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# **meta-raspberrypi Documentation**

*Release master*

**meta-raspberrypi contributors**

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Contents:



Yocto BSP layer for the Raspberry Pi boards - <http://www.raspberrypi.org/>.

Build Status Build Status Build Status  Gitter chat

## 1.1 Quick links

- Git repository web frontend: <https://github.com/agherzan/meta-raspberrypi>
- Mailing list (yocto mailing list): [yocto@yoctoproject.org](mailto:yocto@yoctoproject.org)
- Issues management (Github Issues): <https://github.com/agherzan/meta-raspberrypi/issues>
- Documentation: <http://meta-raspberrypi.readthedocs.io/en/latest/>

## 1.2 Description

This is the general hardware specific BSP overlay for the RaspberryPi device.

More information can be found at: <http://www.raspberrypi.org/> (Official Site)

The core BSP part of meta-raspberrypi should work with different OpenEmbedded/Yocto distributions and layer stacks, such as:

- Distro-less (only with OE-Core).
- Angstrom.
- Yocto/Poky (main focus of testing).

## 1.3 Dependencies

This layer depends on:

- URI: `git://git.yoctoproject.org/poky`
  - branch: master
  - revision: HEAD
- URI: `git://git.openembedded.org/meta-openembedded`
  - layers: meta-oe, meta-multimedia, meta-networking, meta-python
  - branch: master
  - revision: HEAD

## 1.4 Quick Start

1. `source poky/oe-init-build-env rpi-build`
2. Add this layer to `bblayers.conf` and the dependencies above
3. Set `MACHINE` in `local.conf` to one of the supported boards
4. `bitbake core-image-base`
5. `dd` to a SD card the generated `sdimg` file (use `xzcat` if `rpi-sdimg.xz` is used)
6. Boot your RPI.

## 1.5 Maintainers

- Andrei Gherzan <`andrei at gherzan.ro`>



### 2.1 Supported Machines

- raspberrypi
- raspberrypi0
- raspberrypi0-wifi
- raspberrypi2
- raspberrypi3
- raspberrypi3-64 (64 bit kernel & userspace)
- raspberrypi-cm (dummy alias for raspberrypi)
- raspberrypi-cm3 (dummy alias for raspberrypi2)

Note: The raspberrypi3 machines include support for Raspberry Pi 3B+.

### 2.2 Images

- rpi-test-image
  - Image based on core-image-base which includes most of the packages in this layer and some media samples.

For other uses it's recommended to base images on `core-image-minimal` or `core-image-base` as appropriate. The old image names (`rpi-hwup-image` and `rpi-basic-image`) are deprecated.

## 2.3 WiFi and Bluetooth Firmware

Be aware that the WiFi and Bluetooth firmware for the supported boards is not available in the base version of `linux-firmware` from OE-Core (poky). The files are added from Raspbian repositories in this layer's `bbappends` to that recipe. All machines define `MACHINE_EXTRA_RECOMMENDS` to include the required wireless firmware; `raspberrypi3` supports 3, 3B, and 3B+ and so include multiple firmware packages.

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## Optional build configuration

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There are a set of ways in which a user can influence different parameters of the build. We list here the ones that are closely related to this BSP or specific to it. For the rest please check: <http://www.yoctoproject.org/docs/latest/ref-manual/ref-manual.html>

### 3.1 Compressed deployed files

1. Overwrite IMAGE\_FSTYPES in local.conf
  - IMAGE\_FSTYPES = "tar.bz2 ext3.xz"
2. Overwrite SDIMG\_ROOTFS\_TYPE in local.conf
  - SDIMG\_ROOTFS\_TYPE = "ext3.xz"
3. Overwrite SDIMG\_COMPRESSION in local.conf
  - SDIMG\_COMPRESSION = "xz"

Accommodate the values above to your own needs (ex: ext3 / ext4).

### 3.2 GPU memory

- GPU\_MEM: GPU memory in megabyte. Sets the memory split between the ARM and GPU. ARM gets the remaining memory. Min 16. Default 64.
- GPU\_MEM\_256: GPU memory in megabyte for the 256MB Raspberry Pi. Ignored by the 512MB RP. Overrides gpu\_mem. Max 192. Default not set.
- GPU\_MEM\_512: GPU memory in megabyte for the 512MB Raspberry Pi. Ignored by the 256MB RP. Overrides gpu\_mem. Max 448. Default not set.
- GPU\_MEM\_1024: GPU memory in megabyte for the 1024MB Raspberry Pi. Ignored by the 256MB/512MB RP. Overrides gpu\_mem. Max 944. Default not set.

See: <https://www.raspberrypi.org/documentation/configuration/config-txt/memory.md>

### 3.3 Add purchased license codecs

To add you own licenses use variables `KEY_DECODE_MPG2` and `KEY_DECODE_WVC1` in `local.conf`. Example:

```
KEY_DECODE_MPG2 = "12345678"
KEY_DECODE_WVC1 = "12345678"
```

You can supply more licenses separated by comma. Example:

```
KEY_DECODE_WVC1 = "0x12345678,0xabcdabcd,0x87654321"
```

See: <https://www.raspberrypi.org/documentation/configuration/config-txt/codecllicence.md>

### 3.4 Disable overscan

By default the GPU adds a black border around the video output to compensate for TVs which cut off part of the image. To disable this set this variable in `local.conf`:

```
DISABLE_OVERSCAN = "1"
```

### 3.5 Disable splash screen

By default a rainbow splash screen is shown after the GPU firmware is loaded. To disable this set this variable in `local.conf`:

```
DISABLE_SPLASH = "1"
```

### 3.6 Boot delay

The Raspberry Pi waits a number of seconds after loading the GPU firmware and before loading the kernel. By default it is one second. This is useful if your SD card needs a while to get ready before Linux is able to boot from it. To remove (or adjust) this delay set these variables in `local.conf`:

```
BOOT_DELAY = "0"
BOOT_DELAY_MS = "0"
```

### 3.7 Set overclocking options

The Raspberry Pi can be overclocked. As of now overclocking up to the “Turbo Mode” is officially supported by the raspbery and does not void warranty. Check the `config.txt` for a detailed description of options and modes. The following variables are supported in `local.conf`: `ARM_FREQ`, `GPU_FREQ`, `CORE_FREQ`, `SDRAM_FREQ` and `OVER_VOLTAGE`.

Example official settings for Turbo Mode in Raspberry Pi 2:

```
ARM_FREQ = "1000"  
CORE_FREQ = "500"  
SDRAM_FREQ = "500"  
OVER_VOLTAGE = "6"
```

See: <https://www.raspberrypi.org/documentation/configuration/config-txt/overclocking.md>

## 3.8 HDMI and composite video options

The Raspberry Pi can output video over HDMI or SDTV composite (the RCA connector). By default the video mode for these is autodetected on boot: the HDMI mode is selected according to the connected monitor's EDID information and the composite mode is defaulted to NTSC using a 4:3 aspect ratio. Check the config.txt for a detailed description of options and modes. The following variables are supported in local.conf: HDMI\_FORCE\_HOTPLUG, HDMI\_DRIVE, HDMI\_GROUP, HDMI\_MODE, CONFIG\_HDMI\_BOOST, SDTV\_MODE, SDTV\_ASPECT and DISPLAY\_ROTATE.

Example to force HDMI output to 720p in CEA mode:

```
HDMI_GROUP = "1"  
HDMI_MODE = "4"
```

See: <https://www.raspberrypi.org/documentation/configuration/config-txt/video.md>

## 3.9 Video camera support with V4L2 drivers

Set this variable to enable support for the video camera (Linux 3.12.4+ required):

```
VIDEO_CAMERA = "1"
```

## 3.10 Enable offline compositing support

Set this variable to enable support for dispmanx offline compositing:

```
DISPMANX_OFFLINE = "1"
```

This will enable the firmware to fall back to off-line compositing of Dispmanx elements. Normally the compositing is done on-line, during scanout, but cannot handle too many elements. With off-line enabled, an off-screen buffer is allocated for compositing. When scene complexity (number and sizes of elements) is high, compositing will happen off-line into the buffer.

Heavily recommended for Wayland/Weston.

See: <http://wayland.freedesktop.org/raspberrypi.html>

## 3.11 Enable kgdb over console support

To add the kdbg over console (kgdboc) parameter to the kernel command line, set this variable in local.conf:

```
ENABLE_KGDB = "1"
```

## 3.12 Disable rpi boot logo

To disable rpi boot logo, set this variable in local.conf:

```
DISABLE_RPI_BOOT_LOGO = "1"
```

## 3.13 Boot to U-Boot

To have u-boot load kernel image, set in your local.conf:

```
RPI_USE_U_BOOT = "1"
```

This will select the appropriate image format for use with u-boot automatically. For further customisation the `KERNEL_IMAGETYPE` and `KERNEL_BOOTCMD` variables can be overridden to select the exact kernel image type (eg. `zImage`) and u-boot command (eg. `bootz`) to be used.

## 3.14 Image with Initramfs

To build an initramfs image:

- Set this 3 kernel variables (in `linux-raspberrypi.inc` for example)
  - `kernel_configure_variable BLK_DEV_INITRD y`
  - `kernel_configure_variable INITRAMFS_SOURCE ""`
  - `kernel_configure_variable RD_GZIP y`
- Set the yocto variables (in `linux-raspberrypi.inc` for example)
  - `INITRAMFS_IMAGE = "<a name for your initramfs image>"`
  - `INITRAMFS_IMAGE_BUNDLE = "1"`
- Set the meta-raspberrypi variable (in `raspberrypi.conf` for example)
  - `KERNEL_INITRAMFS = "-initramfs"`

## 3.15 Enable SPI bus

When using device tree kernels, set this variable to enable the SPI bus:

```
ENABLE_SPI_BUS = "1"
```

## 3.16 Enable I2C

When using device tree kernels, set this variable to enable I2C:

```
ENABLE_I2C = "1"
```

## 3.17 Enable PiTFT support

Basic support for using PiTFT screens can be enabled by adding below in local.conf:

- `MACHINE_FEATURES += "pitft"`
  - This will enable SPI bus and i2c device-trees, it will also setup framebuffer for console and x server on PiTFT.

NOTE: To get this working the overlay for the PiTFT model must be build, added and specified as well (dtoverlay= in config.txt).

Below is a list of currently supported PiTFT models in meta-raspberrypi, the modelname should be added as a MACHINE\_FEATURES in local.conf like below:

```
MACHINE_FEATURES += "pitft <modelname>"
```

List of currently supported models:

- pitft22
- pitft28r
- pitft35r

## 3.18 Misc. display

If you would like to use the Waveshare “C” 1024×600, 7 inch Capacitive Touch Screen LCD, HDMI interface (<http://www.waveshare.com/7inch-HDMI-LCD-C.htm>) Rev 2.1, please set the following in your local.conf:

```
WAVESHARE_1024X600_C_2_1 = "1"
```

## 3.19 Enable UART

RaspberryPi 0, 1, 2 and CM will have UART console enabled by default.

RaspberryPi 0 WiFi and 3 does not have the UART enabled by default because this needs a fixed core frequency and enable\_uart will set it to the minimum. Certain operations - 60fps h264 decode, high quality deinterlace - which aren't performed on the ARM may be affected, and we wouldn't want to do that to users who don't want to use the serial port. Users who want serial console support on RaspberryPi3 will have to explicitly set in local.conf:

```
ENABLE_UART = "1"
```

Ref.:

- <https://github.com/raspberrypi/firmware/issues/553>
- <https://github.com/RPi-Distro/repo/issues/22>

## 3.20 Enable USB Peripheral (Gadget) support

The standard USB driver only supports host mode operations. Users who want to use gadget modules like g\_ether should set the following in local.conf:

```
ENABLE_DWC2_PERIPHERAL = "1"
```

## 3.21 Enable Openlabs 802.15.4 radio module

When using device tree kernels, set this variable to enable the 802.15.4 hat:

```
ENABLE_AT86RF = "1"
```

See: <https://openlabs.co/OSHW/Raspberry-Pi-802.15.4-radio>

## 3.22 Manual additions to config.txt

The `RPI_EXTRA_CONFIG` variable can be used to manually add additional lines to the `config.txt` file if there is not a specific option above for the configuration you need. To add multiple lines you must include `\n` separators. If double-quotes are needed in the lines you are adding you can use single quotes around the whole string.

For example, to add a comment containing a double-quote and a configuration option:

```
RPI_EXTRA_CONFIG = ' \n \  
    # Raspberry Pi 7\" display/touch screen \n \  
    lcd_rotate=2 \n \  
'
```



#### 4.1 omxplayer

omxplayer depends on libav which has a commercial license. So in order to be able to compile omxplayer you will need to whitelist the commercial license in your local.conf:

```
LICENSE_FLAGS_WHITELIST = "commercial"
```



## 5.1 Mailing list

The main communication tool we use is a mailing list:

- [yocto@yoctoproject.org](mailto:yocto@yoctoproject.org)
- <https://lists.yoctoproject.org/listinfo/yocto>

Feel free to ask any kind of questions but always prepend your email subject with “[meta-raspberrypi]”. This is because we use the ‘yocto’ mailing list and not a particular ‘meta-raspberrypi’ mailing list.

## 5.2 Patches and pull requests

All the contributions should be compliant with the openembedded patch guidelines: [http://www.openembedded.org/wiki/Commit\\_Patch\\_Message\\_Guidelines](http://www.openembedded.org/wiki/Commit_Patch_Message_Guidelines)

To contribute to this project you should send pull requests to the github mirror (<https://github.com/agherzan/meta-raspberrypi>). **Additionally** you can send the patches for review to the above specified mailing list.

When creating patches for the mailing list, please use something like:

```
git format-patch -s --subject-prefix='meta-raspberrypi' [PATCH] origin
```

When sending patches to the mailing list, please use something like:

```
git send-email --to yocto@yoctoproject.org <generated patch>
```

## 5.3 Github issues

In order to manage and trace the meta-raspberrypi issues, we use github issues: <https://github.com/agherzan/meta-raspberrypi/issues>

If you push patches which have a github issue associated, please provide the issue number in the commit log just before “Signed-off-by” line(s). Example line for a bug: `[Issue #13]`

## CHAPTER 6

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### Indices and tables

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- `genindex`
- `modindex`
- `search`