BSP Yocto FSL iMX7 PD18.2.0 Release Notes

Operating System	Linux
BSP Release Status	RELEASED
Release Date	06 Aug 2018
Repository	PHYTEC Public Repos
Binaries	BSP-Yocto-FSL-iMX7-PD18.2.0

Introduction

This BSP provides a basis for development, deployment and execution of Linux based applications on the iMX7 System on Module (SOM). For detailed information on the various software components included in the release and how to use them, please refer to the Quickstart.

Versioning

Software

Linux Kernel	4.9.11 (Based on NXP Release L4.9.11_1.0.0_ga)	PHYTEC Source Repo
U-Boot	2017.03 (Based on NXP Release L4.9.11_1.0.0_ga)	PHYTEC Source Repo
Yocto	2.2 Morty (Based on NXP Release L4.9.11_1.0.0_ga)	PHYTEC Source Repo
Qt	Not Supported (Click here for more info)	
Host OS	Tested on 64-bit Ubuntu 16.04 LTS	Ubuntu 16.04 Release

Yocto Machine Configuration Table

This BSP release supports various configurations of the phyBOARD-Zeta i.MX7. **You will need to know which Yocto machine configuration corresponds to your kit in order to build the appropriate BSP**. By default, only the standard kit configurations are shown in the table. If you have a different kit, use the filters below to search by Kit Part Number or SOM. The U-Boot defconfig and kernel device tree file names are important when creating custom U-Boot and kernel images outside of Yocto development.

Yocto Machine Config	Kit Part Number	SOM Part Number (Click here for description)	Modules	U-Boot defconfig	Kernel Device Tree File

imx7d-phyboard-zeta-001	PB-01910-001 (i.MX7Dual Kit)	PCM-061-2110111C	PEB-EVAL-02 PEB-AV-02	mx7d_pcm061_21x_config	imx7d-phyboard-zeta-001.dtb
imx7s-phyboard-zeta-002	PB-01910-002 (i.MX7Solo Kit)	PCM-061-0502100E	PEB-EVAL-02	mx7s_pcm061_05x_config	imx7s-phyboard-zeta-002.dtb
imx7d-phyboard-zeta-004	PB-01910-004 (i.MX7Dual Kit)	PCM-061-2110111C	PEB-D-RPI PEB-AV-02	mx7d_pcm061_21x_config	imx7d-phyboard-zeta-004.dtb

Linux Device Tree Summary

The following is an example describing the structure of the device tree for the standard phyBOARD-Zeta Kit (machine configuration imx7d-phyboard-zeta-004).

Please look at the dts file corresponding to your machine configuration for the included dtsi files.

Hardware Target	Device Tree File Descriptions	Filename
i.MX7D phyBOARD-Zeta (PB-01910-004)	**Default dts build target**	**imx7d-phyboard-zeta-004.dts**
	Processor	imx7d.dtsi (includes imx7s.dtsi)
	SOM (*Superset) - enables all SOM features.*	imx7-phycore-som.dtsi
	SOM Variant- *excludes features that are not supported by the BOM population options for PCM-061-2110111C.*	imx7d-pcm-061-2110111c.dtsi
	Carrier Board	imx7d-pba-c-09.dtsi (includes imx7s-pba-c-09.dtsi)
	LCD Display Adapter	imx7-peb-av-02.dtsi **OR** imx7-peb-av-06.dtsi
	Expansion Board	imx7-peb-d-rpi.dtsi

Alternate dts **imx7d-phyboard-zeta-004-m4.dtb:** configure u-boot to use this DTS if running Linux on the Cortex-A7 while running FreeRTOS on the Cortex-M4

Compatible Hardware

Supported Hardware Versions

Hardware Description	Part Number	Configuration Details (i.MX7 / DDR3 / eMMC or NAND / Ethernet PHY populated)	PCB Version
phyCORE-i.MX7 SOM	PCM-061-2110111C.A1	Dual / 1GB / 4GB eMMC / Yes	1458.2
	PCM-061-2110111C.A0		
	PCM-061-0502100E.A0	Solo / 256MB / 256MB NAND / No	
	PCM-061-2111101E.A0	Dual / 1GB / 4GB eMMC / No	
	PCM-061-2211101E.A0	Dual / 1GB / 8GB eMMC / No	
	PCM-061-2111111E.A0	Dual / 1GB / 4GB eMMC / Yes	
phyBOARD-Zeta Carrier Board	PBA-C-09.A5		1459.3
	PBA-C-09.A4		1459.2
	PBA-C-09-01.A0		1459.3

Device tree changes are required to support earlier SOM and Carrier Board revisions. Visit the PHYTEC Support Portal to open a support ticket for help on how to make the device tree changes.

Compatible Expansion Boards and Accessories

Module Name	Part Number	PCB Version	Description
PEB-D-RPI Expansion Board	PEB-D-RPI.A0	1503.0	Raspberry Pi HAT support plus: • UART1 (over USB) • JTAG • I2C EEPROM • Two user buttons and two user LEDs Connects to expansion header
LCD Display Adapter with 7" capacitive display	PEB-AV-02-070W.A0 (Includes AV module, display, and cable)	1415.1	ETM0700G0DH6 LCD Display/ Capacitive touch interface Connects to Audio/Video header
MIPI Expansion Board	PEB-AV-06.A1	1487.1	DSI display and CSI camera adapter supporting: • Camera OmniVision LI-OV5640-MIPI-AF • Display NXP TFT3P5581-E Connects to MIPI DSI connector on phyBOARD
WiFi/Bluetooth Module	PEB-WLBT-03-CA.A1	1478.1	LAIRD Sterling-LWB module Connects to phyBOARD expansion header

Supported Raspberry Pi HATs (PEB-D-RPI Expansion Board)

PHYTEC supports a variety of Raspberry Pi HATs for use with the PEB-D-RPI Expansion Board. Other HATs may be hardware-compatible but have not yet been integrated and tested by PHYTEC. Demos and tests for supported HATs have been installed to the BSP file system, and are located in the */usr /share/phytec-rpihat-examples* directory.

The following table lists supported Raspberry Pi HATs and the name of the subdirectory (relative to the *phytec-rpihat-examples* directory) that contains the demos for each HAT:

Raspberry Pi HAT	Demo Subdirectory
Raspberry Pi Sense HAT	sense-hat
Pimoroni Unicorn HD HAT	unicorn-hd-hat
Pimoroni Skywriter HAT	skywriter-hat
Anavi RabbitMax Flex HAT	flex-hat
Adafruit Capacitive Touch HAT	capacitive-touch-hat
Adafruit DC & Stepper Motor HAT	motor-hat
Adafruit 16-channel PWM/Servo HAT	servo-hat

BSP Download

Prebuilt images of BSP-Yocto-FSL-iMX7-PD18.2.0 can be downloaded and extracted from the link below:

BSP-Yocto-FSL-iMX7-PD18.2.0

Quickstart

Quickstarts for BSP-Yocto-FSL-iMX7-PD18.2.0:

BSP Yocto FSL i.MX7 PD18.2.x Quickstart

BSP Features

The following table lists the interfaces available from the phyCORE-iMX7 SOM.

- **Implemented** - driver support exists in the kernel.
- **Tested** - the interface has been configured in the device tree and was tested by PHYTEC
- **Status in Device Tree** - the corresponding device tree nodes are enabled in the device tree. See Linux Device Tree Summary for more information.

> ⚠ The "Status in Device Tree" column is specifically for the standard phyBOARD-Zeta kit (machine configuration imx7d-phyboard-zeta-004).
>
> Please look at the dts file corresponding to your machine configuration for differences.

Interface	Detail	Implemented	Tested	Status in Device Tree	Notes
UART	uart1	Yes	Yes	Okay	Micro-USB B connector on PEB-D-RPI
	uart2	Yes	Yes	Disabled	Micro-USB B connector on PEB-D-RPI Disabled for use as serial console on Cortex-M4 FreeRTOS
	uart3	Yes	No	Disabled [1]	expansion header
	uart4	Yes	No	Disabled [1]	
	uart5	Yes	Yes	Okay	RS232 default serial console at Connector X2
	uart6	Yes	No	Disabled [1]	expansion header
	uart7	Yes	Yes	Okay	expansion header - Configured for BT on PEB-WLBT-03
I2C	i2c1	Yes	Yes	Okay	expansion header
	i2c2	Yes	Yes	Okay	AV Connector X4
	i2c3	Yes	No	Disabled [1]	
	i2c4	Yes	Yes	Okay	expansion header Used for PEB-D-RPI expansion board HAT detection
Ethernet	RGMII1	Yes	Yes	Okay	KSZ9031RNX PHY on SOM, Connector X8
	RGMII2	Yes	Yes	Okay	KSZ9031RNX PHY on CarrierBoard, Connector X7
SAI	sai1	Yes	No	Disabled [1]	Audio/Video Connector X4
	sai2	Yes	No	Disabled [1]	expansion header
	sai3	Yes	No	Disabled [1]	
MMC/SDIO	SD1	Yes	Yes	Yes	microSD slot connector X11
	SD2	Yes	No	Disabled [1]	expansion header
	SD3	Yes	Yes	Okay	signals routed to eMMC.
Communication	MultiCore Communication with Cortex-M4 (RPMsg)	Yes	Yes	Okay	See FreeRTOS release for more info.
	Laird Sterling LWB Bluetooth	Yes	No	Disabled	on PEB-WLBT-03. See Not Tested section for details
	Laird Sterling LWB WiFi	Yes	No	Disabled	on PEB-WLBT-03. See Not Tested section for details
USB	usb1	Yes	Yes	Okay	USB-A Host Connector X9
	usb2	Yes	Yes	Okay	USB-AB OTG Connector X10
	usbh (HSIC)	Yes	Yes	Disabled	expansion header
CAN	can1	Yes	Yes	Okay	Header X1
	can2	Yes	No	Disabled [1]	
SPI	spi1	Yes	No	Disabled [1]	expansion header
	spi2	Yes	No	Disabled [1]	expansion header
	spi3	Yes	No	Disabled [1]	expansion header
	spi4	Yes	No	Disabled [1]	
ADC	adc1	Yes	Yes	Okay	expansion header
Parallel Display and Touch	Parallel LCD Display	Yes	Yes	Okay	via expansion board PEB-AV-02

	Analog LCD Touch	Yes	Yes	Okay	Capacitive ETM-FT5x06 via expansion board PEB-AV-02
	Backlight	Yes	Yes	Okay	PWM via pwm4 via expansion board PEB-AV-02
MIPI DSI/CSI	2-lane MIPI DSI Display	Yes	Yes	Disabled	Display TFT3P5581-E via expansion board PEB-AV-06
	2-lane MIPI CSI Camera	Yes	Yes	Disabled	LI-OV5640-MIPI-AF-16 via expansion board PEB-AV-06
GPIO	User Buttons and LEDs	Yes	Yes	Okay	User LED GPIO2_10 on CarrierBoard Two user LEDs and two buttons on PEB-D-RPI
Memory	8/16-bit NAND Flash (GPMC)	Yes	Yes	Disabled	MT29F4G08 - not populated in default SOM configuration
	SPI NOR Flash	Yes	Yes	Okay	N25Q128A on QSPI_A
	EEPROM on SOM	Yes	Yes	Okay	M24C32 on i2c1
	EEPROM on eval board	Yes	Yes	Okay	CAT24C32 on i2c4 PEB-D-RPI
	eMMC	Yes	Yes	Okay	On SD3 PCM-061.A0 -.A4 SOMs: MTFC4GMDEA-4M PCM-061-2110111C.A1: MTFC4GACAJCN-4M IT
RTC	Internal i.MX7	Yes	Yes	Okay	SNVS RTC
	External RTC	Yes	Yes	Okay	RV-4162-C7 on I2C1
Power Management	PMIC	Yes	Yes	Okay	PF3000 on I2C1
JTAG	JTAG				ARM JTAG 20 connector on PEB-D-RPI
PCIe	mini-pcie	Yes	Yes	Okay	connector X12

[1] Interface requires additional configuration, such as pinmuxing. It may be possible to change the software configuration to utilize this interface even if it is not being set in the board's default configuration. Please see NXP's i.MX7D Technical Reference Manual for more information on the various modes each pin can be muxed to.

New in this Release

PD18.2.0

- **General**
  - Support for connecting the following Raspberry Pi HATs to the PEB-D-RPI:
    - Raspberry Pi Foundation Sense HAT
    - Pimoroni Unicorn HD HAT
    - Pimoroni Skywriter HAT
    - Anavi RabbitMax Flex HAT
    - Adafruit Capacitive Touch HAT
    - Adafruit DC & Stepper Motor HAT
    - Adafruit 16-Channel PWM/Servo HAT
  - Created PHYTEC RPi.GPIO Python library to be a drop-in replacement for RPi.GPIO for supported Raspberry Pi HATs.

- **Linux**
  - **Device Tree Compiler**
    - **Version**: Upgraded to upstream v1.4.4
      - Version bump adds support for compiling device tree overlays used to support the Raspberry Pi HATs listed in General.
  - **Device Tree**
    - Created PEB-D-RPI expansion board dts file "imx7-peb-d-rpi.dtsi".
    - Moved the general contents of "imx7d-phyboard-zeta-001-m4.dts" and "imx7s-phyboard-zeta-002-m4.dtsi" to "imx7-phyboard-zeta-m4.dtsi" for inclusion with i.MX7 kit Cortex-M4 dts files. The dts files "imx7d-phyboard-zeta-001-m4.dts" and "imx7s-phyboard-zeta-002-m4.dts" updated to reflect this change.
    - Created device tree files for i.MX7 Dual-based kit imx7d-phyboard-zeta-004. These files are named "imx7d-phyboard-zeta-004.dts" and "imx7d-phyboard-zeta-004-m4.dts".
    - Added support for module PEB-AV-06 adapter for MIPI CSI and DSI interfaces
  - **Drivers**
    - Created phytec-hat driver to support the Raspberry Pi HATs listed in General.

- **Yocto**
  - **meta-phytec layer**
    - Created new machine for i.MX7 Dual Kit with PEB-D-RPI expansion board. The new machine name is imx7d-phyboard-zeta-004.
    - Created and added recipes to support the Raspberry Pi HATs listed in General.

Fixed in this Release

PD18.2.0

- N/A - see New in this Release for changes

Not Tested

- PEB-WLBT-03
  - Driver support for Laird Sterling LWB has not been tested with Linux v4.9.11
- Booting via network
- Qt5 - NXP includes "fsl-image-qt5" Yocto Image in the BSP but it is meant for i.MX SoCs with hardware graphics, and is not supported by NXP or PHYTEC for the i.MX7D.

Known Issues

PHYTEC Known Issues

- Ethernet:
  - iperf3 is included with the Morty Yocto BSP. With UDP, this command reports much lower bandwidth than expected when compared with iperf command.
- eMMC:
  - Flashing with U-Boot:
    - fsl-image-validation-imx-imx7d-phyboard-zeta-001.sdcard image is too large to be loaded into memory (1GB) from u-boot.
    - Workaround: Partition and flash eMMC from Linux instead. See Quickstart for instructions.
  - HS400 warnings/errors: configure eMMC to run at maximum 100MHz as a work around. See commit b8f6c1b7780 for more information.
- Linux IMX Busfreq driver:
  - Driver disabled by default due to impaired UART console functionality when the system is idle (Low frequency setpoint).
  - For dynamic bus frequency scaling and improved power consumption, the busfreq driver can be enabled in the device tree by removing the "fsl,freq_scaling_disabled" property in imx7-phycore-som.dtsi. It can also be controlled in Linux sysfs:

    ```
    echo 1 > /sys/bus/platform/drivers/imx_busfreq/soc\:busfreq/enable
    ```

- NAND:
  - 256MB NAND is too small to flash fsl-image-validation-imx filesystem. Booting from NAND was tested with core-image-minimal Yocto image, which is included with release binaries.

NXP Known Issues

See i.MX Linux Release Notes from NXP in L4.9.11_1.0.0 BSP Documentation

Technical Support

For further information or to report any problems, visit the PHYTEC Support Portal