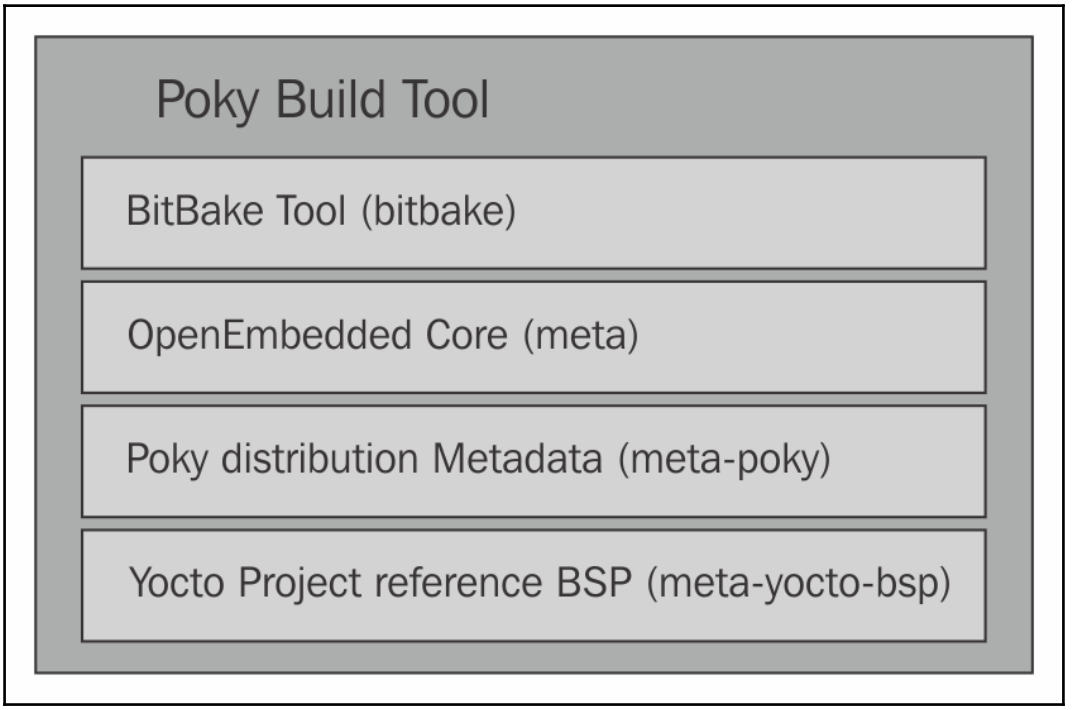
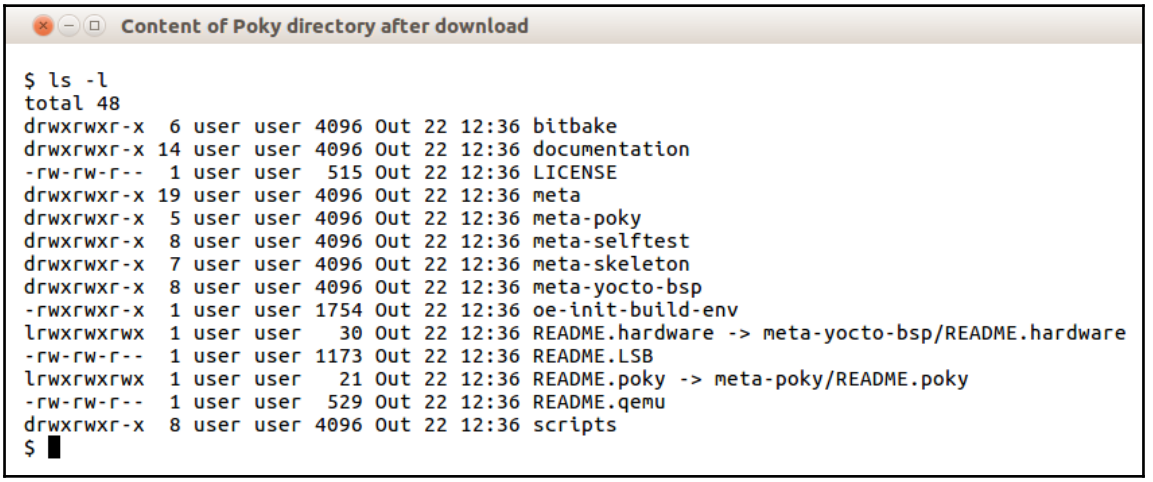
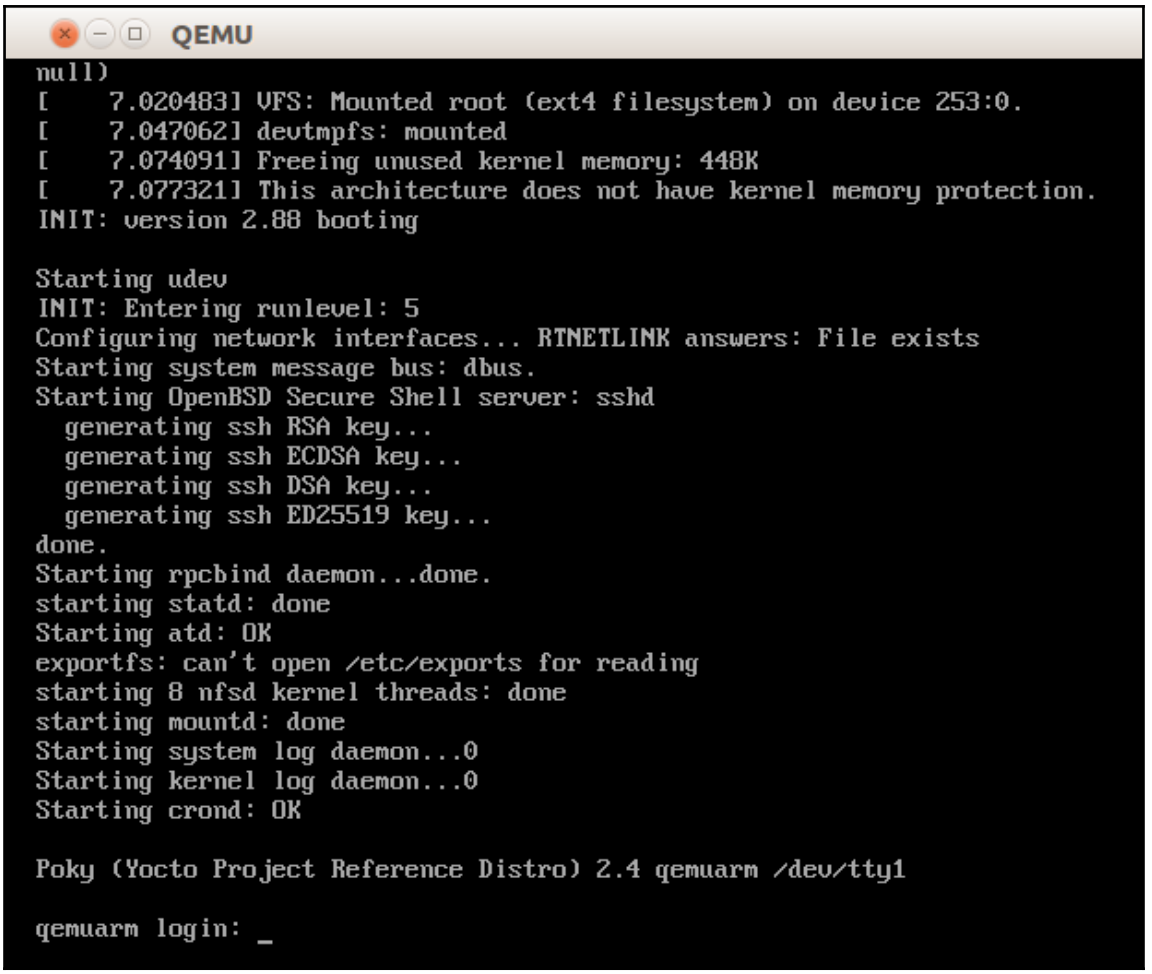
Chapter 1: Meeting the Yocto Project

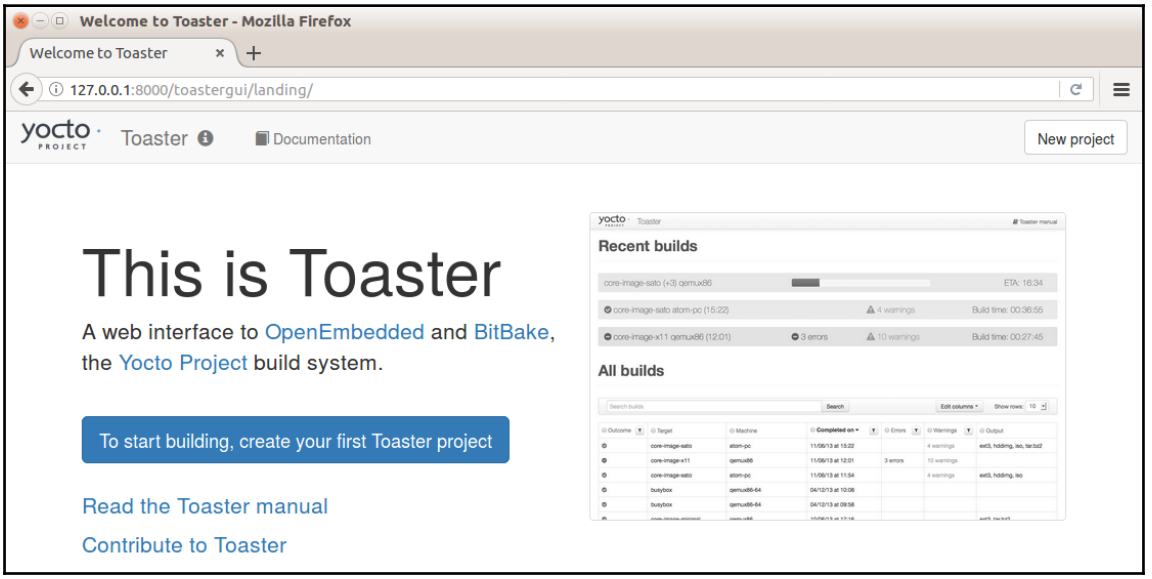


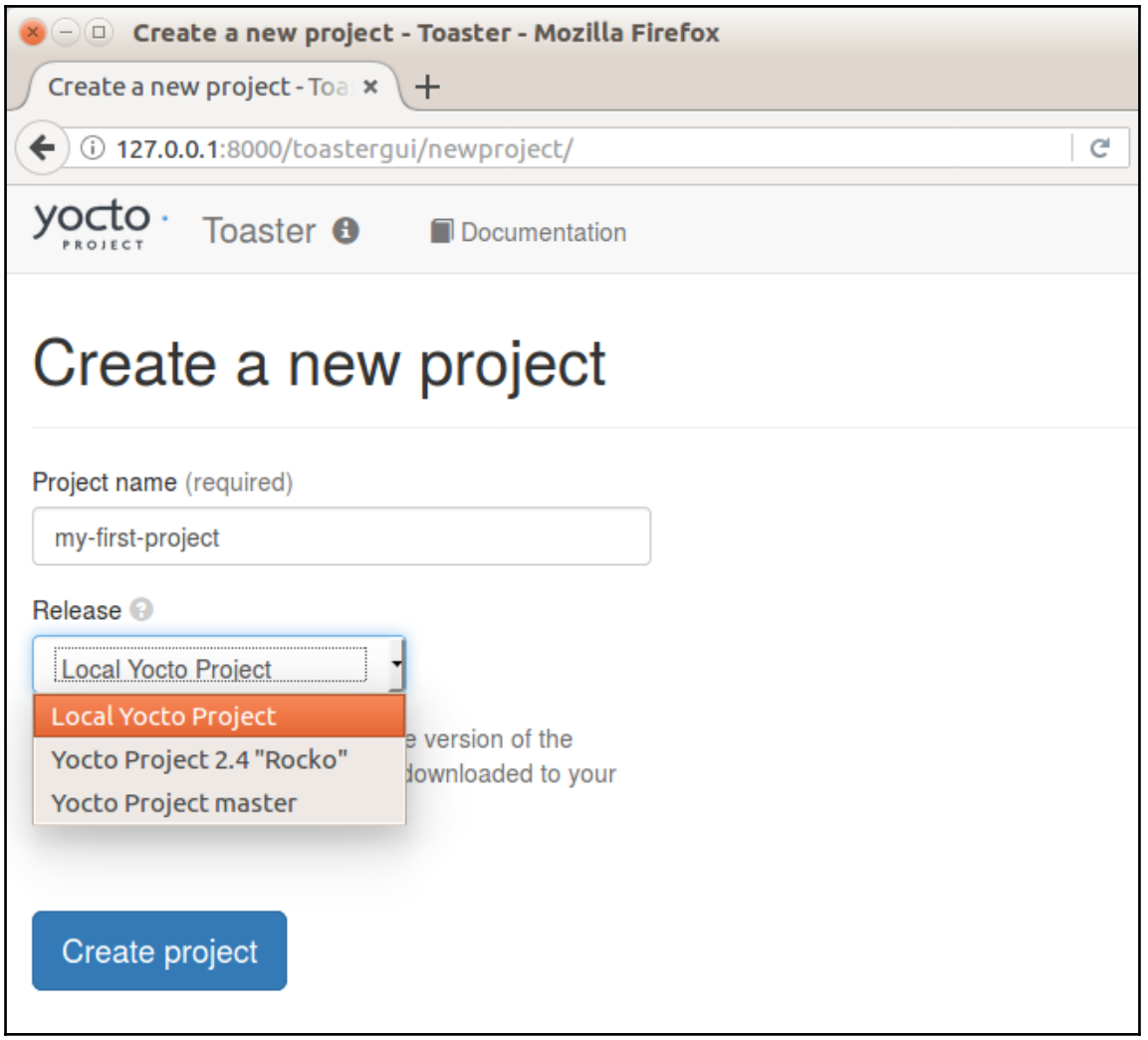
Chapter 2: Baking Our Poky Based System

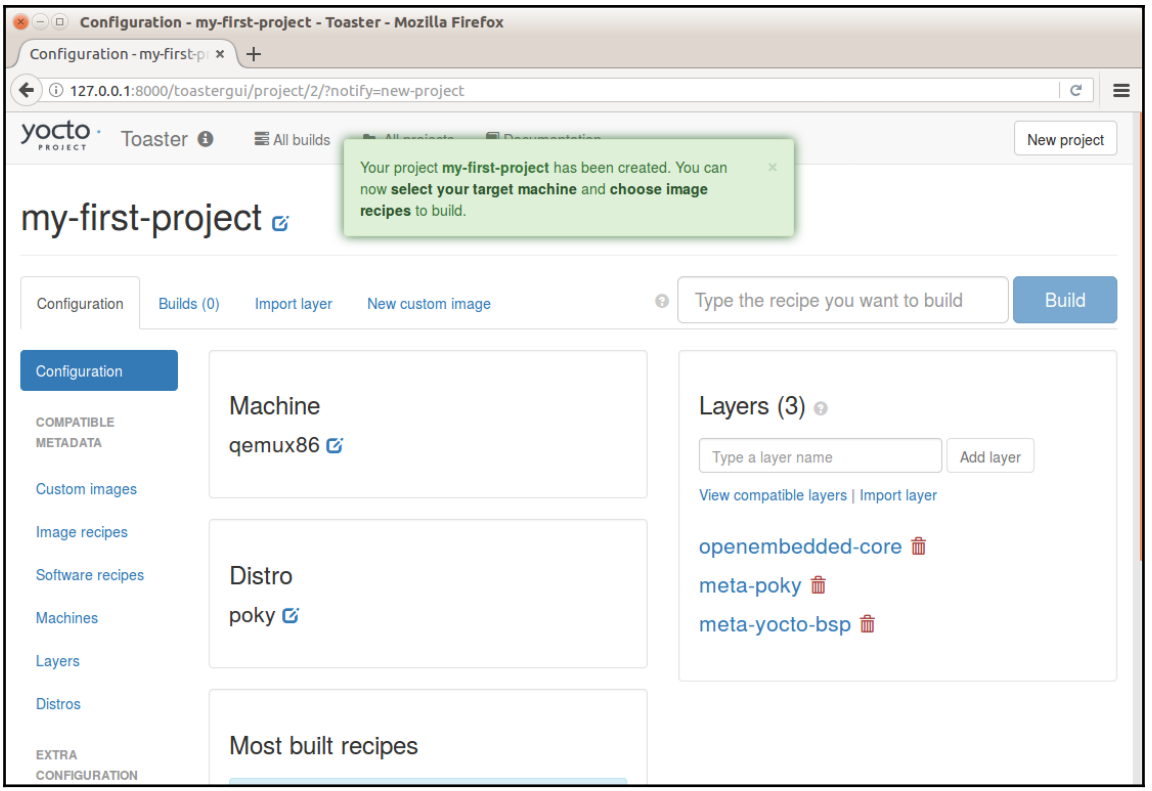


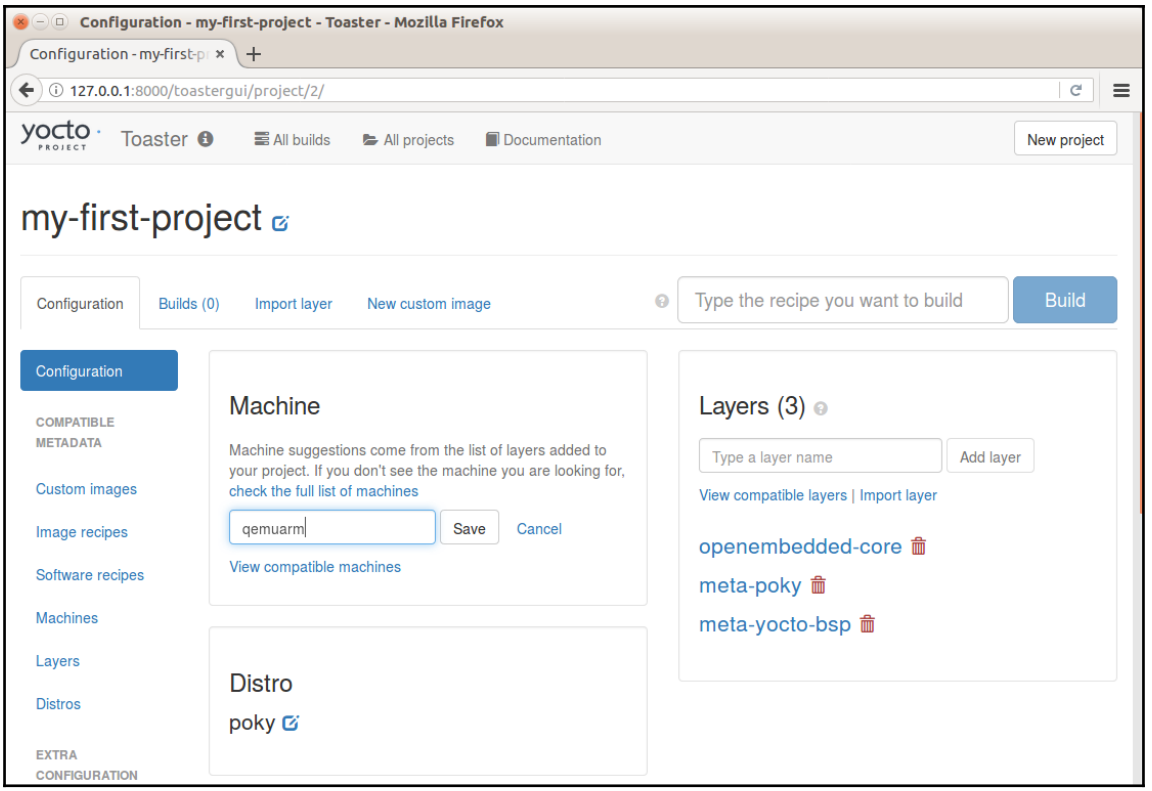

QEMU
null)
[7.020483] VFS: Mounted root (ext4 filesystem) on device 253:0.
[7.047062] devtmpfs: mounted
[7.074091] Freeing unused kernel memory: 448K
[7.077321] This architecture does not have kernel memory protection.
INIT: version 2.88 booting
Starting udev
INIT: Entering runlevel: 5
Configuring network interfaces... RTNETLINK answers: File exists
Starting system message bus: dbus.
Starting OpenBSD Secure Shell server: sshd
generating ssh RSA key...
generating ssh ECDSA key...
generating ssh DSA key...
generating ssh ED25519 key...
done.
Starting rpcbind daemon...done.
starting statd: done
Starting atd: OK
exportfs: can't open /etc/exports for reading
starting 8 nfsd kernel threads: done
starting mountd: done
Starting system log daemon...0
Starting kernel log daemon...0
Starting crond: OK
Poky (Yocto Project Reference Distro) 2.4 qemuarm /dev/tty1
qemuarm login: _

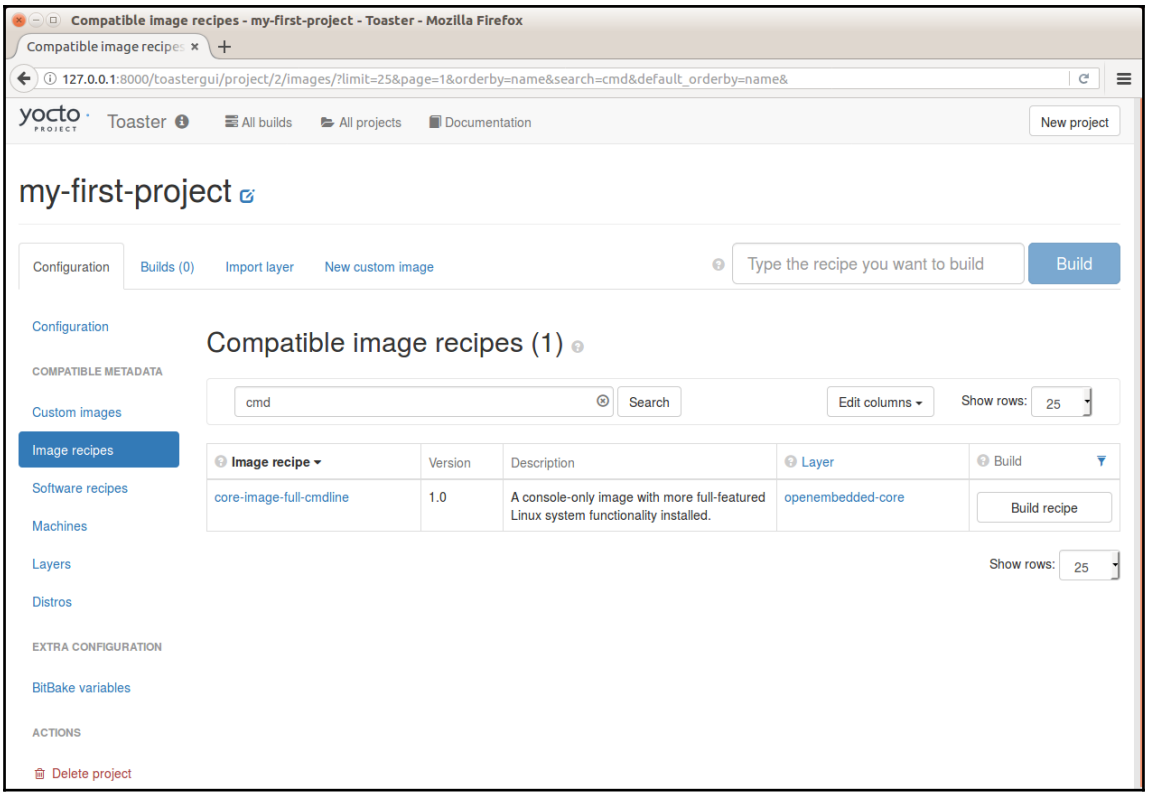
Chapter 3: Using Toaster to Bake an Image

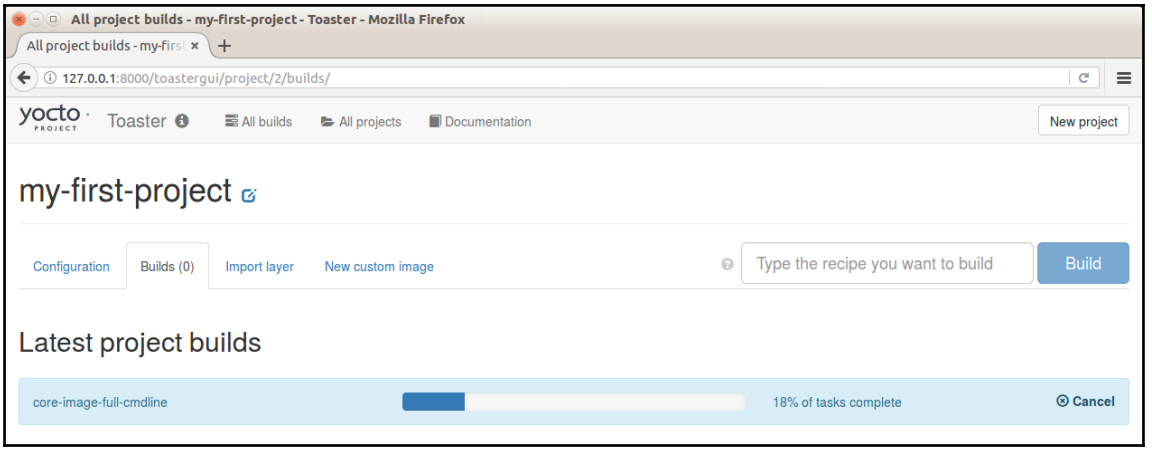


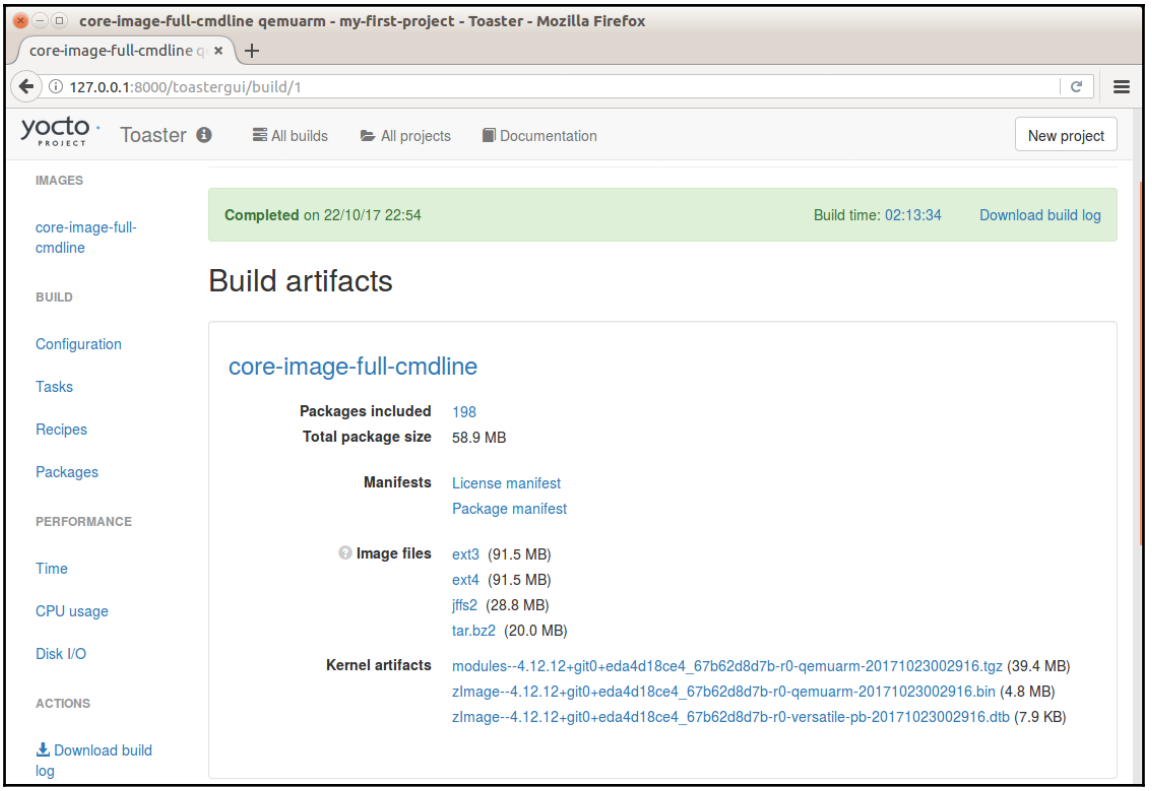

Create a new project - Toaster - Mozilla Firefox
Create a new project - Toa
127.0.0.1:8000/toastergui/newproject/
yocto PROJECT
Toaster
Documentation
Create a new project
Project name (required)
my-first-project
Release
Local Yocto Project
Local Yocto Project
Yocto Project 2.4 "Rocko"
Yocto Project master
e version of the
downloaded to your
Create project

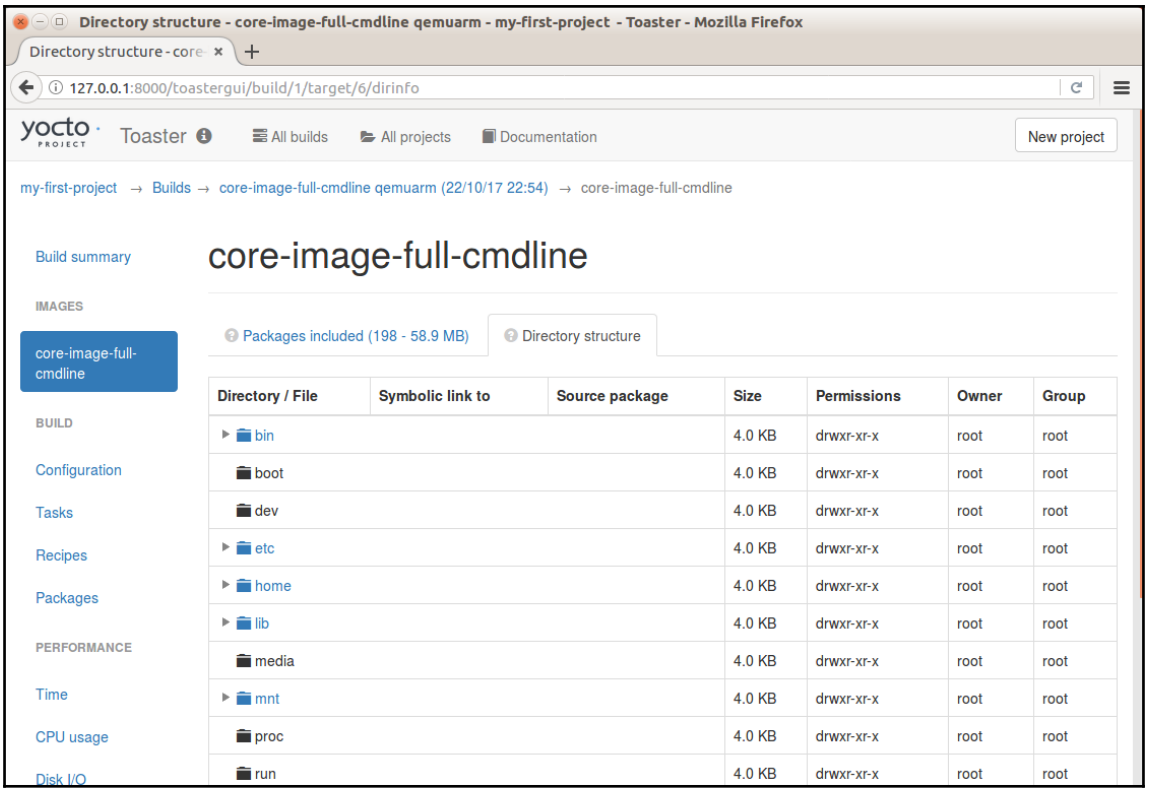

Configuration - my-first-project - Toaster - Mozilla Firefox
Configuration - my-first-p
127.0.0.1:8000/toastergui/project/2/?notify=new-project
yocto PROJECT
Toaster
All builds
New project
Your project my-first-project has been created. You can now select your target machine and choose image recipes to build.
my-first-project
Configuration
Builds (0)
Import layer
New custom image
Type the recipe you want to build
Build
Configuration
COMPATIBLE METADATA
Custom images
Image recipes
Software recipes
Machines
Layers
Distros
EXTRA CONFIGURATION
Machine
qemux86
Distro
poky
Most built recipes
Layers (3)
Type a layer name
Add layer
View compatible layers | Import layer
openembedded-core
meta-poky
meta-yocto-bsp


Configuration - my-first-project - Toaster - Mozilla Firefox
Configuration - my-first-p
127.0.0.1:8000/toastergui/project/2/
yocto PROJECT
Toaster
All builds
All projects
Documentation
New project
my-first-project
Configuration
Builds (0)
Import layer
New custom image
Type the recipe you want to build
Build
Configuration
COMPATIBLE METADATA
Custom images
Image recipes
Software recipes
Machines
Layers
Distros
EXTRA CONFIGURATION
Machine
Machine suggestions come from the list of layers added to your project. If you don't see the machine you are looking for, check the full list of machines
qemuarm
Save
Cancel
View compatible machines
Distro
poky
Layers (3)
Type a layer name
Add layer
View compatible layers | Import layer
openembedded-core
meta-poky
meta-yocto-bsp

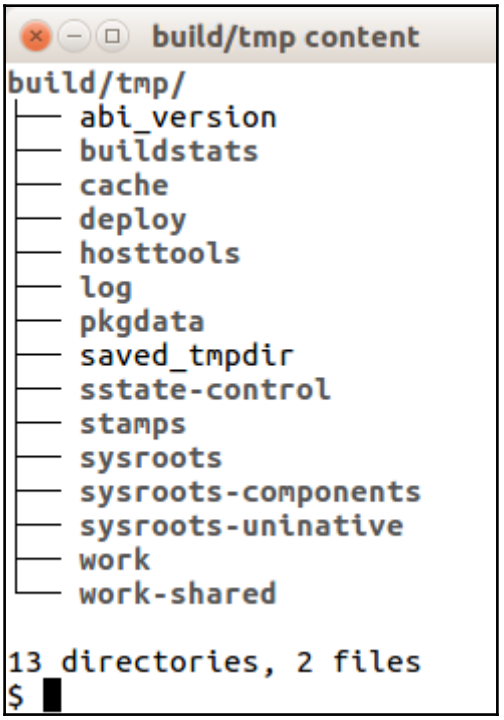

Compatible image recipes - my-first-project - Toaster - Mozilla Firefox
127.0.0.1:8000/toastergui/project/2/images/?limit=25&page=1&orderby=name&search=cmd&default_orderby=name&
yocto PROJECT Toaster
All builds
All projects
Documentation
New project
my-first-project
Configuration
Builds (0)
Import layer
New custom image
Type the recipe you want to build
Build
Configuration
COMPATIBLE METADATA
Custom images
Image recipes
Software recipes
Machines
Layers
Distros
EXTRA CONFIGURATION
BitBake variables
ACTIONS
Delete project
Compatible image recipes (1)
cmd
Search
Edit columns
Show rows: 25
Image recipe
Version
Description
Layer
Build
core-image-full-cmdline
1.0
A console-only image with more full-featured Linux system functionality installed.
openembedded-core
Build recipe
Show rows: 25


All project builds - my-first-project - Toaster - Mozilla Firefox
127.0.0.1:8000/toastergui/project/2/builds/
yocto PROJECT Toaster
All builds
All projects
Documentation
New project
my-first-project
Configuration
Builds (0)
Import layer
New custom image
Type the recipe you want to build
Build
Latest project builds
core-image-full-cmdline
18% of tasks complete
Cancel


core-image-full-cmdline qemuarm - my-first-project - Toaster - Mozilla Firefox
core-image-full-cmdline
127.0.0.1:8000/toastergui/build/1
yocto PROJECT
Toaster
All builds
All projects
Documentation
New project
IMAGES
core-image-full-cmdline
BUILD
Configuration
Tasks
Recipes
Packages
PERFORMANCE
Time
CPU usage
Disk I/O
ACTIONS
Download build log
Completed on 22/10/17 22:54
Build time: 02:13:34
Download build log
Build artifacts
core-image-full-cmdline
Packages included 198
Total package size 58.9 MB
Manifests License manifest
Package manifest
Image files ext3 (91.5 MB)
ext4 (91.5 MB)
jffs2 (28.8 MB)
tar.bz2 (20.0 MB)
Kernel artifacts modules--4.12.12+git0+eda4d18ce4_67b62d8d7b-r0-qemuarm-20171023002916.tgz (39.4 MB)
zImage--4.12.12+git0+eda4d18ce4_67b62d8d7b-r0-qemuarm-20171023002916.bin (4.8 MB)
zImage--4.12.12+git0+eda4d18ce4_67b62d8d7b-r0-versatile-pb-20171023002916.dtb (7.9 KB)

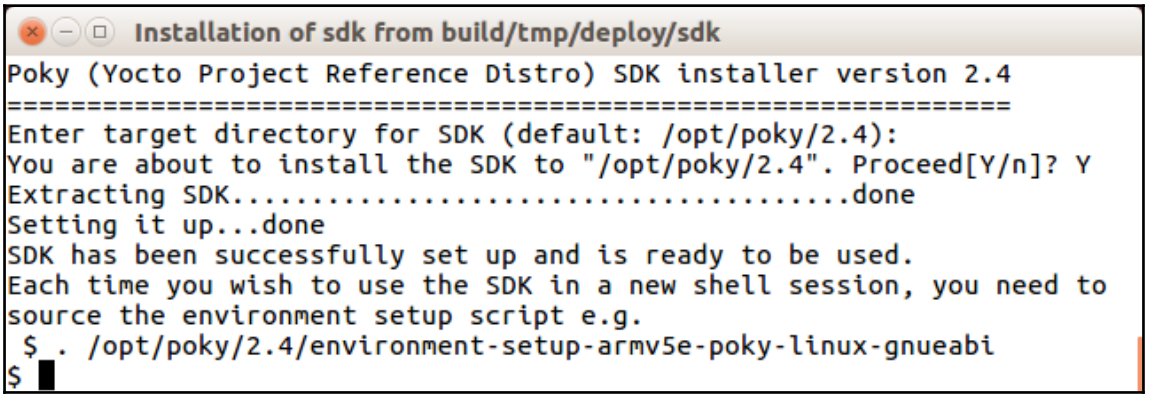

Directory structure - core-image-full-cmdline qemuarm - my-first-project - Toaster - Mozilla Firefox
Directory structure - core
127.0.0.1:8000/toastergui/build/1/target/6/dirinfo
yocto PROJECT
Toaster
All builds
All projects
Documentation
New project
my-first-project → Builds → core-image-full-cmdline qemuarm (22/10/17 22:54) → core-image-full-cmdline
Build summary
IMAGES
core-image-full-cmdline
BUILD
Configuration
Tasks
Recipes
Packages
PERFORMANCE
Time
CPU usage
Disk I/O
core-image-full-cmdline
Packages included (198 - 58.9 MB)
Directory structure
Directory / File
Symbolic link to
Source package
Size
Permissions
Owner
Group
bin 4.0 KB drwxr-xr-x root root
boot 4.0 KB drwxr-xr-x root root
dev 4.0 KB drwxr-xr-x root root
etc 4.0 KB drwxr-xr-x root root
home 4.0 KB drwxr-xr-x root root
lib 4.0 KB drwxr-xr-x root root
media 4.0 KB drwxr-xr-x root root
mnt 4.0 KB drwxr-xr-x root root
proc 4.0 KB drwxr-xr-x root root
run 4.0 KB drwxr-xr-x root root

Chapter 5: Detailing the Temporary Build Directory

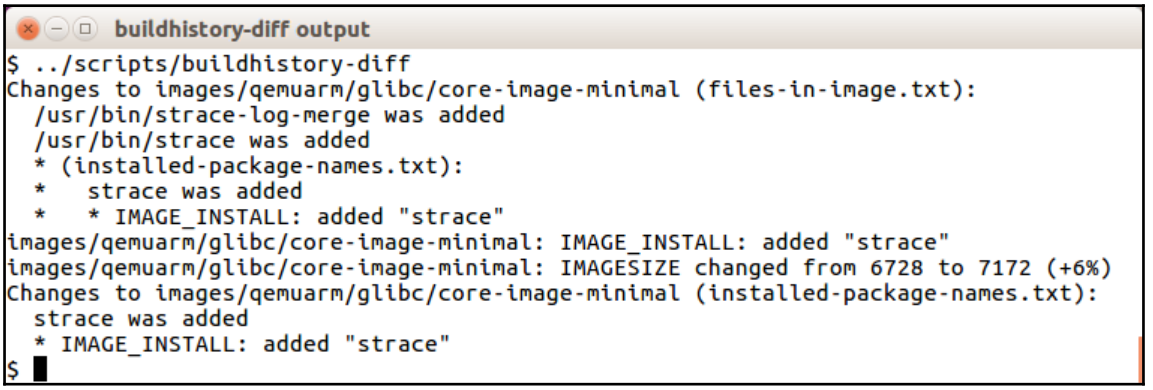


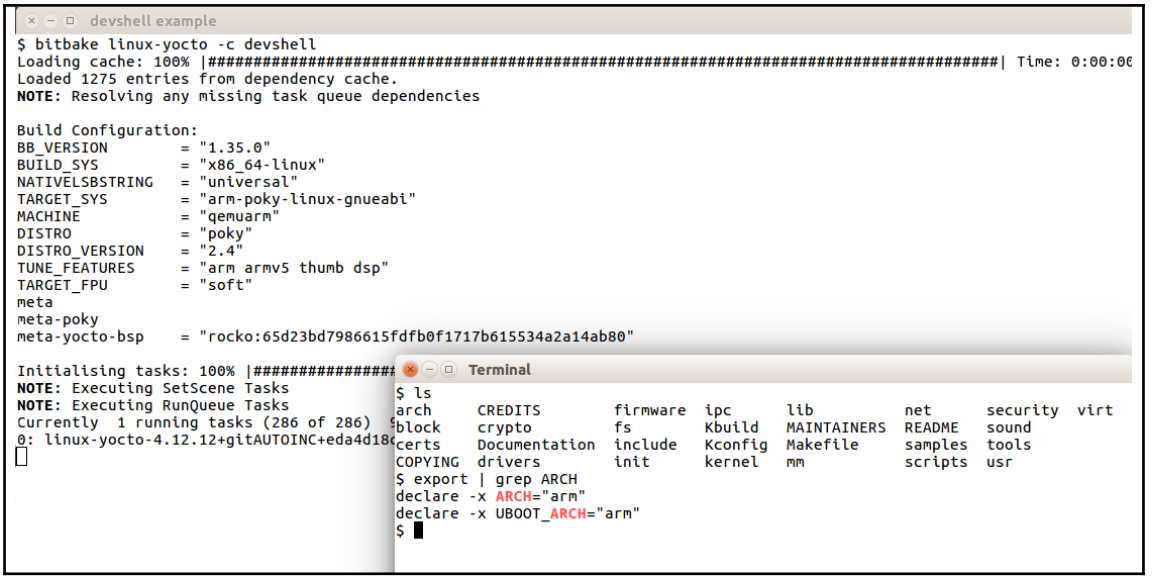
sysvinit-inittab content inside build/tmp/work
work/qemuarm-poky-linux-gnueabi/sysvinit-inittab/2.88dsf-r10/
configure.sstate
deploy-rpms
image
inittab
license-destdir
package
packages-split
patches
pkgdata
pseudo
recipe-sysroot
recipe-sysroot-native
start_getty
sysroot-destdir
sysvinit-inittab.spec
temp
12 directories, 4 files
$

Chapter 6: Assimilating Packaging Support



Chapter 9: Debugging with the Yocto Projects





Chapter 10: Exploring External Layers

Included layers

```
$ bitbake-layers show-layers
NOTE: Starting bitbake server...
layer                 path                                      priority
==========================================================================
meta                  /media/disco2/root_for_user_boot_ed2/poky/meta  5
meta-poky             /media/disco2/root_for_user_boot_ed2/poky/meta-poky  5
meta-yocto-bsp        /media/disco2/root_for_user_boot_ed2/poky/meta-yocto-bsp  5
$
```

Layers source code example

```
meta-*/
├── classes
├── conf
├── COPYING
├── README
└── recipes-*

3 directories, 2 files
$
```

BSP conf directory

```
conf/
├── layer.conf
├── machine
│   ├── include
│   │   └── <another>.conf
│   └── <machine-name>.conf
└── <other>.conf

2 directories, 4 files
$
```

Recipes multimedia directory

```
recipes-multimedia/
├── alsa
│   ├── alsa-fpu.inc
│   ├── alsa-lib
│   ├── alsa-lib_1.1.4.1.bb
│   ├── alsa-plugins_1.1.4.bb
│   ├── alsa-tools
│   ├── alsa-tools_1.1.3.bb
│   ├── alsa-utils
│   ├── alsa-utils_1.1.4.bb
│   └── alsa-utils-scripts_1.1.4.bb
├── ffmpeg
│   ├── ffmpeg
│   └── ffmpeg_3.3.3.bb
├── flac
│   └── flac_1.3.2.bb
├── gstreamer
│   ├── files
```

build/conf/bblayers.conf content

```
# POKY_BBLAYERS_CONF_VERSION is increased each time build/conf/bblayers.conf
# changes incompatibly
POKY_BBLAYERS_CONF_VERSION = "2"

BBPATH = "${TOPDIR}"
BBFILES ?= ""

BBLAYERS ?= " \
  /home/user/poky/meta \
  /home/user/poky/meta-poky \
  /home/user/poky/meta-yocto-bsp \
  "

BBLAYERS += \
  /home/user/poky/meta-openembedded/meta-oe \
"
$
```

Branch: **master** | Layers | Recipes | Machines | Distros

raspberrypi search

Machine name	Description	Layer
raspberrypi	RaspberryPi http://www.raspberrypi.org/ Board	meta-raspberrypi
raspberrypi-cm	RaspberryPi Compute Module (CM1)	meta-raspberrypi
raspberrypi-cm3	RaspberryPi Compute Module 3 (CM3)	meta-raspberrypi
raspberrypi0	RaspberryPi Zero board (https://www.raspberrypi.org/blog/raspberry-pi-zero)	meta-raspberrypi
raspberrypi0-wifi	RaspberryPi Zero WiFi board (https://www.raspberrypi.org/blog/raspberry-pi-zero-w-joins-family/)	meta-raspberrypi
raspberrypi2	RaspberryPi 2	meta-raspberrypi
raspberrypi3	RaspberryPi 3	meta-raspberrypi
raspberrypi3-64	RaspberryPi 3 in 64 bits mode	meta-raspberrypi

Branch: **rocko** | Layers | Recipes | Machines | Distros

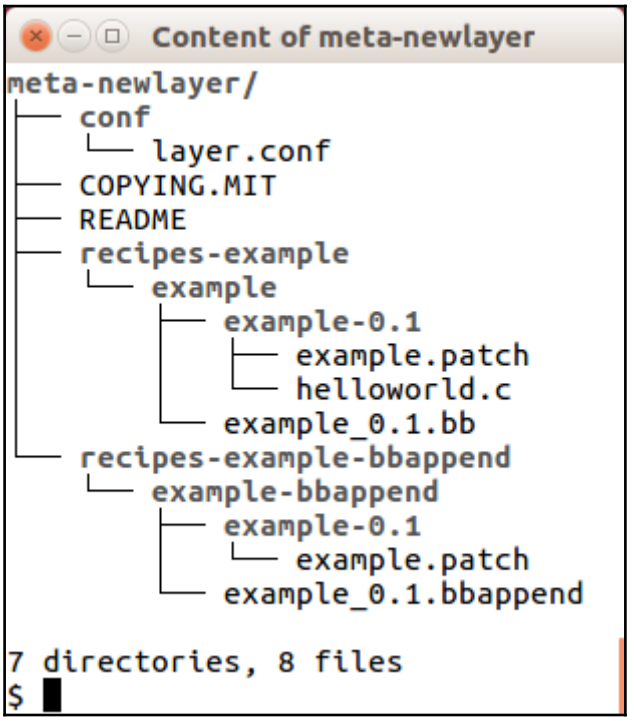
Search layers Filter layers

Layer name	Description	Type	Repository
meta-gnome	GNOME UI support	Software	git://git.openembedded.org/meta-openembedded
meta-networking	Network-related software	Software	git://git.openembedded.org/meta-openembedded
meta-android	Android specific tools	Software	git://github.com/shr-distribution/meta-smartphone.git
meta-filesystems	Support for additional filesystems	Software	git://git.openembedded.org/meta-openembedded
meta-initramfs	initramfs tools	Software	git://git.openembedded.org/meta-openembedded
meta-luneui	Recipes for LuneOS UI	Software	https://github.com/webOS-ports/meta-webos-ports
meta-mono	Mono	Software	git://git.yoctoproject.org/meta-mono
meta-multimedia	Multimedia-related software	Software	git://git.openembedded.org/meta-openembedded
meta-perl	Additional Perl recipes	Software	git://git.openembedded.org/meta-openembedded
meta-python	Python support	Software	git://git.openembedded.org/meta-openembedded
meta-qt5	Qt5 modules	Software	git://github.com/meta-qt5/meta-qt5.git
meta-webserver	Web server related software	Software	git://git.openembedded.org/meta-openembedded
meta-xfce	XFCE UI support	Software	git://git.openembedded.org/meta-openembedded

Chapter 11: Creating Custom Layers

Creating a new layer meta-newlayer

```
$ ./poky/scripts/yocto-layer create newlayer
Please enter the layer priority you'd like to use for the layer: [default: 6]
Would you like to have an example recipe created? (y/n) [default: n] y
Please enter the name you'd like to use for your example recipe: [default: example]
Would you like to have an example bbappend file created? (y/n) [default: n] y
Please enter the name you'd like to use for your bbappend file: [default: example]
Please enter the version number you'd like to use for your bbappend file (this should
match the recipe you're appending to): [default: 0.1]

New layer created in meta-newlayer.

Don't forget to add it to your BBLAYERS (for details see meta-newlayer/README).
$
```



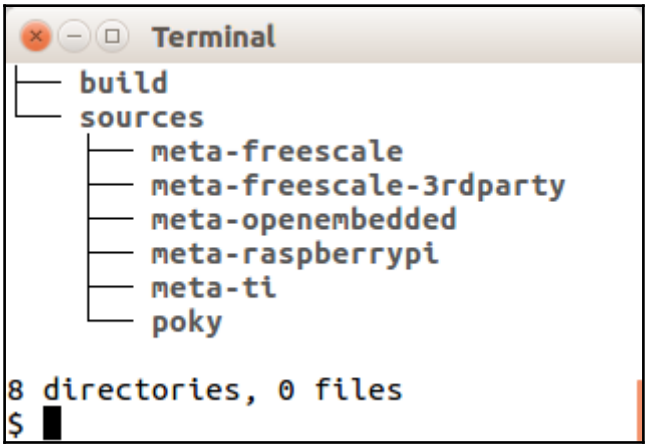
Using recipetool to ease the recipe creation

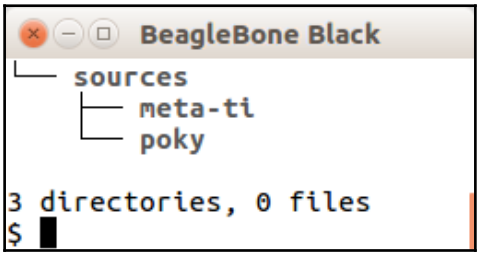
```
$ recipetool create -V 1.0 https://github.com/OsSystems/bbexample
NOTE: Starting bitbake server...
NOTE: Fetching git://github.com/OsSystems/bbexample;protocol=https...
Loading cache: 100% |################################################################################| Time: 0:00:00
Loaded 1275 entries from dependency cache.
Parsing recipes: 100% |##############################################################################| Time: 0:00:00
Parsing of 819 .bb files complete (818 cached, 1 parsed). 1276 targets, 62 skipped, 0 masked, 0 errors.
NOTE: Resolving any missing task queue dependencies

Build Configuration:
BB_VERSION        = "1.35.0"
BUILD_SYS         = "x86_64-linux"
NATIVELSBSTRING   = "universal"
TARGET_SYS        = "arm-poky-linux-gnueabi"
MACHINE           = "qemuarm"
DISTRO            = "poky"
DISTRO_VERSION    = "2.4"
TUNE_FEATURES     = "arm armv5 thumb dsp"
TARGET_FPU        = "soft"
meta
meta-poky
meta-yocto-bsp    = "rocko:65d23bd7986615fdfb0f1717b615534a2a14ab80"

Initialising tasks: 100% |###########################################################| Time: 0:00:00
NOTE: Executing RunQueue Tasks
NOTE: Tasks Summary: Attempted 2 tasks of which 0 didn't need to be rerun and all succeeded.
NOTE: Writing buildhistory
NOTE: Recipe bbexample_git.bb has been created; further editing may be required to make it fully functional
$
```

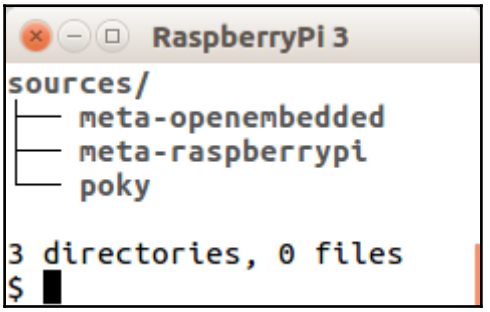
The recipe bbexample_git.bb created by recipetool

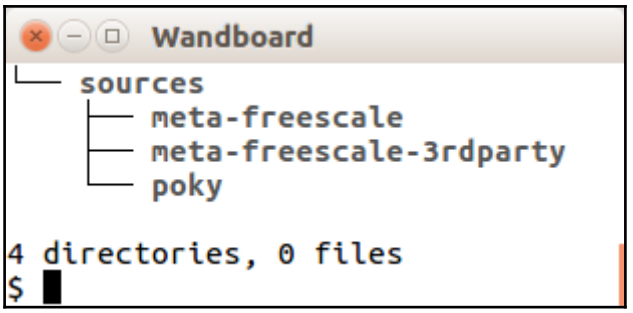
```
$ cat bbexample_git.bb
# Recipe created by recipetool
# This is the basis of a recipe and may need further editing in order to be fully functional.
# (Feel free to remove these comments when editing.)

# WARNING: the following LICENSE and LIC_FILES_CHKSUM values are best guesses - it is
# your responsibility to verify that the values are complete and correct.
LICENSE = "MIT"
LIC_FILES_CHKSUM = "file://LICENSE;md5=96af5705d6f64a88e035781ef00e98a8"

SRC_URI = "git://github.com/OsSystems/bbexample;protocol=https"

# Modify these as desired
PV = "1.0+git${SRCPV}"
SRCREV = "ece3cef9abc95cb77c931f9f27860102e43cc1d9"

S = "${WORKDIR}/git"

# NOTE: if this software is not capable of being built in a separate build directory
# from the source, you should replace autotools with autotools-brokensep in the
# inherit line
inherit autotools

# Specify any options you want to pass to the configure script using EXTRA_OECONF:
EXTRA_OECONF = ""

$
```

Chapter 14: Booting Our Custom Embedded Linux








Wandboard
└── sources
    ├── meta-freescale
    ├── meta-freescale-3rdparty
    └── poky
4 directories, 0 files
$