF-IMX6
- PICO-IMX6
- PICO-IMX6-POP
- PICO-IMX6UL-EMMC

Carrier Boards:

- EDM1-FAIRY
- EDM1-GOBLIN
- EDM2-ELF
- Toucan-0700
- PICO-DWARF
- PICO-HOBBIT
- PICO-NYMPH

Box industrial PC:

- TEK3-IMX6
- TEP5-IMX6

1.2 Software version

name	version
u-boot	2015.04
linux kernel	4.1.15
Yocto	2.0 (jethro)

1.3 Install Yocto Pre-Built image into eMMC

Please refer to the document “Yocto_pre-built_image_installation_guide.pdf”.

2. Memory layout of the yocto image

For i.mx6 series (i.mx6Solo/DualLite/Dual/Quad/SoloX)

Section	Description
MBR	Partition information
SPL	First stage u-boot image
Partition 1 (FAT32) Under / directory <ul style="list-style-type: none">◆ uEnv.txt◆ u-boot.img◆ zImage◆ dtb	<ul style="list-style-type: none">◆ u-boot.img: Second stage u-boot image◆ uEnv.txt: U-boot environment, you can set display type and baseboard type in this plain text.◆ dtb: linux device tree file, it's platform-specific.
Partition 2 (EXT4) rootfs	Yocto rootfs

For i.mx6UL

Section	Description
MBR	Partition information
u-boot.imx	u-boot image
Partition 1 (FAT32) Under / directory <ul style="list-style-type: none">◆ zImage◆ dtb	<ul style="list-style-type: none">◆ dtb: linux device tree file, it's platform-specific.
Partition 2 (EXT4) rootfs	Yocto rootfs

3. Debug Console for Toucan

For all boards, the default debug console is output to ttymx0, except Toucan. The debug console of Toucan-0700 is output to ttyUSB0 by default. We recommend to use USB-to-Serial cable (with Prolific or FTDI chip) on Toucan.

4. Login to Yocto on target board

Please enter “root” in Yocto login prompt.

```
Freescall i.MX Release Distro 4.1.15-1.1.1 edm1-cf-imx6 /dev/ttymx0
```

```
edm1-cf-imx6 login: root
```

5. Change display settings

Display settings can be changed by modifying uEnv.txt.

The eMMC corresponds to /dev/mmcblk2. uEnv.txt is in /dev/mmcblk2p1.

```
root@edml-cf-imx6:~# mkdir -p /mnt/temp
root@edml-cf-imx6:~# mount /dev/mmcblk2p1 /mnt/temp/
root@edml-cf-imx6:~# vi /mnt/temp/uEnv.txt
root@edml-cf-imx6:~# umount /mnt/temp/
```

```
displayinfo=video=mxcfb0:dev=hdmi,1280x720M@60,if=RGB24 fbmem=28M
mmccargs=setenv bootargs console=${console},${baudrate} root=${mmccroot} ${display
bootcmd_mmc=run loadimage;run mmcboot;
uenvcmd=run bootcmd_mmc
```

Replace the red string with:

For HDMI 720P output:

```
video=mxcfb0:dev=hdmi,1280x720M@60,if=RGB24 fbmem=28M
```

For HDMI 1080P output:

```
video=mxcfb0:dev=hdmi,1920x1080M@60,if=RGB24 fbmem=28M
```

For VGA output:

```
video=mxcfb0:dev=lcd,1280x720M@60,if=RGB24
```

For 7 inch LVDS panel:

```
video=mxcfb0:dev=ldb,1024x600@60,if=RGB24
```

For 7 inch TTL panel:

```
video=mxcfb0:dev=lcd,800x480@60,if=RGB24
```

For 10 inch TTL panel: (TEP series)

```
video=mxcfb0:dev=ldb,1280x800@60,if=RGB666
```

For dual display for HDMI and LVDS:

```
video=mxcfb0:dev=hdmi,1280x720M@60,if=RGB24
```

```
video=mxcfb1:dev=ldb,1024x600@60,if=RGB24
```

Note:

For HDMI or VGA output, the display resolution depends on the display monitor. In order to adapt to different monitors, the [display timings](#) should follow [CVT timings standard](#).

If 'M' is present after the resolution you give, it will force to output CVT timings:

example:

```
video=mxcfb0:dev=lcd,1280x720M@60,if=RGB24
```

6. Change baseboard type

For EDM1-CF-IMX6 and PICO-IMX6 CPU, they are CPU modules. It's possible to plug to different baseboard. For each combination of CPU module and baseboard, it means a unique hardware configurations, so it should correspond to a device tree file in kernel. You can specify baseboard type in uEnv.txt to instruct u-boot to load correct device tree file.

```
root@edml-cf-imx6:~# mkdir -p /mnt/temp
root@edml-cf-imx6:~# mount /dev/mmcblk2p1 /mnt/temp/
root@edml-cf-imx6:~# vi /mnt/temp/uEnv.txt
root@edml-cf-imx6:~# umount /mnt/temp/
```

There are three baseboards support for EDM1-CF-IMX6:
fairy, mimas, tc0700.

Example:

Set baseboard as “fairy” in uEnv.txt:

```
baseboard=fairy
```

There are three baseboards support for PICO-IMX6:
dwarf, hobbit, nymph

Example:

Set baseboard as “dwarf” in uEnv.txt:

```
baseboard=dwarf
```

Compatible list of CPU module and baseboard:

Series	CPU module	Baseboard
EDM	EDM1-CF-IMX6 (IMX6 Solo/Dual Lite/Dual/Quad)	EDM1-FAIRY
	EDM1-CF-IMX6P (IMX6 Solo/Dual Lite/Dual/Quad with PMIC)	Toucan-0700
	EDM1-CF-IMX6QP	
	EDM1-CF-IMX6SX (two LANs)	EDM1-GOBLIN (two LANs)
PICO	PICO-IMX6	PICO-DWARF
	PICO-IMX6-POP	PICO-HOBBIT
		PICO-NYMPH

7. Calibrate Resistive Touch Panel

For 4-wire resistive touch panel, the touch panel is connected to touch screen controller “ADS7846”. The calibration data is generated from `ts_calibrate` (the calibration utility of [tslib](#)). The calibration data is fed to ADS7846 driver while booting to apply the calibration, so `xinput` calibration wouldn't be needed.

`more /etc/init.d/touch_cal.sh`

```
#!/bin/sh
CALFILE="/pointercal"

if [ -e $CALFILE ] ; then
    TOUCH_INPUT=`cat /proc/bus/input/devices | grep -A9 'ADS7846 Touchscreen' | grep 'Sysfs' | grep -o 'input[0-9]'`
    if [ "$?" == "0" ];then
        cat ${CALFILE} > /sys/class/input/${TOUCH_INPUT}/calibration
        echo -e "\nFeed calibration data to ADS7846 driver\n"
    fi
fi

exit 0
```

Generate calibration data:

Check the input device number for ADS7846

```
root@edml-cf-imx6:~# cat /proc/bus/input/devices | grep -A9 'ADS7846 Touchscreen' | grep 'Sysfs' | grep -o 'input[0-9]'
input0
```

The calibration data would be expected to be placed on the path “ / ”.

```
root@edml-cf-imx6:~# export TSLIB_CALIBFILE=/pointercal
root@edml-cf-imx6:~# export TSLIB_TSDEVICE="/dev/input/event0"
```

Here we get the input device number “input1” for ADS7846. For different platform, the input device number may be different.

Clean the old calibration data.

```
root@edml-cf-imx6:~# echo '0 0 0 0 0 0 0 0' > /sys/class/input/input0/calibration
root@edml-cf-imx6:~# ts_calibrate
```

Apply the new calibration data immediately.

```
root@edml-cf-imx6:~# cat /pointercal > /sys/class/input/input0/calibration
```

8. Test WIFI and Bluetooth

The yocto qt5 image utilizes “[connman](#)” as network manager.

The default settings for connman in the image is to turn WIFI and bluetooth on.

Please check:

```
more /var/lib/connman/settings
```

```
[global]
OfflineMode=false
```

```
[WiFi]
Enable=true
Tethering=false
```

```
[Bluetooth]
Enable=true
Tethering=false
```

Test wifi:

Load wifi driver module first, then driver would load wifi firmware by wifi chip ID.

```
root@edml-cf-imx6:~# modprobe bcmhdhd
```

Run “connmanctl” in interactive mode.

```
root@edml-cf-imx6:~# connmanctl
```

Scan and list the wifi hotspots, then register the agent to handle user requests.

```
connmanctl> scan wifi
Scan completed for wifi

connmanctl> services
hotspot      wifi_4439c4970d84_544543484e4558494f4e_managed_psk

connmanctl> agent on
Agent registered
```

Connect to the hotspot and enter the passphrase.

```
connmanctl> connect wifi_4439c4970d84_544543484e4558494f4e_managed_psk

Agent RequestInput wifi_4439c4970d84_544543484e4558494f4e_managed_psk
Passphrase = [ Type=psk, Requirement=mandatory, Alternates=[ WPS ] ]
WPS = [ Type=wpspin, Requirement=alternate ]
Passphrase?
Connected wifi_4439c4970d84_544543484e4558494f4e_managed_psk
```


Quit the interactive mode of “connmanctl”.

```
connmanctl> quit
```

Test if wifi actually works.

```
root@edml-cf-imx6:~# ping www.google.com
PING www.google.com (203.66.124.251): 56 data bytes
64 bytes from 203.66.124.251: seq=0 ttl=59 time=4.905 ms
64 bytes from 203.66.124.251: seq=1 ttl=59 time=12.278 ms
64 bytes from 203.66.124.251: seq=2 ttl=59 time=4.307 ms
```

For the next boot, connman will automatically connect to the hotspot you used before.

Clean the stored settings of hotspot.

```
root@edml-cf-imx6:~# rm /var/lib/connman/*/settings
```

Switch on/off wifi.

```
root@edml-cf-imx6:~# connmanctl disable wifi
Disabled wifi
```

```
root@edml-cf-imx6:~# connmanctl enable wifi
Enabled wifi
```

Test bluetooth:

Make sure bluetooth device for testing is able to be scanned.

Load bluetooth firmware into BT chip via UART and need to wait 5~10 sec to complete.

For EDM1-CF-IMX6:

```
root@edml-cf-imx6:~# brcm_patchram_plus --timeout=6.0 \
--patchram /lib/firmware/brcm/bcm4330.hcd --baudrate 3000000 --no2bytes --tosleep=2000 \
--enable_hci /dev/ttymx2 &
```

For EDM1-CF-IMX6P/EDM1-CF-IMX6QP:

```
root@edml-cf-imx6:~# brcm_patchram_plus --timeout=6.0 \
--patchram /lib/firmware/brcm/bcm4339a0.hcd --baudrate 3000000 --no2bytes \
--tosleep=2000 --enable_hci /dev/ttymx2 &
```

For EDM1-CF-IMX6SX:

```
root@edm-goblin-imx6sx:~# brcm_patchram_plus --timeout=6.0 \
--patchram /lib/firmware/brcm/bcm4330.hcd --baudrate 3000000 --no2bytes --tosleep=2000 \
--enable_hci /dev/ttymx5 &
```

For PICO-IMX6:

```
root@pico-imx6:~# brcm_patchram_plus --timeout=6.0 \  
--patchram /lib/firmware/brcm/bcm4339a0.hcd --baudrate 3000000 --no2bytes \  
--tosleep=2000 --enable_hci /dev/ttymxcl &
```

For PICO-IMX6UL:

```
root@pico-imx6:~# brcm_patchram_plus --timeout=6.0 \  
--patchram /lib/firmware/brcm/bcm4339a0.hcd --baudrate 3000000 --no2bytes \  
--tosleep=2000 --enable_hci /dev/ttymxcl &
```

Check if interface “hci” device node exist.

```
root@edml-cf-imx6:~# hciconfig -a  
hci0: Type: BR/EDR Bus: UART  
BD Address: 43:30:A0:00:00:00 ACL MTU: 1021:8 SCO MTU: 64:1  
DOWN  
RX bytes:574 acl:0 sco:0 events:27 errors:0  
TX bytes:411 acl:0 sco:0 commands:27 errors:0  
Features: 0xbf 0xfe 0xcf 0xfe 0xdb 0xff 0x7b 0x87  
Packet type: DM1 DM3 DM5 DH1 DH3 DH5 HV1 HV2 HV3  
Link policy: RSWITCH SNIFF  
Link mode: SLAVE ACCEPT
```

Bring hci interface up.

```
root@edm-fairy-imx6:~# hciconfig hci0 up
```

Scan the bluetooth device.

```
root@edm-fairy-imx6:~# hcitool -i hci0 scan  
Scanning ...  
00:1F:20:7E:21:6C Logitech Bluetooth Mouse M555b
```

9. Switch audio output

The default audio output for HDMI pre-built image is HDMI audio and for LVDS pre-built image is SGTL5000.

List the available audio output sink in the system.

```
root@edm-fairy-imx6:~# LANG=C pactl list sinks | grep 'Name: ' | cut -d" " -f2
alsa_output.platform-sound-hdmi.analog-stereo
alsa_output.platform-sound-spdif.analog-stereo
alsa_output.platform-sound.analog-stereo
```

For EDM1-CF-IMX6/EDM1-CF-IMX6P/EDM1-CF-IMX6QP:

Set audio output to HDMI.

```
pacmd set-default-sink alsa_output.platform-sound-hdmi.analog-stereo
```

Set audio output to SGTL5000 audio codec.

```
pacmd set-default-sink alsa_output.platform-sound.analog-stereo
```

Set audio output to SPDIF.

```
pacmd set-default-sink alsa_output.platform-sound-spdif.analog-stereo
```

Play sound.

```
gst-launch-1.0 filesrc location=/usr/share/qt5everywheredemo-\
1.0/qml/QtDemo/demos/maroon/content/audio/bomb-action.wav ! decodebin ! pulsesink
```

For PICO-IMX6:

Set audio output to HDMI.

```
pacmd set-default-sink alsa_output.platform-sound-hdmi.analog-stereo
```

Set audio output to SGTL5000 audio codec.

```
pacmd set-default-sink alsa_output.platform-sound.analog-stereo
```

Play sound.

```
gst-launch-1.0 filesrc location=/usr/share/qt5everywheredemo-\
1.0/qml/QtDemo/demos/maroon/content/audio/bomb-action.wav ! decodebin ! pulsesink
```

For TEK3-IMX6/TEP-IMX6:

Set audio output to HDMI.

```
pacmd set-default-sink alsa_output.platform-sound-hdmi.analog-stereo
```

Set audio output to SGTL5000 audio codec.

```
pacmd set-default-sink alsa_output.platform-sound.analog-stereo
```

Play sound.

```
gst-launch-1.0 filesrc location=/usr/share/qt5everywheredemo-\
1.0/qml/QtDemo/demos/maroon/content/audio/bomb-action.wav ! decodebin ! pulsesink
```

For EDM1-CF-IMX6SX:

Set audio output to SGTL5000 audio codec.

```
pacmd set-default-sink alsa_output.platform-sound.analog-stereo
```

Set audio output to SPDIF.

```
pacmd set-default-sink alsa_output.platform-sound-spdif.analog-stereo
```

Play sound.

```
gst-launch-1.0 filesrc location=/usr/share/qt5everywheredemo-\
1.0/qml/QtDemo/demos/maroon/content/audio/bomb-action.wav ! decodebin ! pulsesink
```

For PICO-IMX6UL-HOBBIT:

PICO-IMX6UL-HOBBIT only can only output to SGTL5000 audio codec:

Play sound.

```
gst-launch-1.0 filesrc location=./unit_tests/audio8k16S.wav ! decodebin ! pulsesink
```

Save change of the audio output settings permanently:

The audio settings for output are in the bottom of /etc/pulse/default.pa.

Please edit audio output settings manually.

For EDM1-CF-IMX6/EDM1-CF-IMX6P/EDM1-CF-IMX6QP:

```
vi /etc/pulse/default.pa
```

```
set-default-sink alsa_output.platform-sound.analog-stereo
```

For PICO-IMX6:

```
vi /etc/pulse/default.pa
```

```
set-default-sink alsa_output.platform-sound.analog-stereo
```

For TEK3-IMX6/TEP-IMX6:

```
vi /etc/pulse/default.pa
```

```
set-default-sink alsa_output.platform-sound.analog-stereo
```

For EDM1-CF-IMX6SX:

```
vi /etc/pulse/default.pa
```

```
set-default-sink alsa_output.platform-sound.analog-stereo
```

10. Adjust backlight for LVDS panel

For EDM1-CF-IMX6/EDM1-CF-IMX6P/EDM1-CF-IMX6QP:

Brightness is from 0 to 7.

```
echo 0 > /sys/class/backlight/backlight_lvds/brightness
```

For EDM1-CF-IMX6SX:

Brightness is from 0 to 7.

```
echo 0 > /sys/class/backlight/backlight2.16/brightness
```

For PICO-IMX6:

Brightness is from 0 to 7.

```
echo 0 > /sys/class/backlight/backlight_lvds/brightness
```

For PICO-IMX6UL-HOBBIT:

Brightness is from 0 to 7.

```
echo 0 > /sys/class/backlight/backlight/brightness
```

11. Test MIPI camera

```
gst-launch-1.0 imxv4l2src device=/dev/video0 ! 'video/x-raw, \
format=(string)UYVY,width=640,height=480,framerate=(fraction)30/1' ! imxv4l2sink
```

Note:

EDM1-CF-IMX6SX and PICO-IMX6UL don't support MIPI camera.

12. Set up WIFI in AP mode

Load wifi driver and set it up in AP mode.

```
modprobe bcmdhd op_mode=2
```

Expeced message:

```
dhd_module_init in
Power-up adapter 'DHD generic adapter'
wifi_platform_bus_enumerate device present 1
mmc1: queuing unknown CIS tuple 0x80 (2 bytes)
mmc1: queuing unknown CIS tuple 0x80 (3 bytes)
mmc1: queuing unknown CIS tuple 0x80 (3 bytes)
mmc1: queuing unknown CIS tuple 0x80 (7 bytes)
mmc1: queuing unknown CIS tuple 0x80 (11 bytes)
mmc1: new high speed SDIO card at address 0001
F1 signature OK, socitype:0x1 chip:0x4330 rev:0x4 pkg:0x0
DHD: dongle ram size is set to 294912(orig 294912) at 0x0
```

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```
wifi_platform_get_mac_addr
fw path is /lib/firmware/brcm/fw_bcm4330_apsta_bg.bin
nvram_path is /lib/firmware/brcm/brcmfmac4330-sdio.txt
CFG80211-ERROR) wl_setup_wiphy : Registering Vendor80211)
wl_create_event_handler(): thread:wl_event_handler:41b started
CFG80211-ERROR) wl_event_handler : tsk Enter, tsk = 0xa97c143c
dhd_attach(): thread:dhd_watchdog_thread:41c started
dhd_attach(): thread:dhd_dpc:41d started
dhd_deferred_work_init: work queue initialized
fw path is /lib/firmware/brcm/fw_bcm4330_apsta_bg.bin
nvram_path is /lib/firmware/brcm/brcmfmac4330-sdio.txt
dhdsdio_write_vars: Download, Upload and compare of NVRAM succeeded.
dhd_bus_init: enable 0x06, ready 0x06 (waited 0us)
wifi_platform_get_mac_addr
Firmware up: op_mode=0x0002, MAC=44:39:c4:9e:5b:5e
dhd_preinit_ioctls buf_key_b4_m4 set failed -23
Firmware version = wl0: Jan 23 2013 17:47:42 version 5.90.195.114 FWID 01-73201c1f
dhd_preinit_ioctls wl_ampdu_hostreorder failed -23
dhd_wlfc_init(): successfully enabled bdev2 tlv signaling, 79
dhd_wlfc_init(): wlfc_mode=0x0, ret=-23

Dongle Host Driver, version 1.141.88 (r)
Compiled from
Register interface [wlan0] MAC: 44:39:c4:9e:5b:5e
```

Disable network manager - connman.

```
pkill connman
```

Connect ethernet cable and get IP from DHCP server.

```
udhcpc -i eth0
```

Expeced message:

```
udhcpc (v1.22.1) started
Sending discover...
Sending select for 10.20.30.168...
Lease of 10.20.30.168 obtained, lease time 86400
/etc/udhcpc.d/50default: Adding DNS 10.20.80.127
/etc/udhcpc.d/50default: Adding DNS 8.8.8.8
/etc/udhcpc.d/50default: Adding DNS 168.95.192.1
```

Create hotspot with WPA + WPA2 passphrase.

```
create_ap --no-virt wlan0 eth0 MyAccessPoint MyPassPhrase &
```

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For example:

```
create_ap --no-virt wlan0 eth0 SAP 12345678 &
```

Expeced message:

```
Config dir: /tmp/create_ap.wlan0.conf.6kHrAjKg
PID: 1116
dhd_ndo_remove_ip: ndo ip addr remove failed, retcode = -23
dhd_inet6_work_handler: Removing host ip for NDO failed -23
dhd_ndo_add_ip: ndo ip addr add failed, retcode = -23
dhd_inet6_work_handler: Adding host ip for NDO failed -23
Sharing Internet using method: nat
hostapd command-line interface: hostapd_cli -p
/tmp/create_ap.wlan0.conf.6kHrAjKg/hostapd_ctrl
Configuration file: /tmp/create_ap.wlan0.conf.6kHrAjKg/hostapd.conf
CFG80211-ERROR) wl_cfg80211_del_station : Disconnect STA : ff:ff:ff:ff:ff:ff scb_val.val 3
Using interface wlan0 with hwaddr 94:a1:a2:4a:90:28 and ssid "SAP"
Low entropy detected, starting haveged
CFG80211-ERROR) wl_cfg80211_set_channel : netdev_ifidx(4), chan_type(1) target channel(1)
CFG80211-ERROR) wl_cfg80211_parse_ies : No WPSIE in beacon
CFG80211-ERROR) wl_cfg80211_parse_ies : No WPSIE in beacon
wlan0: interface state UNINITIALIZED->ENABLED
wlan0: AP-ENABLED
```

13. Run QT5 on imx6UL

Because i.mx6UL is lack of GPU. QT is supported for i.mx6UL with framebuffer backend instead of X-window.

Run QT application on “imx6UL framebuffer pre-built image”:

```
cd /usr/share/qt5/examples/
widgets/widgets/analogclock/analogclock --platform linuxfb
touch/dials/dials --platform linuxfb
touch/fingerpaint/fingerpaint --platform linuxfb
```